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atgacaagct tacctacgcc ctcagcaatt acgacttcgg cgttagagta tgcattccat 60

actcccgctc gcaatctaac gaaatctcgc ggaaaaaata ttcatcgtta tgtcagtgta 120

aagatgagta agaggattac ggtagaatct actctagagt gtgatgcctg ctatcacttt 180

gattttgagc caagtattgt tcgcttttgc gctcaaccga ttcgattttt atattatctc 240

aatggtcagt ctcactccta tgttcctgac tttctagttc aatttgatac caacgagttt 300

gttctatatg aagtaaagtc agcttatgct aagaacaaac ctgattttga tgttgaatgg 360

gaggcgaaag taaaagcagc aactgaacta gggctagaat tggagcttgt tgaagagagt 420

gatattaggg atacggttgt attaaataat cttaagcgca tgcatcgtta tgcttcgaaa 480

gatgagctga ataacgtaca taactctctc ttaaaaataa taaagtacaa tggcgcccaa 540

tctgcaagat gcttgggaga acagttgggt ttaaaaggcc gaactgtttt accaattttg 600

tgcgatttgc tgtcaaggtg tttactcgat acacgtttgg ataagcctct atctcttgaa 660

tctcgatttg agttggccag ttatggctaa 690

<210> 141
<211> 229
<212> PRT
<213> Vibrio cholerae HE-45

<400> 141

Met Thr Ser Leu Pro Thr Pro Ser Ala Ile Thr Thr Ser Ala Leu Glu
1   5   10   15

Tyr Ala Phe His Thr Pro Ala Arg Asn Leu Thr Lys Ser Arg Gly Lys
            20   25   30

Asn Ile His Arg Tyr Val Ser Val Lys Met Ser Lys Arg Ile Thr Val
        35   40   45

Glu Ser Thr Leu Glu Cys Asp Ala Cys Tyr His Phe Asp Phe Glu Pro
    50   55   60

Ser Ile Val Arg Phe Cys Ala Gln Pro Ile Arg Phe Leu Tyr Tyr Leu
65   70   75   80

Asn Gly Gln Ser His Ser Tyr Val Pro Asp Phe Leu Val Gln Phe Asp
                85   90   95

Thr Asn Glu Phe Val Leu Tyr Glu Val Lys Ser Ala Tyr Ala Lys Asn
            100   105   110

Lys Pro Asp Phe Asp Val Glu Trp Glu Ala Lys Val Lys Ala Ala Thr
        115   120   125

Glu Leu Gly Leu Glu Leu Glu Leu Val Glu Glu Ser Asp Ile Arg Asp
    130   135   140

Thr Val Val Leu Asn Asn Leu Lys Arg Met His Arg Tyr Ala Ser Lys
145   150   155   160

Asp Glu Leu Asn Asn Val His Asn Ser Leu Leu Lys Ile Ile Lys Tyr
                165   170   175

Asn Gly Ala Gln Ser Ala Arg Cys Leu Gly Glu Gln Leu Gly Leu Lys
180 185 190

Gly Arg Thr Val Leu Pro Ile Leu Cys Asp Leu Leu Ser Arg Cys Leu
195 200 205

Leu Asp Thr Arg Leu Asp Lys Pro Leu Ser Leu Glu Ser Arg Phe Glu
210 215 220

Leu Ala Ser Tyr Gly
225

<210> 142
<211> 1812
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 142
atggctaaga aagggttctc gagtttccat agaaaagcag tctcttccca agatacgctt 60

gaatcgatag agcttgtctc tagcgctaat tgtctagaaa gtgttacgta tcaagatata 120

tcagcatttc ccgaaacaat tgcggtagag attaatttcc gattaagcat tcttcgcttt 180

ttagcgcgaa agtgcgaaac cattgtggcc aaatcaattg aaccacatcg tgtagagcta 240

cagcaaaact atagtagaaa aatacccagt gcaataacga tatatcgatg gtggcttgct 300

tttcgaaaat cagactacaa ccccattagc ttagcaccta atatcaagga tagaggtaat 360

agagagacaa aagtgtcaac agttgttgat tctattatgg aacaggcagt tgaaagagtt 420

atatctggac gaaaagtcaa tgttagctct gcatataaac gtgttcgacg aaaagttcgt 480

caatacaatc taactcatgg aacgaaatac acgtatccta agtacgaatc tgtaagaaag 540

cgagtaaaaa agaaaacccc atttgagtta ttagccgcag ggaaagggga gagagtagct 600

aagagagagt ttcgccgaat gggaaaaaag atcctcacgt ctagcgtgct agagagggtt 660

gaaatagatc acactgtcgt tgacctttt gcagtacacg aagagtatcg aattccattg 720

ggccgacctt ggcttactca attggttgat tgttacagta aagctgtaat cggtttttat 780

ttaggtttcg agcctcctag ctatgtgtcg gtttcccttg cacttaagaa tgcaatacaa 840

cgcaaagatg acttaatctc ctcgtatgaa tcgatcgaga atgaatggct atgttatggg 900

atcccagacc tactcgtaac tgataatggt aaagagtttt tgtcgaaagc atttgatcaa 960

gcatgtgaat cactattgat caatgtgcat caaaataaag ttgagacgcc cgacaacaaa 1020

cctcatgttg aacgtaacta cgggactatt aatacttctc tgttagacga tttacctggg 1080

aaatccttca gccagtacct tcaaagagaa gggtacgact ctgtgggaga agctaccctt 1140

acactcaatg agattagaga aatttactta atttggttgg tggatattta tcataaaaaa 1200

cccaatcaga gaggcactaa ttgtcctaat gttgcgtgga aaaagggttg tcaagaatgg 1260

gaaccagagg agttctctgg ttctaaagac gaattagact ttaaatttgc tattgttgat 1320

tacaaacaac ttactaaagt agggataact gtctacaaag aactgagtta tagcaatgac 1380

cgtttagctg aatatagagg gaagaaagga aaccataaag ttcagttcaa gtataaccct 1440

gagtgtatgg cagttatttg ggtgttggat gaggatatga atgagtactt tacagttaat 1500

gcgattgact acgaatatgc aagtagagta tcactttggc aacataaata taacatgaaa 1560

tatcaagcag aactaaattc agcagaatat gatgaagaca aggaaattga tgcagaaata 1620

aaaattgaag aaatcgcaga tcgttcaatt gttaagacta acaaaatcag agctcggagg 1680

cgtggcgcta ggcatcaaga gaatagcgca agggctaagt caatcagtaa tgcgaacccg 1740

gcctcgatac aaaaacatga agatgaaatc gttagtgcag ataatgacga ttgggatatt 1800

gattatgtct ga 1812

<210> 143
<211> 603
<212> PRT
<213> Vibrio cholerae HE-45

<400> 143

Met Ala Lys Lys Gly Phe Ser Ser Phe His Arg Lys Ala Val Ser Ser
1 5 10 15

```
Gln Asp Thr Leu Glu Ser Ile Glu Leu Val Ser Ser Ala Asn Cys Leu
            20                  25                  30

Glu Ser Val Thr Tyr Gln Asp Ile Ser Ala Phe Pro Glu Thr Ile Ala
        35                  40                  45

Val Glu Ile Asn Phe Arg Leu Ser Ile Leu Arg Phe Leu Ala Arg Lys
    50                  55                  60

Cys Glu Thr Ile Val Ala Lys Ser Ile Glu Pro His Arg Val Glu Leu
65                  70                  75                  80

Gln Gln Asn Tyr Ser Arg Lys Ile Pro Ser Ala Ile Thr Ile Tyr Arg
                85                  90                  95

Trp Trp Leu Ala Phe Arg Lys Ser Asp Tyr Asn Pro Ile Ser Leu Ala
            100                 105                 110

Pro Asn Ile Lys Asp Arg Gly Asn Arg Glu Thr Lys Val Ser Thr Val
        115                 120                 125

Val Asp Ser Ile Met Glu Gln Ala Val Glu Arg Val Ile Ser Gly Arg
    130                 135                 140

Lys Val Asn Val Ser Ser Ala Tyr Lys Arg Val Arg Arg Lys Val Arg
145                 150                 155                 160

Gln Tyr Asn Leu Thr His Gly Thr Lys Tyr Thr Tyr Pro Lys Tyr Glu
                165                 170                 175

Ser Val Arg Lys Arg Val Lys Lys Lys Thr Pro Phe Glu Leu Leu Ala
            180                 185                 190

Ala Gly Lys Gly Glu Arg Val Ala Lys Arg Glu Phe Arg Arg Met Gly
        195                 200                 205

Lys Lys Ile Leu Thr Ser Ser Val Leu Glu Arg Val Glu Ile Asp His
```

```
    210                 215                 220

Thr Val Val Asp Leu Phe Ala Val His Glu Glu Tyr Arg Ile Pro Leu
225                 230                 235                 240

Gly Arg Pro Trp Leu Thr Gln Leu Val Asp Cys Tyr Ser Lys Ala Val
                245                 250                 255

Ile Gly Phe Tyr Leu Gly Phe Glu Pro Pro Ser Tyr Val Ser Val Ser
            260                 265                 270

Leu Ala Leu Lys Asn Ala Ile Gln Arg Lys Asp Asp Leu Ile Ser Ser
        275                 280                 285

Tyr Glu Ser Ile Glu Asn Glu Trp Leu Cys Tyr Gly Ile Pro Asp Leu
    290                 295                 300

Leu Val Thr Asp Asn Gly Lys Glu Phe Leu Ser Lys Ala Phe Asp Gln
305                 310                 315                 320

Ala Cys Glu Ser Leu Leu Ile Asn Val His Gln Asn Lys Val Glu Thr
                325                 330                 335

Pro Asp Asn Lys Pro His Val Glu Arg Asn Tyr Gly Thr Ile Asn Thr
            340                 345                 350

Ser Leu Leu Asp Asp Leu Pro Gly Lys Ser Phe Ser Gln Tyr Leu Gln
        355                 360                 365

Arg Glu Gly Tyr Asp Ser Val Gly Glu Ala Thr Leu Thr Leu Asn Glu
    370                 375                 380

Ile Arg Glu Ile Tyr Leu Ile Trp Leu Val Asp Ile Tyr His Lys Lys
385                 390                 395                 400

Pro Asn Gln Arg Gly Thr Asn Cys Pro Asn Val Ala Trp Lys Lys Gly
                405                 410                 415
```

```
Cys Gln Glu Trp Glu Pro Glu Glu Phe Ser Gly Ser Lys Asp Glu Leu
            420                 425                 430

Asp Phe Lys Phe Ala Ile Val Asp Tyr Lys Gln Leu Thr Lys Val Gly
        435                 440                 445

Ile Thr Val Tyr Lys Glu Leu Ser Tyr Ser Asn Asp Arg Leu Ala Glu
    450                 455                 460

Tyr Arg Gly Lys Lys Gly Asn His Lys Val Gln Phe Lys Tyr Asn Pro
465                 470                 475                 480

Glu Cys Met Ala Val Ile Trp Val Leu Asp Glu Asp Met Asn Glu Tyr
                485                 490                 495

Phe Thr Val Asn Ala Ile Asp Tyr Glu Tyr Ala Ser Arg Val Ser Leu
            500                 505                 510

Trp Gln His Lys Tyr Asn Met Lys Tyr Gln Ala Glu Leu Asn Ser Ala
        515                 520                 525

Glu Tyr Asp Glu Asp Lys Glu Ile Asp Ala Glu Ile Lys Ile Glu Glu
    530                 535                 540

Ile Ala Asp Arg Ser Ile Val Lys Thr Asn Lys Ile Arg Ala Arg Arg
545                 550                 555                 560

Arg Gly Ala Arg His Gln Glu Asn Ser Ala Arg Ala Lys Ser Ile Ser
                565                 570                 575

Asn Ala Asn Pro Ala Ser Ile Gln Lys His Glu Asp Glu Ile Val Ser
            580                 585                 590

Ala Asp Asn Asp Asp Trp Asp Ile Asp Tyr Val
        595                 600
```

<210> 144

<211> 993
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 144
atgagtgaaa cgcgtgaggc tcgtatatca agagctaaaa gggcatttgt atccacaccg 60

agcgttagga aaatcttgag ttacatggat agatgtagag acctatcaga cctagagtct 120

gagcctacat gcatgatggt ctatggtgct tcgggtgtag gtaaaacgac cgtcatcaag 180

aaatacttaa atcaaaacag aagagagtcc gaagccgggg gcgatataat accggttttg 240

catattgagt tgccagacaa tgcgaagcca gtagatgcag caagggaatt gctggttgaa 300

atgggtgacc cgctagcact ttatgaaact gacttagcta gattgacgaa aagactgact 360

gaattaatcc ctgcggtcgg cgtgaagctg attattatcg atgagttcca acatttggtg 420

gaagaaaggt caaatcgggt tcttacccaa gtaggtaatt ggctaaaaat gatacttaac 480

aaaacgaaat gtccaattgt tatatttggt atgccatact caaaagttgt actgcaagca 540

aactcgcaac ttcacgggcg attttccatt caggttgaac tgcgcccctt tagctaccag 600

ggaggtagag gtgtatttaa aacttttttg gaataccttg ataaagccct acctttgaa 660

aaacaggctg gcttagccaa cgaaagtttg cagaaaaaat tgtatgcatt ctctcaggga 720

aacatgcgtt cgttgagaaa ccttatttat caagcatcta tcgaagcaat tgataatcag 780

catgagacga taaccgaaga agatttcgtt tttgcatcga agttgacatc gggcgataaa 840

cccaactcat ggaaaaatcc ttttgaggag ggtgttgagg taacagaaga tatgttacga 900

ccgccaccaa aagatattgg ttgggaagac tatttgagac attcaacccc gagagtgagt 960

aaaccaggta gaaataaaaa ctttttcgaa taa 993

<210> 145
<211> 330
<212> PRT
<213> Vibrio cholerae HE-45

<400> 145

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Met Ser Glu Thr Arg Glu Ala Arg Ile Ser Arg Ala Lys Arg Ala Phe
1               5                   10                  15

Val Ser Thr Pro Ser Val Arg Lys Ile Leu Ser Tyr Met Asp Arg Cys
            20                  25                  30

Arg Asp Leu Ser Asp Leu Glu Ser Glu Pro Thr Cys Met Met Val Tyr
        35                  40                  45

Gly Ala Ser Gly Val Gly Lys Thr Thr Val Ile Lys Lys Tyr Leu Asn
    50                  55                  60

Gln Asn Arg Arg Glu Ser Glu Ala Gly Gly Asp Ile Ile Pro Val Leu
65                  70                  75                  80

His Ile Glu Leu Pro Asp Asn Ala Lys Pro Val Asp Ala Ala Arg Glu
                85                  90                  95

Leu Leu Val Glu Met Gly Asp Pro Leu Ala Leu Tyr Glu Thr Asp Leu
            100                 105                 110

Ala Arg Leu Thr Lys Arg Leu Thr Glu Leu Ile Pro Ala Val Gly Val
        115                 120                 125

Lys Leu Ile Ile Ile Asp Glu Phe Gln His Leu Val Glu Glu Arg Ser
    130                 135                 140

Asn Arg Val Leu Thr Gln Val Gly Asn Trp Leu Lys Met Ile Leu Asn
145                 150                 155                 160

Lys Thr Lys Cys Pro Ile Val Ile Phe Gly Met Pro Tyr Ser Lys Val
                165                 170                 175

Val Leu Gln Ala Asn Ser Gln Leu His Gly Arg Phe Ser Ile Gln Val
            180                 185                 190

Glu Leu Arg Pro Phe Ser Tyr Gln Gly Gly Arg Gly Val Phe Lys Thr
        195                 200                 205
```

```
Phe Leu Glu Tyr Leu Asp Lys Ala Leu Pro Phe Glu Lys Gln Ala Gly
    210                 215                 220

Leu Ala Asn Glu Ser Leu Gln Lys Lys Leu Tyr Ala Phe Ser Gln Gly
225                 230                 235                 240

Asn Met Arg Ser Leu Arg Asn Leu Ile Tyr Gln Ala Ser Ile Glu Ala
                245                 250                 255

Ile Asp Asn Gln His Glu Thr Ile Thr Glu Glu Asp Phe Val Phe Ala
            260                 265                 270

Ser Lys Leu Thr Ser Gly Asp Lys Pro Asn Ser Trp Lys Asn Pro Phe
        275                 280                 285

Glu Glu Gly Val Glu Val Thr Glu Asp Met Leu Arg Pro Pro Pro Lys
    290                 295                 300

Asp Ile Gly Trp Glu Asp Tyr Leu Arg His Ser Thr Pro Arg Val Ser
305                 310                 315                 320

Lys Pro Gly Arg Asn Lys Asn Phe Phe Glu
                325                 330
```

<210> 146
<211> 1185
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 146

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atgtttttgc aaagacctaa accttacagc gatgaaagct tagaaagctt ctttatccga       60

gtggctaaca aaaatggcta cggtgatgtc catcgcttcc tagaagccac taaacgattc      120

cttcaagaca ttgaccataa tggctatcaa acctttccga ctgatataac tcggataaac      180

ccatactcag ctaaaaacag ttccagcgca cgaactgcgt cattcctgaa gcttgcacaa      240
```

ttgacattta atgaaccgcc agagctactt gggttggcaa ttaacagaac aaacatgaaa 300

tactcgccgt caactagcgc ggttgttaga ggtgcagaag tctttcctcg cagtttacta 360

cggacgcact ccatcccctg ctgtcctttg tgtctgcgag aaaatggcta cgcctcctac 420

ctttggcact ttcaggggta cgaatactgc cacagccata acgtaccttt aattaccact 480

tgtagctgtg gtaaggagtt tgactaccga gtatctgggt taaagggcat ttgctgcaaa 540

tgcaaggagc ctatcacctt aaccagcagg gagaacggtc atgaggcagc gtgtactgtt 600

tcaaactggc ttgctggcca tgaatctaaa cctctgccaa atcttcctaa aagctaccga 660

tggggtttag ttcattggtg gatgggtatt aaagatagcg aattcgatca cttttcgttc 720

gttcaatttt tctcaaactg gccaaggtca ttccactcga taatcgaaga tgaagtagag 780

ttcaaccttg agcatgctgt tgtcagcacg tctgaattac gactaaaaga tcttcttggt 840

cgattgtttt tcggttcaat tcggttacct gagcggaatc ttcaacacaa tatcatcctt 900

ggtgagcttc tctgctattt agaaaatcgt ttatggcaag acaagggatt aatcgccaac 960

ctcaaaatga acgcgttaga ggcgactgta atgttaaatt gtagcctcga tcagattgca 1020

tcaatggttg aacaacgcat cttgaagcca aatcgaaaaa gcaagcccaa cagccctctt 1080

gatgttaccg attatctatt tcatttcggc gatattttct gtctttggtt agctgaattc 1140

caaagcgatg agtttaaccg ttcgttttat gtgtcgaggt ggtaa 1185

<210> 147
<211> 394
<212> PRT
<213> Vibrio cholerae HE-45

<400> 147

Met Phe Leu Gln Arg Pro Lys Pro Tyr Ser Asp Glu Ser Leu Glu Ser
1 5 10 15

Phe Phe Ile Arg Val Ala Asn Lys Asn Gly Tyr Gly Asp Val His Arg
20 25 30

Phe Leu Glu Ala Thr Lys Arg Phe Leu Gln Asp Ile Asp His Asn Gly

```
        35                  40                  45

Tyr Gln Thr Phe Pro Thr Asp Ile Thr Arg Ile Asn Pro Tyr Ser Ala
    50                  55                  60

Lys Asn Ser Ser Ser Ala Arg Thr Ala Ser Phe Leu Lys Leu Ala Gln
65                  70                  75                  80

Leu Thr Phe Asn Glu Pro Pro Glu Leu Leu Gly Leu Ala Ile Asn Arg
                85                  90                  95

Thr Asn Met Lys Tyr Ser Pro Ser Thr Ser Ala Val Val Arg Gly Ala
            100                 105                 110

Glu Val Phe Pro Arg Ser Leu Leu Arg Thr His Ser Ile Pro Cys Cys
        115                 120                 125

Pro Leu Cys Leu Arg Glu Asn Gly Tyr Ala Ser Tyr Leu Trp His Phe
    130                 135                 140

Gln Gly Tyr Glu Tyr Cys His Ser His Asn Val Pro Leu Ile Thr Thr
145                 150                 155                 160

Cys Ser Cys Gly Lys Glu Phe Asp Tyr Arg Val Ser Gly Leu Lys Gly
                165                 170                 175

Ile Cys Cys Lys Cys Lys Glu Pro Ile Thr Leu Thr Ser Arg Glu Asn
            180                 185                 190

Gly His Glu Ala Ala Cys Thr Val Ser Asn Trp Leu Ala Gly His Glu
        195                 200                 205

Ser Lys Pro Leu Pro Asn Leu Pro Lys Ser Tyr Arg Trp Gly Leu Val
    210                 215                 220

His Trp Trp Met Gly Ile Lys Asp Ser Glu Phe Asp His Phe Ser Phe
225                 230                 235                 240
```

```
Val Gln Phe Phe Ser Asn Trp Pro Arg Ser Phe His Ser Ile Ile Glu
                245                 250                 255

Asp Glu Val Glu Phe Asn Leu Glu His Ala Val Val Ser Thr Ser Glu
            260                 265                 270

Leu Arg Leu Lys Asp Leu Leu Gly Arg Leu Phe Phe Gly Ser Ile Arg
        275                 280                 285

Leu Pro Glu Arg Asn Leu Gln His Asn Ile Ile Leu Gly Glu Leu Leu
    290                 295                 300

Cys Tyr Leu Glu Asn Arg Leu Trp Gln Asp Lys Gly Leu Ile Ala Asn
305                 310                 315                 320

Leu Lys Met Asn Ala Leu Glu Ala Thr Val Met Leu Asn Cys Ser Leu
                325                 330                 335

Asp Gln Ile Ala Ser Met Val Glu Gln Arg Ile Leu Lys Pro Asn Arg
            340                 345                 350

Lys Ser Lys Pro Asn Ser Pro Leu Asp Val Thr Asp Tyr Leu Phe His
        355                 360                 365

Phe Gly Asp Ile Phe Cys Leu Trp Leu Ala Glu Phe Gln Ser Asp Glu
    370                 375                 380

Phe Asn Arg Ser Phe Tyr Val Ser Arg Trp
385                 390
```

<210> 148
<211> 1923
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 148

atgcaaactc tgaaagaact aatcgcatcc aatcctgacg acttaacaac tgaacttaag 60

agagcatttc gtccactcac accgcatatt gcaattgatg gtaatgaact tgacgcactg 120

acgatattag tcaatttaac cgataagact gatgatcaga aagacctgct cgatcgagcc 180

aaatgcaagc aaaaacttcg agatgaaaaa tggtgggcta gctgcataaa ttgcgttaac 240

tacagacaaa gccataaccc aaaattcccg gatatacgtt ctgaaggcgt gattcgaacc 300

caagccctag gtgaattacc gagtttccta ctctcgtctt caaaaatccc accataccat 360

tggtcatata gccatgattc aaaatacgtc aacaaaagcg cattcctcac caatgagttt 420

tgttgggatg gtgagatctc atgtttgggt gagcttctta aagatgcaga tcacccactt 480

tggaatactt tgaaaaagtt aggttgttct caaaaaactt gcaaagcaat ggcaaaacaa 540

ctagctgata ttactctcac gactatcaat gtcacactcg caccaaatta cctgactcaa 600

atatctctcc ccgatagtga tacatcctac atttcactct ctcctgttgc atcgctatcg 660

atgcaaagcc actttcatca gaggctccaa gatgaaaatc ggcatagcgc gataacgcgg 720

tttagccgaa ctaccaacat gggggtcact gcgatgacat gtggcggcgc atttagaatg 780

ttaaagtctg gcgctaagtt ttccagcccc cctcatcacc gattaaacag taaacgaagt 840

tggttaacgt cagagcatgt tcagtcatta aaacagtacc agcgcctcaa caaaagcctc 900

atacctgaaa actctcggat tgcactccgt agaaaataca aaatcgagct tcaaaatatg 960

gtcagatctt ggtttgcaat gcaagaccat acccttgatt cgaacatact tatccaacat 1020

ttgaatcatg acctatctta cttaggagcc acaaaacgtt ttgcatacga tccagcgatg 1080

accaagctct ttactgagct tttgaaacga gagttatcaa attcaatcaa taatggtgag 1140

caacacacta atggatcgtt tttagtccta ccgaatatca gggtttgtgg cgcaacagct 1200

ttaagctccc cggtaacggt ggggatccca tcacttacag ctttctttgg cttcgttcac 1260

gcatttgaac ggaatataaa tcgcaccacc tcatcgtttc gtgttgaatc ctttgcgata 1320

tgcgtccatc aactacatgt cgagaagcga ggtttgacag cagagtttgt ggaaaaaggc 1380

gacgggacta tatccgctcc cgcgacccgg gatgactggc agtgtgatgt cgtatttagc 1440

cttattttga acaccaactt tgctcaacat attgaccaag atacgttagt tacatcacta 1500

ccaaagcgat tggctcgagg ttcagcaaaa attgcgattg atgactttaa acatatcaac 1560

tcattctcga cattagaaac agcgatcgaa tctctgccaa tagaagctgg taggtggtta 1620

tcactttacg cacagtcaaa caataatcta agtgatctat tagcagccat gacagaggac 1680

catcagctca tggcaagctg cgtcggttac cacttgttag aagagcccaa agataaacca 1740

aactccctca gaggttacaa acacgctatc gccgagtgca tcattggact cattaactca 1800

atcaccttta gctcagagac tgatcccaac acaatctttt ggtcgctaaa gaactatcaa 1860

aactacctag tggtacagcc aaggagtatc aacgatgaaa ctaccgacaa atctagccta 1920

tga 1923

<210> 149
<211> 640
<212> PRT
<213> Vibrio cholerae HE-45

<400> 149

Met Gln Thr Leu Lys Glu Leu Ile Ala Ser Asn Pro Asp Asp Leu Thr
1 5 10 15

Thr Glu Leu Lys Arg Ala Phe Arg Pro Leu Thr Pro His Ile Ala Ile
20 25 30

Asp Gly Asn Glu Leu Asp Ala Leu Thr Ile Leu Val Asn Leu Thr Asp
35 40 45

Lys Thr Asp Asp Gln Lys Asp Leu Leu Asp Arg Ala Lys Cys Lys Gln
50 55 60

Lys Leu Arg Asp Glu Lys Trp Trp Ala Ser Cys Ile Asn Cys Val Asn
65 70 75 80

Tyr Arg Gln Ser His Asn Pro Lys Phe Pro Asp Ile Arg Ser Glu Gly
85 90 95

Val Ile Arg Thr Gln Ala Leu Gly Glu Leu Pro Ser Phe Leu Leu Ser
100 105 110

```
Ser Ser Lys Ile Pro Pro Tyr His Trp Ser Tyr Ser His Asp Ser Lys
        115                 120                 125

Tyr Val Asn Lys Ser Ala Phe Leu Thr Asn Glu Phe Cys Trp Asp Gly
    130                 135                 140

Glu Ile Ser Cys Leu Gly Glu Leu Leu Lys Asp Ala Asp His Pro Leu
145                 150                 155                 160

Trp Asn Thr Leu Lys Lys Leu Gly Cys Ser Gln Lys Thr Cys Lys Ala
                165                 170                 175

Met Ala Lys Gln Leu Ala Asp Ile Thr Leu Thr Thr Ile Asn Val Thr
            180                 185                 190

Leu Ala Pro Asn Tyr Leu Thr Gln Ile Ser Leu Pro Asp Ser Asp Thr
        195                 200                 205

Ser Tyr Ile Ser Leu Ser Pro Val Ala Ser Leu Ser Met Gln Ser His
    210                 215                 220

Phe His Gln Arg Leu Gln Asp Glu Asn Arg His Ser Ala Ile Thr Arg
225                 230                 235                 240

Phe Ser Arg Thr Thr Asn Met Gly Val Thr Ala Met Thr Cys Gly Gly
                245                 250                 255

Ala Phe Arg Met Leu Lys Ser Gly Ala Lys Phe Ser Ser Pro Pro His
            260                 265                 270

His Arg Leu Asn Ser Lys Arg Ser Trp Leu Thr Ser Glu His Val Gln
        275                 280                 285

Ser Leu Lys Gln Tyr Gln Arg Leu Asn Lys Ser Leu Ile Pro Glu Asn
    290                 295                 300
```

```
Ser Arg Ile Ala Leu Arg Arg Lys Tyr Lys Ile Glu Leu Gln Asn Met
305                 310                 315                 320

Val Arg Ser Trp Phe Ala Met Gln Asp His Thr Leu Asp Ser Asn Ile
                325                 330                 335

Leu Ile Gln His Leu Asn His Asp Leu Ser Tyr Leu Gly Ala Thr Lys
            340                 345                 350

Arg Phe Ala Tyr Asp Pro Ala Met Thr Lys Leu Phe Thr Glu Leu Leu
        355                 360                 365

Lys Arg Glu Leu Ser Asn Ser Ile Asn Asn Gly Glu Gln His Thr Asn
    370                 375                 380

Gly Ser Phe Leu Val Leu Pro Asn Ile Arg Val Cys Gly Ala Thr Ala
385                 390                 395                 400

Leu Ser Ser Pro Val Thr Val Gly Ile Pro Ser Leu Thr Ala Phe Phe
                405                 410                 415

Gly Phe Val His Ala Phe Glu Arg Asn Ile Asn Arg Thr Thr Ser Ser
            420                 425                 430

Phe Arg Val Glu Ser Phe Ala Ile Cys Val His Gln Leu His Val Glu
        435                 440                 445

Lys Arg Gly Leu Thr Ala Glu Phe Val Glu Lys Gly Asp Gly Thr Ile
    450                 455                 460

Ser Ala Pro Ala Thr Arg Asp Asp Trp Gln Cys Asp Val Val Phe Ser
465                 470                 475                 480

Leu Ile Leu Asn Thr Asn Phe Ala Gln His Ile Asp Gln Asp Thr Leu
                485                 490                 495

Val Thr Ser Leu Pro Lys Arg Leu Ala Arg Gly Ser Ala Lys Ile Ala
            500                 505                 510
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Ile Asp Asp Phe Lys His Ile Asn Ser Phe Ser Thr Leu Glu Thr Ala
        515                 520                 525

Ile Glu Ser Leu Pro Ile Glu Ala Gly Arg Trp Leu Ser Leu Tyr Ala
    530                 535                 540

Gln Ser Asn Asn Asn Leu Ser Asp Leu Leu Ala Ala Met Thr Glu Asp
545                 550                 555                 560

His Gln Leu Met Ala Ser Cys Val Gly Tyr His Leu Leu Glu Glu Pro
                565                 570                 575

Lys Asp Lys Pro Asn Ser Leu Arg Gly Tyr Lys His Ala Ile Ala Glu
            580                 585                 590

Cys Ile Ile Gly Leu Ile Asn Ser Ile Thr Phe Ser Ser Glu Thr Asp
        595                 600                 605

Pro Asn Thr Ile Phe Trp Ser Leu Lys Asn Tyr Gln Asn Tyr Leu Val
    610                 615                 620

Val Gln Pro Arg Ser Ile Asn Asp Glu Thr Thr Asp Lys Ser Ser Leu
625                 630                 635                 640
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<210> 150
<211> 1059
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 150
atgaaactac cgacaaatct agcctatgag cgctctatcg acccatcaga tgtctgtttt 60

tttgtcgtct ggcccgatga tagaaaaaca cctttaacct acaattctcg tactctgctc 120

gggcaaatgg aagcggcatc attagcctat gatgtctcag gtcaaccaat aaaaagtgcc 180

accgctgagg cgttagctca agggaaccct catcaagttg atttctgcca cgttccatat 240

ggtgcgagtc atattgaatg cagtttctcc gtctcgtttt cttctgaact acgtcaacca 300

tataagtgta actcaagcaa agttaaacaa acgctagtgc aattagtcga gctctacgaa 360

acgaaaatcg gctggactga gctagcaacc cgatatttga tgaatatttg caacggtaaa 420

tggctgtgga aaaatacccg taaagcttat tgctggaaca ttgtacttac accttggcca 480

tggaacgggg aaaaggttgg atttgaagat atccgtacta actacacctc acggcaagac 540

tttaaaaata ataaaaattg gtctgctata gttgaaatga tcaaaaccgc attttctagt 600

actgatgggc tggcgatatt tgaagtcagg gccaccttgc acttgccaac gaatgctatg 660

gtgcggccaa gccaagtttt cacagaaaaa gaaagtggca gtaaaagtaa atctaaaact 720

caaaacagtc gagtttttca gagtacaact attgatggtg aacgatcgcc aatactaggg 780

gcctttaaaa cgggagcagc tattgcaacc attgacgact ggtatcctga agccactgag 840

ccactaaggg tcggacggtt tggggttcat cgcgaagatg tcacttgcta ccgtcatccg 900

tctaccggaa aagatttttt ctcgatatta caacaagcag agcactatat tgaagtgttg 960

agcgccaaca aaactcccgc tcaagaaact atcaacgaca tgcacttttt aatggctaac 1020

ctgattaagg gtgggatgtt ccagcataaa ggagactga 1059

<210> 151
<211> 352
<212> PRT
<213> Vibrio cholerae HE-45

<400> 151

Met Lys Leu Pro Thr Asn Leu Ala Tyr Glu Arg Ser Ile Asp Pro Ser
1 5 10 15

Asp Val Cys Phe Phe Val Val Trp Pro Asp Asp Arg Lys Thr Pro Leu
20 25 30

Thr Tyr Asn Ser Arg Thr Leu Leu Gly Gln Met Glu Ala Ala Ser Leu
35 40 45

Ala Tyr Asp Val Ser Gly Gln Pro Ile Lys Ser Ala Thr Ala Glu Ala

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    50                  55                  60

Leu Ala Gln Gly Asn Pro His Gln Val Asp Phe Cys His Val Pro Tyr
65                  70                  75                  80

Gly Ala Ser His Ile Glu Cys Ser Phe Ser Val Ser Phe Ser Ser Glu
                85                  90                  95

Leu Arg Gln Pro Tyr Lys Cys Asn Ser Ser Lys Val Lys Gln Thr Leu
            100                 105                 110

Val Gln Leu Val Glu Leu Tyr Glu Thr Lys Ile Gly Trp Thr Glu Leu
        115                 120                 125

Ala Thr Arg Tyr Leu Met Asn Ile Cys Asn Gly Lys Trp Leu Trp Lys
    130                 135                 140

Asn Thr Arg Lys Ala Tyr Cys Trp Asn Ile Val Leu Thr Pro Trp Pro
145                 150                 155                 160

Trp Asn Gly Glu Lys Val Gly Phe Glu Asp Ile Arg Thr Asn Tyr Thr
                165                 170                 175

Ser Arg Gln Asp Phe Lys Asn Asn Lys Asn Trp Ser Ala Ile Val Glu
            180                 185                 190

Met Ile Lys Thr Ala Phe Ser Ser Thr Asp Gly Leu Ala Ile Phe Glu
        195                 200                 205

Val Arg Ala Thr Leu His Leu Pro Thr Asn Ala Met Val Arg Pro Ser
    210                 215                 220

Gln Val Phe Thr Glu Lys Glu Ser Gly Ser Lys Ser Lys Ser Lys Thr
225                 230                 235                 240

Gln Asn Ser Arg Val Phe Gln Ser Thr Thr Ile Asp Gly Glu Arg Ser
                245                 250                 255
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Pro Ile Leu Gly Ala Phe Lys Thr Gly Ala Ala Ile Ala Thr Ile Asp
            260                 265                 270

Asp Trp Tyr Pro Glu Ala Thr Glu Pro Leu Arg Val Gly Arg Phe Gly
        275                 280                 285

Val His Arg Glu Asp Val Thr Cys Tyr Arg His Pro Ser Thr Gly Lys
    290                 295                 300

Asp Phe Phe Ser Ile Leu Gln Gln Ala Glu His Tyr Ile Glu Val Leu
305                 310                 315                 320

Ser Ala Asn Lys Thr Pro Ala Gln Glu Thr Ile Asn Asp Met His Phe
                325                 330                 335

Leu Met Ala Asn Leu Ile Lys Gly Gly Met Phe Gln His Lys Gly Asp
            340                 345                 350
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<210> 152
<211> 600
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 152
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gctgcaaagt gtcttcgcgt tctgcatgga tttaactatc agtatgagac acgaaatatt 120

ggcgtttcat ttccgctttg gtgtgatgca acggttggaa aaaagatttc atttgtcagc 180

aagaacaaga tagaactcga cttactactt aaacaacact atttcgtcca aatggaacaa 240

cttcaatatt ttcatatatc caacactgtt ctcgtcccag aagattgtac atacgtttcc 300

tttagacgct gtcaatctat agataagctc acagcagcag ggctggcaag gaaaatcaga 360

cgcctggaga aacgtgctct atctagaggc gagcaatttg acccatcatc ttttgctcaa 420

aaagagcata ctgcaatagc gcactaccac tcacttgggg agtccagcaa acagacgaac 480

cgcaactttc gactcaatat caggatgctc tcggagcaac cccgtgaggg gaactcgatt 540

tttagtagct atggcttatc aaattcagaa aactcgtttc agcctgtacc cttaatctga 600

<210> 153
<211> 199
<212> PRT
<213> Vibrio cholerae HE-45

<400> 153

Met Lys Trp Tyr Tyr Lys Thr Ile Thr Phe Leu Pro Glu Leu Cys Asn
1 5 10 15

Asn Glu Ser Leu Ala Ala Lys Cys Leu Arg Val Leu His Gly Phe Asn
20 25 30

Tyr Gln Tyr Glu Thr Arg Asn Ile Gly Val Ser Phe Pro Leu Trp Cys
35 40 45

Asp Ala Thr Val Gly Lys Lys Ile Ser Phe Val Ser Lys Asn Lys Ile
50 55 60

Glu Leu Asp Leu Leu Leu Lys Gln His Tyr Phe Val Gln Met Glu Gln
65 70 75 80

Leu Gln Tyr Phe His Ile Ser Asn Thr Val Leu Val Pro Glu Asp Cys
85 90 95

Thr Tyr Val Ser Phe Arg Arg Cys Gln Ser Ile Asp Lys Leu Thr Ala
100 105 110

Ala Gly Leu Ala Arg Lys Ile Arg Arg Leu Glu Lys Arg Ala Leu Ser
115 120 125

Arg Gly Glu Gln Phe Asp Pro Ser Ser Phe Ala Gln Lys Glu His Thr
130 135 140

Ala Ile Ala His Tyr His Ser Leu Gly Glu Ser Ser Lys Gln Thr Asn
145 150 155 160

Arg Asn Phe Arg Leu Asn Ile Arg Met Leu Ser Glu Gln Pro Arg Glu
165 170 175

Gly Asn Ser Ile Phe Ser Ser Tyr Gly Leu Ser Asn Ser Glu Asn Ser
180 185 190

Phe Gln Pro Val Pro Leu Ile
195

<210> 154
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 154
gtgaactgcc gagtaggtag ctgataac 28

<210> 155
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 155
gttgtctgac acttgtcaca aaccgctagg ag 32

<210> 156
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 156
cugauaacgu ugucugacac uugucacaaa ccgcuaggag gugaacugcc gaguagguag 60

<210> 157
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 157
gtgaactgcc gagtaggtag ctgataac 28

<210> 158
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 158
tgggaggatt cataaagcat tgtttgttgg ct 32

<210> 159
<211> 60
<212> RNA
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<220>
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<400> 159
cugauaacug ggaggauuca uaaagcauug uuuguuggcu gugaacugcc gaguagguag 60

<210> 160
<211> 28
<212> DNA
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<220>
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<400> 160
gtgaactgcc gagtaggtag ctgataac 28

<210> 161
<211> 32

<212> DNA
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<220>
<223> Synthetic

<400> 161
gtcatcttcg gctacttttt ctctgtcaca ga 32

<210> 162
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 162
cugauaacgu caucuucggc uacuuuuucu cugucacaga gugaacugcc gaguagguag 60

<210> 163
<211> 28
<212> DNA
<213> artificial sequence

<220>
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<400> 163
gtgaactgcc gagtaggtag ctgataac 28

<210> 164
<211> 32
<212> DNA
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<220>
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<400> 164
tatcccatta cggtcaatcc gccgtttgtt cc 32

<210> 165
<211> 60
<212> RNA
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<220>
<223> Synthetic

<400> 165
cugauaacua ucccauuacg gucaauccgc cguuuguucc gugaacugcc gaguagguag 60

<210> 166
<211> 28
<212> DNA
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<220>
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<400> 166
gtgaactgcc gagtaggtag ctgataac 28

<210> 167
<211> 32
<212> DNA
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<220>
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<400> 167
agtacagcgc ggctgaaatc atcattaaag cg 32

<210> 168
<211> 60
<212> RNA
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<220>
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<400> 168
cugauaacag uacagcgcgg cugaaaucau cauuaaagcg gugaacugcc gaguagguag 60

<210> 169
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<220>

<223> Synthetic

<400> 169
gtgaactgcc gagtaggtag ctgataac 28

<210> 170
<211> 32
<212> DNA
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<220>
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<400> 170
agcggtgcac gggtgaactg atcgcgcagc gg 32

<210> 171
<211> 60
<212> RNA
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<220>
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<400> 171
cugauaacag cggugcacgg gugaacugau cgcgcagcgg gugaacugcc gaguagguag 60

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<220>
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<400> 172
gtgaactgcc gagtaggtag ctgataac 28

<210> 173
<211> 32
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<220>
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<400> 173
gcgccactgg tgtgggccat aattcaattc gc 32

<210> 174
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 174
cugauaacgc gccacuggug ugggccauaa uucaauucgc gugaacugcc gaguagguag 60

<210> 175
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<220>
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<400> 175
gtgaactgcc gagtaggtag ctgataac 28

<210> 176
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<220>
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<400> 176
aaaagtttgt gtttttaaa tagtacataa tg 32

<210> 177
<211> 60
<212> RNA
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<220>
<223> Synthetic

<400> 177
cugauaacaa aaguuugugu uuuuuaaaua guacauaaug gugaacugcc gaguagguag 60

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<220>
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<400> 178
gtgaactgcc gagtaggtag ctgataac 28

<210> 179
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 179
cgagtttgtc agaaagcaga ccaaacagcg gt 32

<210> 180
<211> 60
<212> RNA
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<220>
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<400> 180
cugauaaccg aguuugucag aaagcagacc aaacagcggu gugaacugcc gaguagguag 60

<210> 181
<211> 28
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<213> artificial sequence

<220>
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<400> 181
gtgaactgcc gagtaggtag ctgataac 28

<210> 182
<211> 32
<212> DNA
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<220>
<223> Synthetic

<400> 182
gcctggcttg gcgatgctcg cctgatcgac aa 32

<210> 183
<211> 60
<212> RNA
<213> artificial sequence

<220>
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<400> 183
cugauaacgc cuggcuuggc gaugcucgcc ugaucgacaa gugaacugcc gaguagguag 60

<210> 184
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<220>
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<400> 184
gtgaactgcc gagtaggtag ctgataac 28

<210> 185
<211> 32
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<220>
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<400> 185
gtcagagtgg cgtatccgat gaatcaccac ag 32

<210> 186
<211> 60

<212> RNA
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<220>
<223> Synthetic

<400> 186
cugauaacgu cagaguggcg uauccgauga aucaccacag gugaacugcc gaguagguag 60

<210> 187
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<220>
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<400> 187
gtgaactgcc gagtaggtag ctgataac 28

<210> 188
<211> 32
<212> DNA
<213> artificial sequence

<220>
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<400> 188
tcgatccgtg ggtgtttatg ttctcagcag ga 32

<210> 189
<211> 60
<212> RNA
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<220>
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<400> 189
cugauaacuc gauccguggg uguuuauguu cucagcagga gugaacugcc gaguagguag 60

<210> 190
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<220>
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<400> 190
gtgaactgcc gagtaggtag ctgataac 28

<210> 191
<211> 32
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<220>
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<400> 191
gcattactaa gctggcgcgt gaagctgtag aa 32

<210> 192
<211> 60
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<220>
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<400> 192
cugauaacgc auuacuaagc uggcgcguga agcuguagaa gugaacugcc gaguagguag 60

<210> 193
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<220>
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<400> 193
gtgaactgcc gagtaggtag ctgataac 28

<210> 194
<211> 32
<212> DNA
<213> artificial sequence

<220>

<223> Synthetic

<400> 194
gagaatattg tggcaaaagc gcataaggtg ct 32

<210> 195
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 195
cugauaacga gaauauugug gcaaaagcgc auaaggugcu gugaacugcc gaguagguag 60

<210> 196
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 196
gtgaactgcc gagtaggtag ctgataac 28

<210> 197
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 197
gcagaagtgc acggcgtgtg cggcggcgag ca 32

<210> 198
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 198
cugauaacgc agaagugcac ggcgugugcg gcggcgagca gugaacugcc gaguagguag 60

<210> 199
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 199
gtgaactgcc gagtaggtag ctgataac 28

<210> 200
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 200
ttacttacgg cgttgcgcat tctcattgca cc 32

<210> 201
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 201
cugauaacuu acuuacggcg uugcgcauuc ucauugcacc gugaacugcc gaguagguag 60

<210> 202
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 202
gtgaactgcc gagtaggtag ctgataac 28

<210> 203
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 203
ggggcgtaaa aagaaggggc gctgattaac gc 32

<210> 204
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 204
cugauaacgg ggcguaaaaa gaaggggcgc ugauuaacgc gugaacugcc gaguagguag 60

<210> 205
<211> 28
<212> DNA
<213> artificial sequence

<220>
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<400> 205
gtgaactgcc gagtaggtag ctgataac 28

<210> 206
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 206
tcttgctgag attgataagg taattaacct ta 32

<210> 207
<211> 60
<212> RNA
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<220>
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<400> 207
cugauaacuc uugcugagau ugauaaggua auuaaccuua gugaacugcc gaguagguag 60

<210> 208
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<220>
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<400> 208
gtgaactgcc gagtaggtag ctgataac 28

<210> 209
<211> 32
<212> DNA
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<220>
<223> Synthetic

<400> 209
gactgcaagt gagtcggctt ttttgttgct aa 32

<210> 210
<211> 60
<212> RNA
<213> artificial sequence

<220>
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<400> 210
cugauaacga cugcaaguga gucggcuuuu uuguugcuaa gugaacugcc gaguagguag 60

<210> 211
<211> 28

<212> DNA
<213> artificial sequence

<220>
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<400> 211
gtgaactgcc gagtaggtag ctgataac 28

<210> 212
<211> 32
<212> DNA
<213> artificial sequence

<220>
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<400> 212
gcaaacaact gagaaatttt taattcgctc tg 32

<210> 213
<211> 60
<212> RNA
<213> artificial sequence

<220>
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<400> 213
cugauaacgc aaacaacuga gaaauuuuua auucgcucug gugaacugcc gaguagguag 60

<210> 214
<211> 28
<212> DNA
<213> artificial sequence

<220>
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<400> 214
gtgaactgcc gagtaggtag ctgataac 28

<210> 215
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 215
attgaacgcg cgaagcacgc cgccggacag gt   32

<210> 216
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 216
cugauaacau ugaacgcgcg aagcacgccg ccggacaggu gugaacugcc gaguagguag   60

<210> 217
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 217
gtgaactgcc gagtaggtag ctgataac   28

<210> 218
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 218
tggcccacgt tgtggatcac ccgttaaaca aa   32

<210> 219
<211> 60
<212> RNA
<213> artificial sequence

<220>

<223> Synthetic

<400> 219
cugauaacug gcccacguug uggaucaccc guuaaacaaa gugaacugcc gaguagguag 60

<210> 220
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 220
gtgaactgcc gagtaggtag ctgataac 28

<210> 221
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 221
tgaagatagg tctggtcggc gaagaaaccg cc 32

<210> 222
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 222
cugauaacug aagauagguc uggucggcga agaaaccgcc gugaacugcc gaguagguag 60

<210> 223
<211> 28
<212> DNA
<213> artificial sequence

<220>
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<400> 223
gtgaactgcc gagtaggtag ctgataac 28

<210> 224
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 224
agcctgtaat ctctgcttaa aagcacagaa tc 32

<210> 225
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 225
cugauaacag ccuguaaucu cugcuuaaaa gcacagaauc gugaacugcc gaguagguag 60

<210> 226
<211> 28
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 226
gtgaactgcc gagtaggtag ctgataac 28

<210> 227
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 227
tgagattttc actcgtcagt gtgaacacaa tt 32

<210> 228
<211> 60
<212> RNA
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<220>
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<400> 228
cugauaacug agauuuucac ucgucagugu gaacacaauu gugaacugcc gaguagguag 60

<210> 229
<211> 28
<212> DNA
<213> artificial sequence

<220>
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<400> 229
gtgaactgcc gagtaggtag ctgataac 28

<210> 230
<211> 32
<212> DNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 230
gtacagcgcg gctgaaatca tcattaaagc ga 32

<210> 231
<211> 60
<212> RNA
<213> artificial sequence

<220>
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<400> 231
cugauaacgu acagcgcggc ugaaaucauc auuaaagcga gugaacugcc gaguagguag 60

<210> 232
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<220>
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<400> 232
gtgaactgcc gagtaggtag ctgataac 28

<210> 233
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<220>
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<400> 233
tacagcgcgg ctgaaatcat cattaaagcg ag 32

<210> 234
<211> 60
<212> RNA
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<220>
<223> Synthetic

<400> 234
cugauaacua cagcgcggcu gaaaucauca uuaaagcgag gugaacugcc gaguagguag 60

<210> 235
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<212> DNA
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<220>
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<400> 235
gtgaactgcc gagtaggtag ctgataac 28

<210> 236
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<212> DNA
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<220>
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<400> 236
acagcgcggc tgaaatcatc attaaagcga gt 32

<210> 237
<211> 60
<212> RNA
<213> artificial sequence

<220>
<223> Synthetic

<400> 237
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aagcaagaga ttgttggtcg cccttatcta acattgatca tggatagtta ttccggctgt 780

gtcgcagggt ttcacctggg ctttgaggca gcaggttcgc atgaagtggg tttagctttg 840

cgccatgcga tgttacccaa acagtatggc tccgagtaca aacttaaggc ggagtggaat 900

gtttttggcg tgccagagta ttggctgacc gatcgggcga aggaattcaa gtccaatcat 960

ttgaagcaag tctcaatgca agtaggcttc aagcgtagat tgcgggcttt tccatccgca 1020

gggggactca ttgaatccat tttcgacaag attaataaag aagtcttgtc ccactttgga 1080

ggctacacag gctcgaacat tacaaaacgc cctaaagaag cggaaaagca tgcatgtctg 1140

acgttggatg agctagagaa gagactggtg atatactttg ttgatcatta caacggacat 1200

gattacccaa aggtagccaa tcaaaagcga tcgaaccggt ggaaggcaaa cctactgaca 1260

gagccagagg tgctggatga acgtgagctt gacatctgcc tgatgaaagt tgcccatcgc 1320

aaagttgaaa agtacggttg cattcggttt gagggacttg tgtatcaggg agactgtctc 1380

gtagagtatg agggggatga ggtgtctctg aggtacgatg agcgcaatat tcttgcgctt 1440

ttggcttacg aacgacctca gcgcgatcga ccaggcaagt tcattggtga agttcgtgca 1500

agagacgcaa aagaggagca actttccctg gaagaattga ggtggctcaa gcgaaaactg 1560

aaagaacgcg ggaaggaagt ggacaacaat tccatctggg ctgaacgact aggcttgtat 1620

cagttcattg atgagaagcg aaaatccaag cgacaacgcc gcaagaaggc gcagcagcgg 1680

cgcagtcaaa agacaaataa atcgcaagta gtcgagttat ttcctcaaaa tgctgttcct 1740

gagaaccagc ctgaagttca ggagtcagag actaaagaaa gtacactccc cactactgac 1800

caacctcagc ctgatattgt aaagtctaaa gacacaccag caagtcaacc gatcgcatcc 1860

aatgtcgttg cgtacgattg gaaccagctt ttagaggaca actggtag 1908

<210> 416
<211> 951
<212> DNA
<213> Filamentous cyanobacterium

<400> 416
atggcgacat ctaacgcagt tccacaacca ctagatgatg attcgcaatc agtaactgca 60

cctcagccag atgcggcacc tcagccagca ccgctccgcc cgcttgctga accggaacga 120

tcgcctgaag ttcaggcaga agtcgagcgc attcgtagca gcgaagcata caaggacatt 180

tctcgtgatt cagccctgtt tttctggctc agtcttcagc gagattctcg atcgaacggc 240

tacgtctttg gggctaattt tgcagattta aggaaagctt gccagttcta caggatgcaa 300

tacgtccagc gacgggggac tctctacaag attccgatgc ctgttaccta tgtggatgtt 360

gaacagtatg gttctcctat tgatctactc gttgctattc ttgaatcgct tggtagcccc 420

tttgcaaaaa tcggtttgct cagagatatg agatcgcgca cttttggtac gctcaactct 480

tttggggtca agcttcttat aattggctat gcagaatgct tatcctacga agcttataac 540

gagcttctca ggttgacccg gcagttaaaa atttcggtaa ttcttgcagg ttcaatggaa 600

ctaagggaga tcttgggcaa ttttgtaaac cgtcgaagta agcgttatgg agagatttac 660

aacaattttc tggactttca cgaatacaga gcttttgaga aaagtgatat tgaaacgttg 720

ctcgaaagct gggagaacca ggtgttgagt tcttgggatc agaaattagc tctgaaagat 780

attcctgatg ttccggcttt tctttatcaa cgctgtgaag ggcatgctga aactctgtac 840

gaaattctcc gcaaaatagc aattttcaag ctagataatc cttctcatca actgagcaaa 900

gctgatattg agaatatggt gtcgcgaagg acgataccaa aacgctccta a 951

<210> 417
<211> 510
<212> DNA
<213> Filamentous cyanobacterium

<400> 417
atggacaacg aagcgtttga tctgccgcgc tggtgccctg aaccctatga aggagagagc 60

attgccagtt atctcgtgcg gtttcgctct caggaagtcg cccaaatttc tacgcccagc 120

agcttcagca aggcgatcgg cttggggatt gcacttacac ggtgggagaa gtttcgcttc 180

aatccttttc ccagtgagga ggagatacag aagttttgtg gtgtggtggg tttagagtta 240

gagcggttta aggcgatgct gccaccggaa ggggagcgaa tgaagttgga accgattcgg 300

ttgtgtgcgg cttgctatgc agaagcccct tatcatcggt tgaagtggca gtttcagtca 360

acggagggct gtagtaagca taagctacgt cttctctcta aatgccctgg ttgtgaaaga 420

ccttttacga ttcctggttt ggctgtggaa gggaaatgtc cgtgtgggat gttttataag 480

aggatggcaa agagtcaaaa gccttattag 510

<210> 418
<211> 1755
<212> DNA
<213> Nostoc punctiforme

<400> 418
atgaacagtc agcaaaatcc tgatttagct gttcatccct cggcaattcc tatagaaggc 60

ttactaggag aaagcgatat aactcttgag aagaatgtaa ttgccacaca actctcagag 120

gaagcccaac tcaagctaga ggtaatccaa agtttactag aaccctgcga tcgcacaacc 180

tatggacaaa agttgcggga agcagcagag aaactaggtg tatcgttacg aacggtacaa 240

aggttggtga aaaactggga acacgatggc ttagtcggac tcactcaaac aggtagggct 300

gataaaggaa aacatcgcat tggtgagttt tgggaaaaat tcattaccaa aacctacaac 360

gagggtaaca agggtagtaa acgtatgacc cctaaacaag ttgctctcag agtcgaggct 420

aaagcccgtg agttaaagga ctctaagcca cccaattaca aaaccgtgtt acgggtatta 480

gcgcccatat tagaaaagca agaaaaagcc aagagtattc gtagccctgg atggagagga 540

actacgcttt cagttaaaac ccgtgaaggg aaagatttat cagttgatta cagtaaccat 600

gtttggcaat gtgaccatac ccgcgtagat gtgttgctcg tggatcaaca tggtgaatta 660

ctaagtcgtc cctggctaac aacagtaatt gatacttact ctcgttgcat tatgggtatc 720

aacttgggct ttgatgcacc tagttctggg gtagtagcat tagcgttacg ccatgcaatt 780

ctacccaaac agtacggttt cgagtacaaa ctgcattgtg agtggggaac ctatggtaag 840

ccagaacatt tttatactga tggcggtaaa gactttcgct ctaaccactt gagtcagatt 900

ggagcgcaat taggatttgt ctgccattta cgcgatcgcc cttctgaagg tggagtagta 960

gaacgtcctt tcaaaacatt gaatgaccaa ctattttcaa cgcttcctgg gtacaccgga 1020

tctaatgtgc aggaacgccc aaaagatgcg gaaaaagacg caaggctcac tctaagggaa 1080

ctagaacagc tacttatacg ctatatcgtt gaccgttaca accaaagtat tgatgctcgg 1140

atgggcgatc aaactcgctt tgagcgttgg gaagcaggat tgcccacagt accagtacca 1200

ataccagaac gagatttgga tatctgttta atgaagcagt cacggcgtac tgtacaaaga 1260

ggtggttgct tgcagttcca gaatttgatg tatcgaggag aatatctggc aggttatgca 1320

ggggaaactg tcaacttaag atttgacccc agagacatta caacaatttt ggtttatcgc 1380

caggaaaaca atcaggaagt atttctcacc cgcgctcacg ctcaaggttt ggagacagag 1440

caactggcat tagatgaggc tgaggcagca agtcgcagac tccgtaacgc aggcaaaact 1500

atcagtaacc aatcattatt gcaagaagtt gttgaccgcg atgctcttgt cgcaaccaag 1560

aaaagccgta aggagcgtca aaaattggaa caggcggttt tgcgatctgc tggggttgac 1620

gaaagtaaaa ctgaatcctt gtcttcccaa gtagttgaac cagatgaagt ggaatctaca 1680

gaaacggttc actcccaata cgaagacatg gaagtgtggg actatgaaca acttcgtgaa 1740

gaatacgggt tttaa 1755

<210> 419
<211> 831
<212> DNA
<213> Nostoc punctiforme

<400> 419
atgacagaag ctcaagcgat cgccaagcag ttgggtgggg taaaaccaga tgatgagtgg 60

ttgcaagctg aaattgctcg tctcaagggt aagagtattg tgcctttaca gcaggtaaaa 120

actctccatg attggttgga tggcaagcgt aaagcacggc aatcttgtcg agtcgttggg 180

gaatcacgga ctggcaagac ggttgcctgt gatgcctata ggtacaggca aaagccacag 240

caagaagttg ggcgaccccc gattgtgcct gtagtttata ttcagcctcc gcaaaaatgc 300

ggctctaagg atttattcaa ggagatgatt gagtatctta agtttcgagc aacaaaggga 360

actgtttctg attttcgtgg gagggcgatg gaggtactca aggggtgtgg ggtagaaatg 420

ctgattattg atgaagctga tcgcctcaaa cctgagacgt ttgctgaggt gcgagatatt 480

tatgacaagt taggaattgc tgtggtattg gtgggaacag accgcttgga ggcagtaatc 540

aagcgagatg aacaagtcta taaccgcttt cgggcttgtc atcgcttcgg caagttatcg 600

gggaaagatt ttcaagatac tgtgcaagcc tgggaagata gagttttgaa actgcctgtt 660

tcttctaatt taactagcaa ggatatgctg cggattctca catcagcaac tgaaggttac 720

attggccgcc tggatgagat tctcagggaa acagcgattc gttctttatc taagggattt 780

aagaagattg ataaggctgt tttacaggaa gtggcgaaag agtacaagtg a 831

<210> 420
<211> 501
<212> DNA
<213> Nostoc punctiforme

<400> 420
atgacaacac cagatgttaa gccttggctt tttattatag aaccctatcc aggggaaagc 60

ctaagtcatt ttctaggtcg gtttagacgt gctaaccatt tatctcctgc tgggttgggt 120

ggtttagctg ggattggtgc tgtagtggca cggtgggaaa gatttcattt taaccctcgc 180

cctagtcaaa aagagttgga agcgatcgca tctgtagtag aagtggatgc ccaaaggtta 240

gcccagatgt taccacctgc tggagtggga atgcagcatg agccaattcg cttgtgtggg 300

gcttgttatg ctgaagcgcc ttgtcacaga attgagtggc agtataagtc ggtgtggaag 360

tgcgatcgcc atcaactcaa aattttagcg aagtgtccaa attgtcaagc acctttaaa 420

atgcctgccc tgtgggaaga tgggtgttgt catagatgta ggactctgtt tgcggaaatg 480

gcaaagcaac agaagagtta a 501

<210> 421
<211> 1866
<212> DNA
<213> Scytonema hofmannii

<400> 421
atgttagacg aagaatttga gttcactgag gaattgacgc aagctccaga tgttattgtg 60

cttgacaaga gtcattttgt ggtagaccca tcccaaatta ttctgcaaac atcggataag 120

cataaactga gatttaatct tatcaagtgg ttcgctgaat cccccaacat tactattaaa 180

tctcagagaa aacaggcagt cgtagatacc cttggtgttt ctactcggca ggtggagcgt 240

ctcctcaagc aatatcataa tggtgagtta tcagagacag cgggagtaca acgctcagat 300

aaggggaaac ttcgcatcag ccaatattgg gaagattata ttaaaacaac ttatgaaaaa 360

agtctgaaag ataaacatcc aatgttgcca gcagctgtcg tgcgggaagt gaagcgacac 420

gcgatcgttg acctcggact gaaaccagga gattatcccc atccagccac catctataga 480

aatttagctc ctttaatcga gcaacacacg cggaagaaaa aagttagaaa tccgggttcg 540

ggatcttggc tgaccgttgt cacgcgagat ggtcagctac tgaaggctga ctttagtaac 600

caaattatcc aatgcgacca taccgagctg gatattcata tagttgatag tcatggcagt 660

ttattgtctg accgtccttg gctaactact gttgtcgata cttattcaag ttgcattctt 720

ggttttcatt tatggatcaa acaaccaggt tctacggagg tagctcttgc cttaagacac 780

gccattctac ccaaaaatta tcctgaggac tacaaacttg gcaaagtttg ggaaatatat 840

ggacctcctt ttcaatattt ttttactgat ggtggaaaag attttaattc aaagcatcta 900

aaagccattg gtaagaaatt aggatttcag tgcgaactac gcaatcgccc gccccaaggt 960

ggaattgtag aacgtctttt taaaaccatt aatactcaag ttcttaaaga gcttcccggt 1020

tacacggggg caaacgttca agaacgcccg aaaaatgcag agaaagaagc ctgtttaaca 1080

atacaggatt tggataaaat tctagctagc ttcttttgtg atatttataa ccacgaaccc 1140

tatcccaagg agcctcgcaa cacgagattt gaacgctggt ttaaaggtat ggggggaaaa 1200

ttacccgaac ctttggacga gcgagaattg gatatttgtt tgatgaaaga agcacaacga 1260

gttgttcaag ctcatggtag catacagttt gaaaacctaa tttatcgagg agaagctctt 1320

aaggcatata gaggtgaata cgtcacccta agatacgatc ccgaccatgt cctgacttta 1380

tatgtctata gttgcgaagc tgatgataat gcagaagagt tcttgggcta tgctcacgct 1440

ataaacatgg atactcatga cttgagtata gaagaattga aaactctcaa taaagaacga 1500

agtaaagctc gtagcgatca ttacaactat gatgctttat tagcattggg taaacgcaaa 1560

gaacttgtag aagaaagaaa acaagacaag aaagcaaaaa ggcaatcaga gcaaaaacgt 1620

ctccgcactg cttccaagaa aaactcaaat gttattgaac tacgcaaaag tagagcttcg 1680

agttcttcaa gtaaagatga ccgacaggaa attttaccag agagagtttc tagggacgaa 1740

ctaaagccgg agaagacaga actgaaatat gaggaaaatc tgttagcaca gaccgatact 1800

caaaaacagg agagacataa gttagttgtc tctgaccgta aaaaaaattt aaagaatatt 1860

tggtga 1866

<210> 422
<211> 855
<212> DNA
<213> Scytonema hofmannii

<400> 422
atggcgatat ctcaactggc aacccaacca tttgtcgaag tcttacctcc agagttagat 60

agcaaagctc aaattgctaa aactattgat attgaggagc ttttcagaat taattttatc 120

acaaccgatc ggtcttcaga atgtttcaga tggttagatg agctgcgtat cctgaaacaa 180

tgcggtcgga tcattggacc aagaaatgta ggcaaaagcc gagcagtgct tcactatcgt 240

aatgaggata aaaaacgagt ttcttatgta aaggcttggt cggcatcgag ttctaaacgt 300

ctattttcac aaatcttaaa ggatattaac catgctgcat caacaggtaa acgacaggat 360

ttacgtccaa gattagctgg tagtcttgaa ctatttggat tagaattggt cattgttgat 420

aatgctgaaa atcttcaaaa agaggcgctc ttagatttaa agcaactttt tgaagaatgc 480

catgttccta ttgtcttagt tggaggtaag gagttagatg atattttaga agattttgat 540

ttgttgacta actttccaac gttatatgag tttgaacgat tggaacatga tgattttata 600

aaaacattaa agacaattga attggatatt ttatctcttc cagaagcgtc taagttaagt 660

gagggtaaca tatttgcaat tttagctgag agtacaggtg ggaaaatagg aattttagtc 720

aagatactaa ctaaagcagt tttacattct cttaaaaagg gatttggtaa agttgatgaa 780

agcattttag aaaaaatcgc aagtcgttat ggaacaaaat acgttcccat tgaaaacaaa 840

aatagaaatg attga 855

<210> 423
<211> 516
<212> DNA
<213> Scytonema hofmannii

<400> 423
atgattgaag atgatgaaat tcgtctaagg ttgggctatg ttgaaccaca cccaggtgaa 60

agcatcagtc attatttggg acggcttcgt cgatttaagg ctaacagcct tccttcagga 120

tatgctctag gaaaaattgc gggtcttggg tctgttctga ctcgatggga aaagttgtac 180

ttcaacccat ttcccactca acaagaacta gaggcattag cacaagtgat tcaagtggag 240

gttgagaaat taagagagat gctacccact aaaggtgtca caatgatgcc tcgacccatt 300

cgattatgtg cggcttgcta tgcagagtca ccttatcacc ggatcgagtg gcagtttaag 360

gacaaaatga agtgcgatcg ccatcagttg cgcttattaa caaaatgcac aaactgtcag 420

acaccattcc ccattcctgc tgattgggaa aaaggagaat gctcgcattg ttttttgtct 480

tttgctaaga tggtgaagtg tcaaaagcgt cgttag 516

<210> 424
<211> 560
<212> PRT

<213> Anabaena variabilis

<400> 424

```
Met Leu Asp Asp Pro Asp Lys Gly Asn Gln Glu Pro Glu Thr His Glu
1               5                  10                  15


Ile Val Thr Glu Leu Ser Leu Asp Glu Gln His Leu Leu Glu Met Ile
            20                  25                  30


Gln Lys Leu Ile Glu Pro Cys Asp Arg Ile Thr Tyr Gly Glu Arg Gln
        35                  40                  45


Arg Glu Val Ala Gly Lys Leu Gly Lys Ser Val Arg Thr Val Arg Arg
    50                  55                  60


Leu Val Lys Lys Trp Glu Gln Glu Gly Leu Thr Ala Leu Gln Thr Ala
65                  70                  75                  80


Thr Arg Thr Asp Lys Gly Thr His Arg Ile Asp Ser Asp Trp Gln Asp
                85                  90                  95


Phe Ile Ile Lys Thr Tyr Lys Glu Asn Asn Lys Asp Gly Lys Arg Met
            100                 105                 110


Ser Pro Lys Gln Val Ala Leu Arg Val Gln Thr Lys Ala Glu Glu Leu
        115                 120                 125


Gly Gln Gln Lys Tyr Pro Ser Tyr Arg Thr Val Tyr Arg Val Leu Gln
    130                 135                 140


Pro Ile Ile Glu Gln Lys Glu Gln Lys Glu Gly Ile Arg His Arg Gly
145                 150                 155                 160


Trp His Gly Ser Arg Leu Ser Val Lys Thr Arg Asp Gly Lys Asp Leu
                165                 170                 175


Phe Val Glu His Ser Asn His Val Trp Gln Cys Asp His Thr Arg Val
            180                 185                 190
```

```
Asp Leu Leu Leu Val Asp Gln His Gly Glu Leu Leu Ser Arg Pro Trp
        195                 200                 205

Leu Thr Ile Val Val Asp Thr Tyr Ser Arg Cys Ile Met Gly Ile Asn
    210                 215                 220

Leu Gly Phe Asp Ala Pro Ser Ser Gln Val Ile Ala Leu Ala Leu Arg
225                 230                 235                 240

His Ala Ile Leu Pro Lys Arg Tyr Gly Ser Glu Tyr Gly Leu His Glu
                245                 250                 255

Glu Trp Gly Thr Tyr Gly Lys Pro Glu His Phe Tyr Thr Asp Gly Gly
            260                 265                 270

Lys Asp Phe Arg Ser Asn His Leu Gln Gln Ile Gly Val Gln Leu Gly
        275                 280                 285

Phe Val Cys His Leu Arg Asp Arg Pro Ser Glu Gly Gly Ile Val Glu
    290                 295                 300

Arg Pro Phe Gly Thr Phe Asn Thr Asp Leu Phe Ser Thr Leu Pro Gly
305                 310                 315                 320

Tyr Thr Gly Ser Asn Val Gln Glu Arg Pro Glu Gln Ala Glu Lys Glu
                325                 330                 335

Ala Cys Ile Thr Leu Arg Glu Leu Glu Arg Leu Leu Val Arg Tyr Ile
            340                 345                 350

Val Asp Lys Tyr Asn Gln Ser Ile Asp Ala Arg Leu Gly Asp Gln Thr
        355                 360                 365

Arg Tyr Gln Arg Trp Glu Ala Gly Leu Ile Val Ala Pro Asn Leu Ile
    370                 375                 380
```

```
Ser Glu Glu Glu Leu Arg Ile Cys Leu Met Lys Gln Thr Arg Arg Ser
385                 390                 395                 400


Ile Tyr Arg Gly Gly Tyr Val Gln Phe Glu Asn Leu Thr Tyr Arg Gly
                405                 410                 415


Glu Asn Leu Ala Gly Tyr Ala Gly Glu Asn Val Val Leu Arg Tyr Asp
            420                 425                 430


Pro Lys Asp Ile Thr Thr Leu Leu Val Tyr Arg Gln Lys Gly Asn Gln
        435                 440                 445


Glu Glu Phe Leu Ala Arg Ala Tyr Ala Gln Asp Leu Glu Thr Glu Glu
    450                 455                 460


Leu Ser Val Asp Glu Ala Lys Ala Met Ser Arg Arg Ile Arg Gln Ala
465                 470                 475                 480


Gly Lys Ala Ile Ser Asn Arg Ser Ile Leu Ala Glu Val Arg Asp Arg
                485                 490                 495


Glu Thr Phe Val Asn Gln Lys Lys Thr Lys Lys Glu Arg Gln Lys Ala
            500                 505                 510


Glu Gln Thr Ile Val Gln Lys Ala Lys Lys Pro Val Pro Val Glu Pro
        515                 520                 525


Glu Glu Glu Ile Glu Val Ala Ser Val Asp Ser Glu Pro Glu Tyr Gln
    530                 535                 540


Met Pro Glu Val Phe Asp Tyr Glu Gln Met Arg Glu Asp Tyr Gly Trp
545                 550                 555                 560


<210>  425
<211>  278
<212>  PRT
<213>  Anabaena variabilis

<400>  425
```

```
Met Thr Ser Lys Gln Ala Gln Ala Val Ala Gln Gln Leu Gly Asp Ile
1               5                  10                  15

Pro Val Asn Asp Glu Lys Ile Gln Ala Glu Ile Gln Arg Leu Asn Arg
            20                  25                  30

Lys Ser Phe Ile Pro Leu Glu Gln Val Gln Met Leu His Asp Trp Leu
        35                  40                  45

Asp Gly Lys Arg Gln Ser Arg Gln Ser Gly Arg Val Val Gly Glu Ser
    50                  55                  60

Arg Thr Gly Lys Thr Met Gly Cys Asp Ala Tyr Arg Leu Arg His Lys
65                  70                  75                  80

Pro Lys Gln Glu Pro Gly Arg Pro Pro Thr Val Pro Val Ala Tyr Ile
                85                  90                  95

Gln Ile Pro Gln Glu Cys Gly Ala Lys Glu Leu Phe Gly Val Leu Leu
            100                 105                 110

Glu His Leu Lys Tyr Gln Met Thr Lys Gly Thr Val Ala Glu Ile Arg
        115                 120                 125

Asp Arg Thr Leu Arg Val Leu Lys Gly Cys Gly Val Glu Met Leu Ile
    130                 135                 140

Ile Asp Glu Ala Asp Arg Leu Lys Pro Lys Thr Phe Ala Glu Val Pro
145                 150                 155                 160

Asp Ile Phe Asp Lys Leu Glu Ile Ala Val Ile Leu Val Gly Thr Asp
                165                 170                 175

Arg Leu Asp Ala Val Ile Lys Arg Asp Glu Gln Val Tyr Asn Arg Phe
            180                 185                 190

Arg Ala Cys His Arg Phe Gly Lys Phe Ser Gly Asp Glu Phe Lys Lys
```

```
        195                 200                 205

Ile Val Asp Ile Trp Glu Lys Lys Val Leu Gln Leu Pro Val Ala Ser
    210                 215                 220

Asn Leu Ser Ser Lys Thr Met Leu Lys Thr Leu Gly Glu Thr Thr Gly
225                 230                 235                 240

Gly Tyr Ile Gly Leu Leu Asp Met Ile Leu Arg Glu Ser Ala Ile Arg
                245                 250                 255

Ala Leu Lys Lys Gly Leu Arg Lys Val Asp Leu Ala Thr Leu Lys Glu
            260                 265                 270

Val Thr Glu Glu Tyr Lys
        275
```

<210> 426
<211> 167
<212> PRT
<213> Anabaena variabilis

<400> 426

```
Met Glu Val Pro Gln Ile Gln Pro Trp Leu Phe Gln Ile Glu Pro Leu
1               5                   10                  15

Glu Gly Glu Ser Leu Ser His Phe Leu Gly Arg Phe Arg Arg Ala Asn
            20                  25                  30

Asp Leu Thr Pro Thr Gly Leu Gly Lys Ala Ala Gly Leu Gly Gly Ala
        35                  40                  45

Ile Ala Arg Trp Glu Lys Phe Arg Phe Asn Pro Pro Pro Ser Arg Gln
    50                  55                  60

Gln Leu Glu Ala Leu Ala Asn Val Val Gly Val Asp Ala Asp Arg Leu
65                  70                  75                  80
```

```
Ala Gln Met Leu Pro Ser Ala Gly Val Gly Met Lys Met Glu Pro Ile
                85                  90                  95

Arg Leu Cys Ala Ala Cys Tyr Ala Glu Ser Pro Cys His Lys Ile Glu
            100                 105                 110

Trp Gln Phe Lys Val Thr Arg Gly Cys Ala Arg His Lys Ile Thr Leu
        115                 120                 125

Leu Ser Glu Cys Pro Asn Cys Lys Ala Arg Phe Lys Val Pro Ala Leu
    130                 135                 140

Trp Val Asp Gly Trp Cys Asn Arg Cys Phe Leu Arg Phe Glu Glu Met
145                 150                 155                 160

Ala Lys Tyr Gln Lys Gly Leu
                165
```

<210> 427
<211> 554
<212> PRT
<213> Cyanobacterium aponinum

<400> 427

```
Met Thr Ile Asp Asn Gln Phe Ser Asp Ser Pro Glu Leu Ile Ser Gln
1               5                   10                  15

Leu Ser Pro Glu Asp Gln Lys Ile Ala Asp Val Ile Glu Asn Leu Leu
            20                  25                  30

Gln Pro Cys Asp Lys Lys Thr Tyr Gly Lys Lys Leu Lys Gln Ala Ser
        35                  40                  45

Asp Gln Leu Lys Lys Ser Val Arg Thr Ile Gln Arg Tyr Val Lys Gln
    50                  55                  60

Trp Glu Glu Asn Gly Leu Val Gly Ile Leu Gln Asn Asn Arg Ala Asp
65                  70                  75                  80
```

```
Lys Gly Ser Tyr Arg Ile Asp Pro Arg Leu Gln Asp Phe Ile Leu Lys
                85                  90                  95

Thr Tyr Arg Glu Gly Asn Lys Gly Ser Lys Arg Met Thr Pro Lys Gln
            100                 105                 110

Val Tyr Leu Arg Ala Val Val Gln Ala Glu Asn Trp Gly Ile Lys Pro
        115                 120                 125

Pro Ser His Met Thr Ile Tyr Arg Ile Leu Asn Pro Ile Ile Ala Glu
    130                 135                 140

Lys Glu Asn Lys Lys Arg Ile Arg Ser Ser Gly Trp Arg Gly Ser Gln
145                 150                 155                 160

Leu Val Leu Ser Thr Arg Ser Gly Thr Glu Ile Asp Val Gln Tyr Ser
                165                 170                 175

Asn His Val Trp Gln Cys Asp His Thr Arg Ala Asp Ile Leu Leu Val
            180                 185                 190

Asp Gln Phe Gly Glu Leu Leu Gly Arg Pro Trp Ile Thr Ile Val Val
        195                 200                 205

Asp Thr Tyr Ser Arg Cys Ile Met Gly Ile Asn Leu Gly Phe Asp Ala
    210                 215                 220

Pro Ser Ser Gln Val Val Thr Leu Ala Leu Arg His Ala Ile Leu Pro
225                 230                 235                 240

Lys Ser Tyr Ser Ser Asp Tyr Glu Leu His Glu Glu Trp Gly Thr Tyr
                245                 250                 255

Gly Lys Pro Glu Tyr Phe Tyr Thr Asp Gly Gly Lys Asp Phe Arg Ser
            260                 265                 270

Asn His Leu Gln Gln Ile Ser Leu Gln Leu Gly Phe Thr Cys His Leu
```

```
        275                 280                 285

Arg Ser Arg Pro Ser Glu Gly Gly Val Val Glu Arg Leu Phe Lys Thr
    290                 295                 300

Leu Asn Thr Glu Val Phe Ser Thr Leu Pro Gly Tyr Thr Gly Ala Asn
305                 310                 315                 320

Val Gln Glu Arg Pro Glu Asp Ala Glu Lys Glu Ala Cys Leu Thr Leu
                325                 330                 335

Lys Glu Leu Glu Ile Leu Ile Val Arg Tyr Ile Val Asp Asn Tyr Asn
            340                 345                 350

Gln Arg Ile Asp Ala Arg Met Gly Glu Gln Thr Arg Phe Gln Arg Trp
        355                 360                 365

Glu Ser Gly Leu Leu Ser Thr Pro His Ile Ile Pro Glu Arg Glu Leu
    370                 375                 380

Asp Ile Cys Leu Met Lys Gln Ser Arg Arg Lys Val Gln Lys Gly Gly
385                 390                 395                 400

His Leu Gln Phe Glu Asn Leu Ile Tyr Lys Gly Gln Tyr Leu Ala Gly
                405                 410                 415

Tyr Glu Gly Glu Thr Val Ile Leu Arg Tyr Asp Pro Arg Asp Ile Thr
            420                 425                 430

Gly Ile Leu Ile Tyr Arg Val Glu Asn Asn Lys Glu Ile Phe Leu Thr
        435                 440                 445

Arg Ala Tyr Ala Thr Asp Leu Glu Gly Asp Cys Leu Ser Leu Thr Asp
    450                 455                 460

Ala Lys Ser Ser Val Lys Arg Ile Arg Glu Lys Ser Lys Asn Val His
465                 470                 475                 480
```

```
Asn Lys Ser Ile Leu Met Glu Ile Gln Gln Arg His Leu Phe Ser Glu
                485                 490                 495


Lys Lys Thr Lys Lys Gln Ile Gln Gln Glu Glu Gln Lys Gln Ile Lys
            500                 505                 510


Pro Asn Thr Ser Leu Ser Ile Phe Lys Pro Glu Thr Glu Met Asp Thr
        515                 520                 525


Gln Val Glu Ser Ser Gln Glu Leu Ser Glu Glu Asp Leu Asp Ile Glu
    530                 535                 540


Met Ile Asp Tyr Gly Asn Leu Gln Gln Tyr
545                 550
```

<210> 428
<211> 277
<212> PRT
<213> Cyanobacterium aponinum

<400> 428

```
Met Glu Ala Lys Glu Ile Ala Gln Gln Leu Gly Glu Val Glu Gln Pro
1               5                   10                  15


Asn Gln Ser Leu Gln Asn Glu Leu Asp Arg Leu Ser Lys Lys Gln Phe
            20                  25                  30


Leu Phe Leu Asp Gln Val Lys Ile Tyr His Gln Trp Leu Asn Glu Arg
        35                  40                  45


Leu Phe Met Lys His Cys Cys Arg Val Val Gly Asp Ser His Thr Gly
    50                  55                  60


Lys Thr Ser Ser Ser Gln Ala Tyr Cys Leu Arg Tyr Lys Ser Thr Gln
65                  70                  75                  80


Glu Ser Gly Lys Asn Pro Ile Phe Pro Val Leu Tyr Val Ser Val Pro
                85                  90                  95
```

```
Glu Asn Ala Thr Ser Lys Val Phe Phe Glu Thr Ser Ile Lys Ser Phe
            100                 105                 110

Gly Tyr Arg Ile Ser Lys Gly Thr Ile Ser Asp Leu Arg Glu Arg Met
        115                 120                 125

Leu Thr Leu Leu Ser Arg Cys Gln Val Lys Met Met Ile Ile Asp Glu
    130                 135                 140

Ala Asp Arg Cys Lys Pro Glu Thr Leu Ser Tyr Ile Arg Asp Ile Phe
145                 150                 155                 160

Asp His Leu Asn Ile Cys Ile Val Leu Val Gly Thr Asp Arg Leu Asn
                165                 170                 175

Thr Val Leu Lys Arg Asp Glu Gln Val Tyr Asn Arg Phe Leu Pro Cys
            180                 185                 190

Tyr Arg Tyr Gly Leu Leu Asp Lys Glu Ser Leu Ile Lys Thr Ile Lys
        195                 200                 205

Ile Trp Glu Ile Lys Ile Leu Lys Leu Pro Val Ala Ser Asn Leu Ser
    210                 215                 220

Gln Gly Lys Lys Phe Asn Ile Ile Tyr Ser Thr Ser Lys Gly Cys Leu
225                 230                 235                 240

Gly Thr Met Asp Lys Leu Leu Arg Thr Ser Ala Ser Met Ala Leu Ile
                245                 250                 255

Arg Gly Leu Ser Lys Ile Glu Leu Asn Ile Leu Glu Glu Ala Ala His
            260                 265                 270

Leu Phe Lys Asp Lys
        275
```

<210> 429
<211> 163
<212> PRT
<213> Cyanobacterium aponinum

<400> 429

```
Met Ile Thr Asn Ser Phe Asp Ser Trp Ile Leu Met Leu Asp Pro Tyr
1               5                   10                  15


Gln Gly Glu Ser Ile Ser His Phe Leu Gly Arg Phe Arg Arg Glu Asn
            20                  25                  30


Ser Leu Thr Val Asn Asn Leu Gly Lys Ala Thr Glu Leu Tyr Gly Ala
        35                  40                  45


Ile Ala Arg Trp Glu Lys Phe Arg Phe Asn Pro Pro Pro Ser Ser Glu
    50                  55                  60


Gln Leu Lys Lys Leu Ser Ala Ile Val Gln Val Glu Val Ala Thr Leu
65                  70                  75                  80


Gln Thr Met Phe Pro Ser Ala Pro Met Lys Met Thr Pro Ile Arg Leu
                85                  90                  95


Cys Ser Ala Cys Tyr Gly Glu Lys Pro Tyr His Lys Met Glu Trp Gln
            100                 105                 110


Tyr Lys Glu Ile Tyr Lys Cys Asp Arg His Gln Leu Lys Leu Leu Ser
        115                 120                 125


Glu Cys Pro Asn Cys Gly Ala Arg Phe Lys Phe Pro Ser Leu Trp Val
    130                 135                 140


Asp Gly Trp Cys His Arg Cys Phe Thr Pro Phe Ala Glu Met Lys Gln
145                 150                 155                 160


Gln Lys Asp
```

<210> 430
<211> 635
<212> PRT
<213> Filamentous cyanobacterium

<400> 430

Met Ser Thr Asp Ala Thr Ser Ala Thr Cys Ser Pro Ser Gln Asp Ser
1   5   10   15

Gly Leu Glu Gln Gly Gln Gln Gly Gln Pro Pro Met Leu Leu Asn Glu
            20   25   30

Val Ser Pro Glu Val Gln Gln Lys Ile Asp Leu Ile Asp Ala Ile Phe
        35   40   45

Gln Thr Pro Asp Lys Lys Ala Arg Arg Glu Ala Ile Leu His Ala Ala
    50   55   60

Lys Thr Leu Gly Lys Thr Thr Arg Thr Ile Arg Leu Met Met Glu Lys
65   70   75   80

Val Lys Asn Asp Gly Val Ala Thr Leu Ala Val Gly Arg Lys Asp Glu
                85   90   95

Gly Gln Phe Arg Ile Ser Glu Gln Trp Ser Asn Phe Ile Lys Val Ile
            100   105   110

Tyr Glu Trp Gly Gln Arg Asp Gly Ser Arg Ile Asn Ile Asn Gly Val
        115   120   125

Tyr Thr His Leu Val Ala Leu Ala Ser Gln Gly Glu Ala Leu Arg Asp
    130   135   140

Lys Lys Tyr Ala Asp Arg Phe Lys Gly Tyr Pro Gln Val Leu Glu Asp
145   150   155   160

Leu Val Ala Gly Lys His Pro Ser His Val Thr Val Tyr Lys Val Val
                165   170   175

```
Asn Phe Tyr Leu Glu Arg Lys Asn Lys Lys Val Arg His Pro Gly Ser
            180                 185                 190

Pro Ala Glu Gly Gln Val Ile Gln Thr Thr Glu Gly Ile Ile Glu Leu
        195                 200                 205

Thr His Ser Asn Gln Val Trp Gln Cys Asp His Thr Lys Leu Asp Ile
    210                 215                 220

Leu Leu Val Asp Gly Asp Gly Glu Val Ile Leu Gln Trp Asp Asp Gln
225                 230                 235                 240

Lys Gln Glu Ile Val Gly Arg Pro Tyr Leu Thr Leu Ile Met Asp Ser
                245                 250                 255

Tyr Ser Gly Cys Val Ala Gly Phe His Leu Gly Phe Glu Ala Ala Gly
            260                 265                 270

Ser His Glu Val Gly Leu Ala Leu Arg His Ala Met Leu Pro Lys Gln
        275                 280                 285

Tyr Gly Ser Glu Tyr Lys Leu Lys Ala Glu Trp Asn Val Phe Gly Val
    290                 295                 300

Pro Glu Tyr Trp Leu Thr Asp Arg Ala Lys Glu Phe Lys Ser Asn His
305                 310                 315                 320

Leu Lys Gln Val Ser Met Gln Val Gly Phe Lys Arg Arg Leu Arg Ala
                325                 330                 335

Phe Pro Ser Ala Gly Gly Leu Ile Glu Ser Ile Phe Asp Lys Ile Asn
            340                 345                 350

Lys Glu Val Leu Ser His Phe Gly Gly Tyr Thr Gly Ser Asn Ile Thr
        355                 360                 365
```

```
Lys Arg Pro Lys Glu Ala Glu Lys His Ala Cys Leu Thr Leu Asp Glu
    370                 375                 380

Leu Glu Lys Arg Leu Val Ile Tyr Phe Val Asp His Tyr Asn Gly His
385                 390                 395                 400

Asp Tyr Pro Lys Val Ala Asn Gln Lys Arg Ser Asn Arg Trp Lys Ala
                405                 410                 415

Asn Leu Leu Thr Glu Pro Glu Val Leu Asp Glu Arg Glu Leu Asp Ile
            420                 425                 430

Cys Leu Met Lys Val Ala His Arg Lys Val Glu Lys Tyr Gly Cys Ile
        435                 440                 445

Arg Phe Glu Gly Leu Val Tyr Gln Gly Asp Cys Leu Val Glu Tyr Glu
    450                 455                 460

Gly Asp Glu Val Ser Leu Arg Tyr Asp Glu Arg Asn Ile Leu Ala Leu
465                 470                 475                 480

Leu Ala Tyr Glu Arg Pro Gln Arg Asp Arg Pro Gly Lys Phe Ile Gly
                485                 490                 495

Glu Val Arg Ala Arg Asp Ala Lys Glu Glu Gln Leu Ser Leu Glu Glu
            500                 505                 510

Leu Arg Trp Leu Lys Arg Lys Leu Lys Glu Arg Gly Lys Glu Val Asp
        515                 520                 525

Asn Asn Ser Ile Trp Ala Glu Arg Leu Gly Leu Tyr Gln Phe Ile Asp
    530                 535                 540

Glu Lys Arg Lys Ser Lys Arg Gln Arg Arg Lys Lys Ala Gln Gln Arg
545                 550                 555                 560

Arg Ser Gln Lys Thr Asn Lys Ser Gln Val Val Glu Leu Phe Pro Gln
                565                 570                 575
```

```
Asn Ala Val Pro Glu Asn Gln Pro Glu Val Gln Glu Ser Glu Thr Lys
            580                 585                 590


Glu Ser Thr Leu Pro Thr Thr Asp Gln Pro Gln Pro Asp Ile Val Lys
        595                 600                 605


Ser Lys Asp Thr Pro Ala Ser Gln Pro Ile Ala Ser Asn Val Val Ala
    610                 615                 620


Tyr Asp Trp Asn Gln Leu Leu Glu Asp Asn Trp
625                 630                 635


<210>  431
<211>  316
<212>  PRT
<213>  Filamentous cyanobacterium

<400>  431

Met Ala Thr Ser Asn Ala Val Pro Gln Pro Leu Asp Asp Asp Ser Gln
1               5                   10                  15


Ser Val Thr Ala Pro Gln Pro Asp Ala Ala Pro Gln Pro Ala Pro Leu
            20                  25                  30


Arg Pro Leu Ala Glu Pro Glu Arg Ser Pro Glu Val Gln Ala Glu Val
        35                  40                  45


Glu Arg Ile Arg Ser Ser Glu Ala Tyr Lys Asp Ile Ser Arg Asp Ser
    50                  55                  60


Ala Leu Phe Phe Trp Leu Ser Leu Gln Arg Asp Ser Arg Ser Asn Gly
65                  70                  75                  80


Tyr Val Phe Gly Ala Asn Phe Ala Asp Leu Arg Lys Ala Cys Gln Phe
                85                  90                  95


Tyr Arg Met Gln Tyr Val Gln Arg Arg Gly Thr Leu Tyr Lys Ile Pro
```

```
            100                 105                 110

Met Pro Val Thr Tyr Val Asp Val Glu Gln Tyr Gly Ser Pro Ile Asp
        115                 120                 125

Leu Leu Val Ala Ile Leu Glu Ser Leu Gly Ser Pro Phe Ala Lys Ile
    130                 135                 140

Gly Leu Leu Arg Asp Met Arg Ser Arg Thr Phe Gly Thr Leu Asn Ser
145                 150                 155                 160

Phe Gly Val Lys Leu Leu Ile Ile Gly Tyr Ala Glu Cys Leu Ser Tyr
                165                 170                 175

Glu Ala Tyr Asn Glu Leu Leu Arg Leu Thr Arg Gln Leu Lys Ile Ser
            180                 185                 190

Val Ile Leu Ala Gly Ser Met Glu Leu Arg Glu Ile Leu Gly Asn Phe
        195                 200                 205

Val Asn Arg Arg Ser Lys Arg Tyr Gly Glu Ile Tyr Asn Asn Phe Leu
    210                 215                 220

Asp Phe His Glu Tyr Arg Ala Phe Glu Lys Ser Asp Ile Glu Thr Leu
225                 230                 235                 240

Leu Glu Ser Trp Glu Asn Gln Val Leu Ser Ser Trp Asp Gln Lys Leu
                245                 250                 255

Ala Leu Lys Asp Ile Pro Asp Val Pro Ala Phe Leu Tyr Gln Arg Cys
            260                 265                 270

Glu Gly His Ala Glu Thr Leu Tyr Glu Ile Leu Arg Lys Ile Ala Ile
        275                 280                 285

Phe Lys Leu Asp Asn Pro Ser His Gln Leu Ser Lys Ala Asp Ile Glu
    290                 295                 300
```

```
Asn Met Val Ser Arg Arg Thr Ile Pro Lys Arg Ser
305                 310                 315


<210>  432
<211>  169
<212>  PRT
<213>  Filamentous cyanobacterium

<400>  432

Met Asp Asn Glu Ala Phe Asp Leu Pro Arg Trp Cys Pro Glu Pro Tyr
1               5                   10                  15


Glu Gly Glu Ser Ile Ala Ser Tyr Leu Val Arg Phe Arg Ser Gln Glu
            20                  25                  30


Val Ala Gln Ile Ser Thr Pro Ser Ser Phe Ser Lys Ala Ile Gly Leu
        35                  40                  45


Gly Ile Ala Leu Thr Arg Trp Glu Lys Phe Arg Phe Asn Pro Phe Pro
    50                  55                  60


Ser Glu Glu Glu Ile Gln Lys Phe Cys Gly Val Val Gly Leu Glu Leu
65                  70                  75                  80


Glu Arg Phe Lys Ala Met Leu Pro Pro Glu Gly Glu Arg Met Lys Leu
                85                  90                  95


Glu Pro Ile Arg Leu Cys Ala Ala Cys Tyr Ala Glu Ala Pro Tyr His
            100                 105                 110


Arg Leu Lys Trp Gln Phe Gln Ser Thr Glu Gly Cys Ser Lys His Lys
        115                 120                 125


Leu Arg Leu Leu Ser Lys Cys Pro Gly Cys Glu Arg Pro Phe Thr Ile
    130                 135                 140


Pro Gly Leu Ala Val Glu Gly Lys Cys Pro Cys Gly Met Phe Tyr Lys
145                 150                 155                 160
```

Arg Met Ala Lys Ser Gln Lys Pro Tyr
165

<210> 433
<211> 584
<212> PRT
<213> Nostoc punctiforme

<400> 433

Met Asn Ser Gln Gln Asn Pro Asp Leu Ala Val His Pro Ser Ala Ile
1 5 10 15

Pro Ile Glu Gly Leu Leu Gly Glu Ser Asp Ile Thr Leu Glu Lys Asn
20 25 30

Val Ile Ala Thr Gln Leu Ser Glu Glu Ala Gln Leu Lys Leu Glu Val
35 40 45

Ile Gln Ser Leu Leu Glu Pro Cys Asp Arg Thr Thr Tyr Gly Gln Lys
50 55 60

Leu Arg Glu Ala Ala Glu Lys Leu Gly Val Ser Leu Arg Thr Val Gln
65 70 75 80

Arg Leu Val Lys Asn Trp Glu His Asp Gly Leu Val Gly Leu Thr Gln
85 90 95

Thr Gly Arg Ala Asp Lys Gly Lys His Arg Ile Gly Glu Phe Trp Glu
100 105 110

Lys Phe Ile Thr Lys Thr Tyr Asn Glu Gly Asn Lys Gly Ser Lys Arg
115 120 125

Met Thr Pro Lys Gln Val Ala Leu Arg Val Glu Ala Lys Ala Arg Glu
130 135 140

Leu Lys Asp Ser Lys Pro Pro Asn Tyr Lys Thr Val Leu Arg Val Leu

```
145                 150                 155                 160

Ala Pro Ile Leu Glu Lys Gln Glu Lys Ala Lys Ser Ile Arg Ser Pro
                165                 170                 175

Gly Trp Arg Gly Thr Thr Leu Ser Val Lys Thr Arg Glu Gly Lys Asp
            180                 185                 190

Leu Ser Val Asp Tyr Ser Asn His Val Trp Gln Cys Asp His Thr Arg
        195                 200                 205

Val Asp Val Leu Leu Val Asp Gln His Gly Glu Leu Leu Ser Arg Pro
    210                 215                 220

Trp Leu Thr Thr Val Ile Asp Thr Tyr Ser Arg Cys Ile Met Gly Ile
225                 230                 235                 240

Asn Leu Gly Phe Asp Ala Pro Ser Ser Gly Val Val Ala Leu Ala Leu
                245                 250                 255

Arg His Ala Ile Leu Pro Lys Gln Tyr Gly Phe Glu Tyr Lys Leu His
            260                 265                 270

Cys Glu Trp Gly Thr Tyr Gly Lys Pro Glu His Phe Tyr Thr Asp Gly
        275                 280                 285

Gly Lys Asp Phe Arg Ser Asn His Leu Ser Gln Ile Gly Ala Gln Leu
    290                 295                 300

Gly Phe Val Cys His Leu Arg Asp Arg Pro Ser Glu Gly Gly Val Val
305                 310                 315                 320

Glu Arg Pro Phe Lys Thr Leu Asn Asp Gln Leu Phe Ser Thr Leu Pro
                325                 330                 335

Gly Tyr Thr Gly Ser Asn Val Gln Glu Arg Pro Lys Asp Ala Glu Lys
            340                 345                 350
```

```
Asp Ala Arg Leu Thr Leu Arg Glu Leu Glu Gln Leu Leu Ile Arg Tyr
        355                 360                 365

Ile Val Asp Arg Tyr Asn Gln Ser Ile Asp Ala Arg Met Gly Asp Gln
    370                 375                 380

Thr Arg Phe Glu Arg Trp Glu Ala Gly Leu Pro Thr Val Pro Val Pro
385                 390                 395                 400

Ile Pro Glu Arg Asp Leu Asp Ile Cys Leu Met Lys Gln Ser Arg Arg
                405                 410                 415

Thr Val Gln Arg Gly Gly Cys Leu Gln Phe Gln Asn Leu Met Tyr Arg
            420                 425                 430

Gly Glu Tyr Leu Ala Gly Tyr Ala Gly Glu Thr Val Asn Leu Arg Phe
        435                 440                 445

Asp Pro Arg Asp Ile Thr Thr Ile Leu Val Tyr Arg Gln Glu Asn Asn
    450                 455                 460

Gln Glu Val Phe Leu Thr Arg Ala His Ala Gln Gly Leu Glu Thr Glu
465                 470                 475                 480

Gln Leu Ala Leu Asp Glu Ala Glu Ala Ala Ser Arg Arg Leu Arg Asn
                485                 490                 495

Ala Gly Lys Thr Ile Ser Asn Gln Ser Leu Leu Gln Glu Val Val Asp
            500                 505                 510

Arg Asp Ala Leu Val Ala Thr Lys Lys Ser Arg Lys Glu Arg Gln Lys
        515                 520                 525

Leu Glu Gln Ala Val Leu Arg Ser Ala Gly Val Asp Glu Ser Lys Thr
    530                 535                 540

Glu Ser Leu Ser Ser Gln Val Val Glu Pro Asp Glu Val Glu Ser Thr
```

545 550 555 560

Glu Thr Val His Ser Gln Tyr Glu Asp Met Glu Val Trp Asp Tyr Glu
565 570 575

Gln Leu Arg Glu Glu Tyr Gly Phe
580

<210> 434
<211> 276
<212> PRT
<213> Nostoc punctiforme

<400> 434

Met Thr Glu Ala Gln Ala Ile Ala Lys Gln Leu Gly Gly Val Lys Pro
1 5 10 15

Asp Asp Glu Trp Leu Gln Ala Glu Ile Ala Arg Leu Lys Gly Lys Ser
20 25 30

Ile Val Pro Leu Gln Gln Val Lys Thr Leu His Asp Trp Leu Asp Gly
35 40 45

Lys Arg Lys Ala Arg Gln Ser Cys Arg Val Val Gly Glu Ser Arg Thr
50 55 60

Gly Lys Thr Val Ala Cys Asp Ala Tyr Arg Tyr Arg Gln Lys Pro Gln
65 70 75 80

Gln Glu Val Gly Arg Pro Pro Ile Val Pro Val Val Tyr Ile Gln Pro
85 90 95

Pro Gln Lys Cys Gly Ser Lys Asp Leu Phe Lys Glu Met Ile Glu Tyr
100 105 110

Leu Lys Phe Arg Ala Thr Lys Gly Thr Val Ser Asp Phe Arg Gly Arg
115 120 125

```
Ala Met Glu Val Leu Lys Gly Cys Gly Val Glu Met Leu Ile Ile Asp
    130                 135                 140

Glu Ala Asp Arg Leu Lys Pro Glu Thr Phe Ala Glu Val Arg Asp Ile
145                 150                 155                 160

Tyr Asp Lys Leu Gly Ile Ala Val Val Leu Val Gly Thr Asp Arg Leu
                165                 170                 175

Glu Ala Val Ile Lys Arg Asp Glu Gln Val Tyr Asn Arg Phe Arg Ala
            180                 185                 190

Cys His Arg Phe Gly Lys Leu Ser Gly Lys Asp Phe Gln Asp Thr Val
        195                 200                 205

Gln Ala Trp Glu Asp Arg Val Leu Lys Leu Pro Val Ser Ser Asn Leu
    210                 215                 220

Thr Ser Lys Asp Met Leu Arg Ile Leu Thr Ser Ala Thr Glu Gly Tyr
225                 230                 235                 240

Ile Gly Arg Leu Asp Glu Ile Leu Arg Glu Thr Ala Ile Arg Ser Leu
                245                 250                 255

Ser Lys Gly Phe Lys Lys Ile Asp Lys Ala Val Leu Gln Glu Val Ala
            260                 265                 270

Lys Glu Tyr Lys
        275
```

<210> 435
<211> 166
<212> PRT
<213> Nostoc punctiforme

<400> 435

```
Met Thr Thr Pro Asp Val Lys Pro Trp Leu Phe Ile Ile Glu Pro Tyr
1               5                   10                  15
```

```
Pro Gly Glu Ser Leu Ser His Phe Leu Gly Arg Phe Arg Arg Ala Asn
            20                  25                  30

His Leu Ser Pro Ala Gly Leu Gly Gly Leu Ala Gly Ile Gly Ala Val
        35                  40                  45

Val Ala Arg Trp Glu Arg Phe His Phe Asn Pro Arg Pro Ser Gln Lys
    50                  55                  60

Glu Leu Glu Ala Ile Ala Ser Val Val Glu Val Asp Ala Gln Arg Leu
65                  70                  75                  80

Ala Gln Met Leu Pro Pro Ala Gly Val Gly Met Gln His Glu Pro Ile
                85                  90                  95

Arg Leu Cys Gly Ala Cys Tyr Ala Glu Ala Pro Cys His Arg Ile Glu
            100                 105                 110

Trp Gln Tyr Lys Ser Val Trp Lys Cys Asp Arg His Gln Leu Lys Ile
        115                 120                 125

Leu Ala Lys Cys Pro Asn Cys Gln Ala Pro Phe Lys Met Pro Ala Leu
    130                 135                 140

Trp Glu Asp Gly Cys Cys His Arg Cys Arg Thr Leu Phe Ala Glu Met
145                 150                 155                 160

Ala Lys Gln Gln Lys Ser
                165
```

<210> 436
<211> 621
<212> PRT
<213> Scytonema hofmannii

<400> 436

```
Met Leu Asp Glu Glu Phe Glu Phe Thr Glu Glu Leu Thr Gln Ala Pro
1               5                   10                  15
```

```
Asp Val Ile Val Leu Asp Lys Ser His Phe Val Val Asp Pro Ser Gln
            20                  25                  30

Ile Ile Leu Gln Thr Ser Asp Lys His Lys Leu Arg Phe Asn Leu Ile
        35                  40                  45

Lys Trp Phe Ala Glu Ser Pro Asn Ile Thr Ile Lys Ser Gln Arg Lys
    50                  55                  60

Gln Ala Val Val Asp Thr Leu Gly Val Ser Thr Arg Gln Val Glu Arg
65                  70                  75                  80

Leu Leu Lys Gln Tyr His Asn Gly Glu Leu Ser Glu Thr Ala Gly Val
                85                  90                  95

Gln Arg Ser Asp Lys Gly Lys Leu Arg Ile Ser Gln Tyr Trp Glu Asp
            100                 105                 110

Tyr Ile Lys Thr Thr Tyr Glu Lys Ser Leu Lys Asp Lys His Pro Met
        115                 120                 125

Leu Pro Ala Ala Val Val Arg Glu Val Lys Arg His Ala Ile Val Asp
    130                 135                 140

Leu Gly Leu Lys Pro Gly Asp Tyr Pro His Pro Ala Thr Ile Tyr Arg
145                 150                 155                 160

Asn Leu Ala Pro Leu Ile Glu Gln His Thr Arg Lys Lys Lys Val Arg
                165                 170                 175

Asn Pro Gly Ser Gly Ser Trp Leu Thr Val Val Thr Arg Asp Gly Gln
            180                 185                 190

Leu Leu Lys Ala Asp Phe Ser Asn Gln Ile Ile Gln Cys Asp His Thr
        195                 200                 205
```

```
Glu Leu Asp Ile His Ile Val Asp Ser His Gly Ser Leu Leu Ser Asp
    210                 215                 220

Arg Pro Trp Leu Thr Thr Val Val Asp Thr Tyr Ser Ser Cys Ile Leu
225                 230                 235                 240

Gly Phe His Leu Trp Ile Lys Gln Pro Gly Ser Thr Glu Val Ala Leu
                245                 250                 255

Ala Leu Arg His Ala Ile Leu Pro Lys Asn Tyr Pro Glu Asp Tyr Lys
            260                 265                 270

Leu Gly Lys Val Trp Glu Ile Tyr Gly Pro Pro Phe Gln Tyr Phe Phe
        275                 280                 285

Thr Asp Gly Gly Lys Asp Phe Asn Ser Lys His Leu Lys Ala Ile Gly
    290                 295                 300

Lys Lys Leu Gly Phe Gln Cys Glu Leu Arg Asn Arg Pro Pro Gln Gly
305                 310                 315                 320

Gly Ile Val Glu Arg Leu Phe Lys Thr Ile Asn Thr Gln Val Leu Lys
                325                 330                 335

Glu Leu Pro Gly Tyr Thr Gly Ala Asn Val Gln Glu Arg Pro Lys Asn
            340                 345                 350

Ala Glu Lys Glu Ala Cys Leu Thr Ile Gln Asp Leu Asp Lys Ile Leu
        355                 360                 365

Ala Ser Phe Phe Cys Asp Ile Tyr Asn His Glu Pro Tyr Pro Lys Glu
    370                 375                 380

Pro Arg Asn Thr Arg Phe Glu Arg Trp Phe Lys Gly Met Gly Gly Lys
385                 390                 395                 400

Leu Pro Glu Pro Leu Asp Glu Arg Glu Leu Asp Ile Cys Leu Met Lys
                405                 410                 415
```

```
Glu Ala Gln Arg Val Val Gln Ala His Gly Ser Ile Gln Phe Glu Asn
            420                 425                 430

Leu Ile Tyr Arg Gly Glu Ala Leu Lys Ala Tyr Arg Gly Glu Tyr Val
        435                 440                 445

Thr Leu Arg Tyr Asp Pro Asp His Val Leu Thr Leu Tyr Val Tyr Ser
    450                 455                 460

Cys Glu Ala Asp Asp Asn Ala Glu Glu Phe Leu Gly Tyr Ala His Ala
465                 470                 475                 480

Ile Asn Met Asp Thr His Asp Leu Ser Ile Glu Glu Leu Lys Thr Leu
                485                 490                 495

Asn Lys Glu Arg Ser Lys Ala Arg Ser Asp His Tyr Asn Tyr Asp Ala
            500                 505                 510

Leu Leu Ala Leu Gly Lys Arg Lys Glu Leu Val Glu Glu Arg Lys Gln
        515                 520                 525

Asp Lys Lys Ala Lys Arg Gln Ser Glu Gln Lys Arg Leu Arg Thr Ala
    530                 535                 540

Ser Lys Lys Asn Ser Asn Val Ile Glu Leu Arg Lys Ser Arg Ala Ser
545                 550                 555                 560

Ser Ser Ser Ser Lys Asp Asp Arg Gln Glu Ile Leu Pro Glu Arg Val
                565                 570                 575

Ser Arg Asp Glu Leu Lys Pro Glu Lys Thr Glu Leu Lys Tyr Glu Glu
            580                 585                 590

Asn Leu Leu Ala Gln Thr Asp Thr Gln Lys Gln Glu Arg His Lys Leu
        595                 600                 605
```

```
Val Val Ser Asp Arg Lys Lys Asn Leu Lys Asn Ile Trp
    610                 615                 620


<210>  437
<211>  284
<212>  PRT
<213>  Scytonema hofmannii

<400>  437

Met Ala Ile Ser Gln Leu Ala Thr Gln Pro Phe Val Glu Val Leu Pro
1               5                   10                  15


Pro Glu Leu Asp Ser Lys Ala Gln Ile Ala Lys Thr Ile Asp Ile Glu
            20                  25                  30


Glu Leu Phe Arg Ile Asn Phe Ile Thr Thr Asp Arg Ser Ser Glu Cys
        35                  40                  45


Phe Arg Trp Leu Asp Glu Leu Arg Ile Leu Lys Gln Cys Gly Arg Ile
    50                  55                  60


Ile Gly Pro Arg Asn Val Gly Lys Ser Arg Ala Val Leu His Tyr Arg
65                  70                  75                  80


Asn Glu Asp Lys Lys Arg Val Ser Tyr Val Lys Ala Trp Ser Ala Ser
                85                  90                  95


Ser Ser Lys Arg Leu Phe Ser Gln Ile Leu Lys Asp Ile Asn His Ala
            100                 105                 110


Ala Ser Thr Gly Lys Arg Gln Asp Leu Arg Pro Arg Leu Ala Gly Ser
        115                 120                 125


Leu Glu Leu Phe Gly Leu Glu Leu Val Ile Val Asp Asn Ala Glu Asn
    130                 135                 140


Leu Gln Lys Glu Ala Leu Leu Asp Leu Lys Gln Leu Phe Glu Glu Cys
145                 150                 155                 160
```

```
His Val Pro Ile Val Leu Val Gly Gly Lys Glu Leu Asp Asp Ile Leu
                165                 170                 175


Glu Asp Phe Asp Leu Leu Thr Asn Phe Pro Thr Leu Tyr Glu Phe Glu
            180                 185                 190


Arg Leu Glu His Asp Asp Phe Ile Lys Thr Leu Lys Thr Ile Glu Leu
        195                 200                 205


Asp Ile Leu Ser Leu Pro Glu Ala Ser Lys Leu Ser Glu Gly Asn Ile
    210                 215                 220


Phe Ala Ile Leu Ala Glu Ser Thr Gly Gly Lys Ile Gly Ile Leu Val
225                 230                 235                 240


Lys Ile Leu Thr Lys Ala Val Leu His Ser Leu Lys Lys Gly Phe Gly
                245                 250                 255


Lys Val Asp Glu Ser Ile Leu Glu Lys Ile Ala Ser Arg Tyr Gly Thr
            260                 265                 270


Lys Tyr Val Pro Ile Glu Asn Lys Asn Arg Asn Asp
        275                 280


<210>  438
<211>  171
<212>  PRT
<213>  Scytonema hofmannii

<400>  438

Met Ile Glu Asp Asp Glu Ile Arg Leu Arg Leu Gly Tyr Val Glu Pro
1               5                   10                  15


His Pro Gly Glu Ser Ile Ser His Tyr Leu Gly Arg Leu Arg Arg Phe
            20                  25                  30


Lys Ala Asn Ser Leu Pro Ser Gly Tyr Ala Leu Gly Lys Ile Ala Gly
        35                  40                  45
```

```
Leu Gly Ser Val Leu Thr Arg Trp Glu Lys Leu Tyr Phe Asn Pro Phe
    50                  55                  60

Pro Thr Gln Gln Glu Leu Glu Ala Leu Ala Gln Val Ile Gln Val Glu
65                  70                  75                  80

Val Glu Lys Leu Arg Glu Met Leu Pro Thr Lys Gly Val Thr Met Met
                85                  90                  95

Pro Arg Pro Ile Arg Leu Cys Ala Ala Cys Tyr Ala Glu Ser Pro Tyr
            100                 105                 110

His Arg Ile Glu Trp Gln Phe Lys Asp Lys Met Lys Cys Asp Arg His
        115                 120                 125

Gln Leu Arg Leu Leu Thr Lys Cys Thr Asn Cys Gln Thr Pro Phe Pro
    130                 135                 140

Ile Pro Ala Asp Trp Glu Lys Gly Glu Cys Ser His Cys Phe Leu Ser
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Phe Ala Lys Met Val Lys Cys Gln Lys Arg Arg
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<210> 439
<211> 1929
<212> DNA
<213> Anabaena variabilis

<400> 439

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caacaccctg aatttgaaac ttggcgacaa aagggcaaac acccagccaa aattgtcaaa      180

gaattatgcg agcctttgag aactgatcct cgcttcatcg gtcaacctgg acgtttttac      240

acaagtgcga tcgccacagt aaattacatc tacaaatctt ggtttgcatt gatgaagcga      300
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ttagtagaag ttagtggagt tactttagag agtcttcgta ctaaagctgc tgaaatactg 420

tctcaatttg ctccccagcc agatacagtt gaagcacaac cagcgaaagg aaagaaacgt 480

aagaaaacca aaaaatcaga tggcgattgc gcggagcgca cgctacgcga acgtagtatt 540

tctgattatt tgtttgaagc ttaccgcgac acagaagaaa tattgacacg ttgtgcaatt 600

aactatttac tgaaaaatgg ttgcaaaatc agcaataaag aggaaaatgc tgaaaaattc 660

gctaaacgcc gccgcaaact ggagattcaa attgaacgcc taagagaaaa actagaggca 720

cgaatcccca aaggtcgaga cttaacggat gccaaatggt tagaaactct tttgctggcc 780

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aaatctatca cagtaccttt cccagtcgct tatgaaacca acgaagacat gacttggttt 900

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gcagaagaaa ttgctaaagc tatcgcccaa acaaaagcca aaggcaaact caacgataaa 1260

caacaagctc atataaaacg gaaaaactct tctctagcca gaattaataa cctctttccc 1320

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agtattcgct cgtcagcagc taaagttgga attgtgattg aggaatcgaa acaaccgatt 1860

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<210> 440
<211> 1872
<212> DNA
<213> Cyanobacterium aponinum

<400> 440
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catcatcccg attttcctca atggcgagag aaaggaagac tgccgaaaaa ctttattgct 180

caacaaattc aagagctaaa aaatgattct cgttttcaag gacaaccatc tcggttttat 240

gcttctgtcg gtaaaatcat cgactacata tacaaatctt ggttcaaagt gcaaaagagt 300

tacaaaatcc aattagaagg taatagccgt tggttagaaa tgttgaaacc cgatagttta 360

ttaatagaat cctttgatgg ttcaatggaa gcactgcaaa atcaggctca acagattctc 420

gataatattg aaacgacttc tactcaagaa ggtattgttg attatttatt tcaaaaatat 480

gagaaaatag aaaattgtcg aatgaaggat gcgatcgttt atctgatcaa aaatggtagt 540

cgtattccta agaacaatat tgaaacaacc aagaaatata aaagaatcaa aagaaaatta 600

gaaatcaaaa ttcgtaaatt gaaaagacaa gtggaaatgt ctattccttc tggcagagat 660

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caaagtgaga gtgatagttg gttttcagca ctgaaacgaa attctccgtc aattccctat 780

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tggactgtgg aaggtacaca agtcattgct caaaaaaagc aggaggaagt gctaaatctc 1140

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tctaaattgg gtattgtcgt agaggaaggc aaacaaccca aacaaggaac atttaccgat 1800

aaggcatcac agttagcatt gagtacccag aaaaataatc gccaaaataa tcccaaaaag 1860

acaaattctt aa 1872

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<211> 2268
<212> DNA
<213> Filamentous cyanobacterium

<400> 441
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gcccttaaga aacaccatgc agagtttcag gggttgccac accgcttcta catctcagcc 180

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aaaattgatg gcaaacgacg ctggttaaac cgagttgaag atgatattga acttgcaaaa 300

gtgacggact ttagcccaga aatgattcag aatcgggcta ggaaaatcct agcagagata 360

catccatcta accctgttga acctgaacct gagacatctt cagacaatga aataaatgaa 420

ggagagaact gccaggaaga ggaagagatg aatcaaccca aatctcttct ttcctgcttg 480

tttgatttgt acgacagtac ggaagatgcg cttactctcc gggcgatcgt tcatttgctc 540

aaaaataatg gtgaagtgaa tgaggaagac gaagatccta aaaagcttga actgcgttta 600

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ggacgcgatc caacgggtga aactaccact cgtttttag aagaggctat taagctacct 720

gaacacccaa ccgcctatcc accccggttt cttctcaacg ccttttattg ctacgcctta 780

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aagctaaaaa aatatcggtt agtcaaccaa ttatgtatgt ggaagaagaa gaacattact 1860

caacgaaccc aacaacaaaa gcaaggactg tgcattcaaa acaccactga atctaatcta 1920

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gccggaagta ttgtcacacc gcaactggga gagatccgcg agagtattga aagtgccgtt 2040

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cgtgctcgtc aggagggaat tctagttcaa gctggacgac aacctgtcga gggcaatctt 2220

gttggtaaag ccctcacaat tgccttatca gggcgaaatt tggtctag 2268

<210> 442
<211> 1920
<212> DNA
<213> Nostoc punctiforme

<400> 442
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aaacacccag acttcgagaa ttggcgacaa caaggtaagc ttccaacaac tgttgttagt 180

caactgtgcc aacctctcaa gactgaccct cgctttgtag gtcaacctag ccgtttatat 240

atgtcggcga ttcatattgt ggactacatc tacaagtctt ggctggctat acaaaaacgt 300

ctacagcaac agctagacgg caaaatgcgc tggctagaaa tgctcaacag tgatgttgaa 360

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gatttgacca atcgtaaatg gttagagaca ctcttcactg ctacaaccac ctttcctgaa 780

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ggtagtcagg caggaattgt gattgaagag ggaaaacaac ctgttagagg tagccctcat 1860

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<210> 443
<211> 1938
<212> DNA
<213> Scytonema hofmannii

<400> 443
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caacatccag attttgatac ttgggtacaa gcaggcaaga tgcctgaaaa gacagttgag 180

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<210> 444
<211> 642
<212> PRT
<213> Anabaena variabilis

<400> 444

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Asn Glu Leu Leu Val Gln Val Ala Gln His Pro Glu Phe Glu Thr Trp
35 40 45

Arg Gln Lys Gly Lys His Pro Ala Lys Ile Val Lys Glu Leu Cys Glu
50 55 60

Pro Leu Arg Thr Asp Pro Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Ile Ala Thr Val Asn Tyr Ile Tyr Lys Ser Trp Phe Ala
85 90 95

Leu Met Lys Arg Ser Gln Ser Gln Leu Glu Gly Lys Met Arg Trp Trp
100 105 110

Glu Met Leu Lys Ser Asp Ala Glu Leu Val Glu Val Ser Gly Val Thr
115 120 125

Leu Glu Ser Leu Arg Thr Lys Ala Ala Glu Ile Leu Ser Gln Phe Ala
130 135 140

Pro Gln Pro Asp Thr Val Glu Ala Gln Pro Ala Lys Gly Lys Lys Arg
145 150 155 160

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Lys Lys Thr Lys Lys Ser Asp Gly Asp Cys Ala Glu Arg Thr Leu Arg
                165                 170                 175

Glu Arg Ser Ile Ser Asp Tyr Leu Phe Glu Ala Tyr Arg Asp Thr Glu
            180                 185                 190

Glu Ile Leu Thr Arg Cys Ala Ile Asn Tyr Leu Leu Lys Asn Gly Cys
        195                 200                 205

Lys Ile Ser Asn Lys Glu Glu Asn Ala Glu Lys Phe Ala Lys Arg Arg
    210                 215                 220

Arg Lys Leu Glu Ile Gln Ile Glu Arg Leu Arg Glu Lys Leu Glu Ala
225                 230                 235                 240

Arg Ile Pro Lys Gly Arg Asp Leu Thr Asp Ala Lys Trp Leu Glu Thr
                245                 250                 255

Leu Leu Leu Ala Thr Leu Asn Val Pro Glu Asn Glu Ala Glu Ala Lys
            260                 265                 270

Ser Trp Gln Asp Ser Leu Leu Lys Lys Ser Ile Thr Val Pro Phe Pro
        275                 280                 285

Val Ala Tyr Glu Thr Asn Glu Asp Met Thr Trp Phe Lys Asn Glu Arg
    290                 295                 300

Gly Arg Ile Cys Val Lys Phe Ser Gly Leu Ser Glu His Thr Phe Gln
305                 310                 315                 320

Val Tyr Cys Asp Ser Arg Gln Leu Gln Trp Phe Gln Arg Phe Leu Glu
                325                 330                 335

Asp Gln Gln Ile Lys Arg Asn Ser Lys Asn Gln His Ser Ser Ser Leu
            340                 345                 350
```

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Phe Thr Leu Arg Ser Gly Arg Ile Ala Trp Gln Glu Gly Glu Gly Lys
        355                 360                 365

Ser Glu Pro Trp Lys Val Asn Arg Leu Ile Leu Tyr Cys Ser Val Asp
    370                 375                 380

Thr Arg Leu Trp Thr Ala Glu Gly Thr Asn Leu Val Arg Glu Glu Lys
385                 390                 395                 400

Ala Glu Glu Ile Ala Lys Ala Ile Ala Gln Thr Lys Ala Lys Gly Lys
                405                 410                 415

Leu Asn Asp Lys Gln Gln Ala His Ile Lys Arg Lys Asn Ser Ser Leu
            420                 425                 430

Ala Arg Ile Asn Asn Leu Phe Pro Arg Pro Ser Lys Pro Leu Tyr Lys
        435                 440                 445

Gly Gln Ser His Ile Leu Val Gly Val Ser Leu Gly Leu Glu Lys Pro
    450                 455                 460

Thr Thr Leu Ala Val Val Asp Gly Ser Ile Gly Lys Val Leu Thr Tyr
465                 470                 475                 480

Arg Asn Ile Lys Gln Leu Leu Gly Asp Asn Tyr Arg Leu Leu Asn Arg
                485                 490                 495

Gln Arg Gln Gln Lys His Thr Leu Ser His Gln Arg Gln Val Ala Gln
            500                 505                 510

Ile Leu Ala Ser Pro Asn Gln Leu Gly Glu Ser Glu Leu Gly Gln Tyr
        515                 520                 525

Val Asp Arg Leu Leu Ala Lys Glu Ile Val Ala Ile Thr Gln Thr Tyr
    530                 535                 540

Lys Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Met Arg Glu Gln
545                 550                 555                 560
```

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Val Gln Ser Glu Ile Gln Ala Lys Ala Glu Gln Lys Ser Asp Leu Ile
                565                 570                 575


Glu Val Gln Gln Lys Tyr Ser Lys Gln Tyr Arg Val Ser Val His Gln
            580                 585                 590


Trp Ser Tyr Gly Arg Leu Ile Ala Ser Ile Arg Ser Ser Ala Ala Lys
        595                 600                 605


Val Gly Ile Val Ile Glu Glu Ser Lys Gln Pro Ile Arg Gly Ser Pro
    610                 615                 620


Gln Glu Lys Ala Arg Glu Leu Ala Ile Ala Ala Tyr Asn Ser Arg Arg
625                 630                 635                 640


Arg Thr
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<210> 445
<211> 623
<212> PRT
<213> Cyanobacterium aponinum

<400> 445

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Arg Gln Ser Leu Trp Leu Leu Met Ser Lys Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Ile Leu Thr Arg Ile Lys His His Pro Asp Phe Pro Gln Trp
        35                  40                  45


Arg Glu Lys Gly Arg Leu Pro Lys Asn Phe Ile Ala Gln Gln Ile Gln
    50                  55                  60


Glu Leu Lys Asn Asp Ser Arg Phe Gln Gly Gln Pro Ser Arg Phe Tyr
```

```
65                  70                  75                  80

Ala Ser Val Gly Lys Ile Ile Asp Tyr Ile Tyr Lys Ser Trp Phe Lys
                85                  90                  95

Val Gln Lys Ser Tyr Lys Ile Gln Leu Glu Gly Asn Ser Arg Trp Leu
            100                 105                 110

Glu Met Leu Lys Pro Asp Ser Leu Leu Ile Glu Ser Phe Asp Gly Ser
        115                 120                 125

Met Glu Ala Leu Gln Asn Gln Ala Gln Gln Ile Leu Asp Asn Ile Glu
    130                 135                 140

Thr Thr Ser Thr Gln Glu Gly Ile Val Asp Tyr Leu Phe Gln Lys Tyr
145                 150                 155                 160

Glu Lys Ile Glu Asn Cys Arg Met Lys Asp Ala Ile Val Tyr Leu Ile
                165                 170                 175

Lys Asn Gly Ser Arg Ile Pro Lys Asn Asn Ile Glu Thr Thr Lys Lys
            180                 185                 190

Tyr Lys Arg Ile Lys Arg Lys Leu Glu Ile Lys Ile Arg Lys Leu Lys
        195                 200                 205

Arg Gln Val Glu Met Ser Ile Pro Ser Gly Arg Asp Leu Glu Gly Glu
    210                 215                 220

Lys Trp Leu His Thr Leu Ile Leu Ala Ser Asn Thr Met Pro Val Asp
225                 230                 235                 240

Gln Ser Glu Ser Asp Ser Trp Phe Ser Ala Leu Lys Arg Asn Ser Pro
                245                 250                 255

Ser Ile Pro Tyr Pro Ile Val Tyr Glu Ser Asn Glu Asp Leu Thr Trp
            260                 265                 270
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Cys Leu Asn Asn Gln Asn Arg Ile Cys Ile Lys Phe Ser Gly Leu Ser
        275                 280                 285

Asp His Leu Phe Gln Ile Tyr Cys Asp Ser Arg Gln Leu Ala Tyr Phe
    290                 295                 300

Arg Arg Phe Tyr Glu Asp Gln Glu Leu Lys Lys Ala Ser Lys Asp Gln
305                 310                 315                 320

Phe Ser Ser Ala Leu Phe Thr Leu Arg Ser Ala Met Ile Ile Trp Lys
                325                 330                 335

Glu Asp Asp Gly Lys Gly Glu Ser Trp Asp Lys His Lys Leu Tyr Leu
            340                 345                 350

His Cys Thr Phe Asp Thr Asp Tyr Trp Thr Val Glu Gly Thr Gln Val
        355                 360                 365

Ile Ala Gln Lys Lys Gln Glu Glu Val Leu Asn Leu Ile Asp Arg Met
    370                 375                 380

Lys Glu Lys Thr Asp Leu Thr Asp Thr Gln Lys Ala Phe Ile Gln Arg
385                 390                 395                 400

Lys Gln Thr Thr Leu Ala Arg Leu Asn Asn Ile Phe Pro Arg Pro Ser
                405                 410                 415

Lys Pro Ile Tyr Gln Gly Asn Pro Asn Leu Phe Leu Gly Val Ala Met
            420                 425                 430

Gly Leu Gln Glu Pro Val Thr Ile Ala Leu Val Asp Val Ser Thr Asn
        435                 440                 445

Lys Val Ile Leu Tyr Arg Asn Ile Lys Gln Leu Leu Gly Asp Asn Tyr
    450                 455                 460

His Leu Leu Arg Arg Arg Arg Asn Glu Lys Gln Lys Leu Asn His Gln
```

```
465                 470                 475                 480

Asn His Lys Ala Arg Lys Arg Ala Asn Phe Gln Gln Lys Gly Glu Ser
                485                 490                 495

Asn Leu Gly Glu Tyr Leu Asp Arg Leu Ile Ala Lys Ser Ile Leu Gln
            500                 505                 510

Ile Ala Lys Glu Tyr Gln Val Ser Thr Ile Ile Val Pro Arg Leu Asn
        515                 520                 525

Gln Met Arg Ser Ile Thr Glu Ala Glu Ile Gln Ala Arg Ala Glu Glu
    530                 535                 540

Arg Ile Pro Glu Tyr Lys Glu Gly Gln Arg Lys Tyr Ala Gln Asp Tyr
545                 550                 555                 560

Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg Leu Ile Asp Asn Ile
                565                 570                 575

Lys Ala Ile Ser Ser Lys Leu Gly Ile Val Val Glu Glu Gly Lys Gln
            580                 585                 590

Pro Lys Gln Gly Thr Phe Thr Asp Lys Ala Ser Gln Leu Ala Leu Ser
        595                 600                 605

Thr Gln Lys Asn Asn Arg Gln Asn Asn Pro Lys Lys Thr Asn Ser
    610                 615                 620
```

<210> 446
<211> 778
<212> PRT
<213> Filamentous cyanobacterium

<400> 446

```
Met Gln Leu Arg Val Ile Cys Cys Cys Leu Ser Ala Asp Glu Ala Thr
1               5                   10                  15
```

```
Arg Gln Phe Phe Trp Glu Ala Met Val Lys Tyr Thr Leu Leu Val Asn
            20                  25                  30

Arg Leu Leu Glu Gln Val Gly Gln Leu Ser Glu Phe Lys Gln Trp Gln
        35                  40                  45

Glu Lys Gly Ser Ile Ser Lys Glu Pro Val Lys Gln Leu Cys Asp Ala
    50                  55                  60

Leu Lys Lys His His Ala Glu Phe Gln Gly Leu Pro His Arg Phe Tyr
65                  70                  75                  80

Ile Ser Ala Lys Leu Met Val Thr Tyr Thr Phe Glu Ser Trp Leu Ala
                85                  90                  95

Leu Gln Gln Arg Arg Arg Arg Lys Ile Asp Gly Lys Arg Arg Trp Leu
            100                 105                 110

Asn Arg Val Glu Asp Asp Ile Glu Leu Ala Lys Val Thr Asp Phe Ser
        115                 120                 125

Pro Glu Met Ile Gln Asn Arg Ala Arg Lys Ile Leu Ala Glu Ile His
    130                 135                 140

Pro Ser Asn Pro Val Glu Pro Glu Pro Glu Thr Ser Ser Asp Asn Glu
145                 150                 155                 160

Ile Asn Glu Gly Glu Asn Cys Gln Glu Glu Glu Glu Met Asn Gln Pro
                165                 170                 175

Lys Ser Leu Leu Ser Cys Leu Phe Asp Leu Tyr Asp Ser Thr Glu Asp
            180                 185                 190

Ala Leu Thr Leu Arg Ala Ile Val His Leu Leu Lys Asn Asn Gly Glu
        195                 200                 205

Val Asn Glu Glu Asp Glu Asp Pro Lys Lys Leu Glu Leu Arg Leu Ala
    210                 215                 220
```

```
Ala Lys Arg Glu Glu Ile Gln Arg Leu Glu Lys Gln Leu Gln Gly Arg
225                 230                 235                 240

Leu Pro Lys Gly Arg Asp Pro Thr Gly Glu Thr Thr Thr Arg Phe Leu
                245                 250                 255

Glu Glu Ala Ile Lys Leu Pro Glu His Pro Thr Ala Tyr Pro Pro Arg
            260                 265                 270

Phe Leu Leu Asn Ala Phe Tyr Cys Tyr Ala Leu Leu Pro Met Pro Tyr
        275                 280                 285

Ile Gln Tyr Gly Val Tyr Leu Leu Asn Ala Ile Leu Asp Glu Ala Arg
    290                 295                 300

Ile Val Glu Ser Asp Phe Ile Thr Trp Arg Asp Thr Ile Ala Glu His
305                 310                 315                 320

Leu Val Asn Ala Ala Lys Arg Pro Asn Ser Leu Pro Tyr Pro Leu Ile
                325                 330                 335

Phe Gly Ser Thr Ser Asp Leu Val Trp Glu Ser Glu Ser Lys Arg Lys
            340                 345                 350

Gly Pro Asn Ala Pro Asp Thr Glu Gly Ala Leu Glu Gln Ser Gly Ala
        355                 360                 365

Lys Ser Ser Arg Lys Arg Pro Ser Lys Arg Lys Arg Thr Arg Leu Lys
    370                 375                 380

Thr Gln Ser Asp Glu Arg Ile Thr Val Arg Phe His Gly Met Ser Gln
385                 390                 395                 400

Tyr Arg Phe Lys Ile Tyr Cys Asp Arg Arg Gln Leu Pro Ile Phe Arg
                405                 410                 415
```

```
Gln Phe Leu Thr Asp Tyr Cys Thr His Lys Ala Leu Asp Glu Glu Asn
            420                 425                 430

Lys Phe Ser Met Gly Leu Phe Ala Leu Arg Ser Ala Ser Leu Ile Trp
        435                 440                 445

Lys Lys Asp Lys Gln Arg Pro His Lys Arg Asn Ser Ser Glu Pro Val
    450                 455                 460

Glu Pro Leu Ser Pro Trp Gln Thr His Arg Leu Tyr Leu His Cys Ser
465                 470                 475                 480

Ile Asp Ser Arg Leu Leu Thr Ala Glu Gly Thr Glu Gln Val Arg Phe
                485                 490                 495

Gln Lys Ile Leu Gln Thr Lys Arg Lys Leu Glu Gly Ala Lys Asn Lys
            500                 505                 510

Glu Gln Glu Ile Leu Arg Gln Lys Ser Glu Arg Gln His Thr Glu Ser
        515                 520                 525

Glu Gln Asp Leu Asp Asp Lys Leu Lys Lys Gln Arg Gln Asn Val Ala
    530                 535                 540

Arg Asn Gln Thr Ser Leu Asn Cys Leu Tyr Asn Pro Thr Pro Pro Arg
545                 550                 555                 560

Pro Ser Arg Val Arg Tyr Gln Gly Asn Pro Asn Ile Ala Ile Gly Val
                565                 570                 575

Ser Phe Cys Arg Gln Gln Leu Val Gly Val Gly Val Ile Asp Leu Gln
            580                 585                 590

Thr Gln Gln Val Gln Glu Tyr Tyr Ser Ile Arg Arg Leu Leu Ile Asn
        595                 600                 605

Arg Lys Val Thr Gln Val Lys Arg Gly Arg Ser Val Leu Gln Leu Lys
    610                 615                 620
```

```
Leu Lys Lys Tyr Arg Leu Val Asn Gln Leu Cys Met Trp Lys Lys Lys
625                 630                 635                 640


Asn Ile Thr Gln Arg Thr Gln Gln Gln Lys Gln Gly Leu Cys Ile Gln
                645                 650                 655


Asn Thr Thr Glu Ser Asn Leu Arg Gln Tyr Leu Glu Arg Leu Val Ala
            660                 665                 670


Asp Arg Ile Val Glu Val Ala Leu Lys His Gln Ala Gly Ser Ile Val
        675                 680                 685


Thr Pro Gln Leu Gly Glu Ile Arg Glu Ser Ile Glu Ser Ala Val Gln
    690                 695                 700


Ala Ile Ala Lys Gln Leu Phe Glu Asn His Arg Glu Ala Gln Gln Ala
705                 710                 715                 720


Tyr Ala Lys Gln Phe Arg Met Asp Phe His Arg Trp Ser Tyr Gly Arg
                725                 730                 735


Leu Thr Asp Cys Ile His Ser Arg Ala Arg Gln Glu Gly Ile Leu Val
            740                 745                 750


Gln Ala Gly Arg Gln Pro Val Glu Gly Asn Leu Val Gly Lys Ala Leu
        755                 760                 765


Thr Ile Ala Leu Ser Gly Arg Asn Leu Val
    770                 775
```

<210> 447
<211> 639
<212> PRT
<213> Nostoc punctiforme

<400> 447

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Ile Ala Ser Glu Ser Thr
```

```
1               5                   10                  15

Arg Gln Lys Leu Trp Lys Leu Met Ala Thr Leu Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Ile Glu Gln Leu Gly Lys His Pro Asp Phe Glu Asn Trp
        35                  40                  45

Arg Gln Gln Gly Lys Leu Pro Thr Thr Val Val Ser Gln Leu Cys Gln
    50                  55                  60

Pro Leu Lys Thr Asp Pro Arg Phe Val Gly Gln Pro Ser Arg Leu Tyr
65                  70                  75                  80

Met Ser Ala Ile His Ile Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Met Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Val Glu Leu Val Glu Thr Ser Gly Ser Ser
        115                 120                 125

Met Gly Ala Ile Arg Thr Lys Ala Ser Glu Ile Leu Ala Lys Ala Met
    130                 135                 140

Pro Thr Ser Asp Ser Asp Ser Ser Gln Pro Lys Thr Lys Lys Gly Lys
145                 150                 155                 160

Glu Ala Lys Lys Ser Ser Ser Ser Ser Ser Asp Arg Ser Leu Ser Asn
                165                 170                 175

Lys Leu Phe Glu Ala Tyr Gln Glu Thr Glu Asp Ile Leu Ser Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Ser Asp Lys Glu
        195                 200                 205
```

```
Glu Asp Ser Glu Lys Phe Ala Lys Arg Arg Arg Gln Val Glu Ile Gln
    210                 215                 220

Ile Gln Arg Leu Thr Glu Lys Leu Ile Ser Arg Met Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Asn Arg Lys Trp Leu Glu Thr Leu Phe Thr Ala Thr Thr
                245                 250                 255

Thr Phe Pro Glu Asp Asn Ala Glu Ala Lys Arg Trp Gln Asp Ile Leu
            260                 265                 270

Leu Thr Arg Pro Ser Ser Leu Pro Phe Pro Leu Val Phe Glu Thr Asn
        275                 280                 285

Glu Asp Met Val Trp Ser Lys Asn Gln Lys Gly Arg Leu Cys Val His
    290                 295                 300

Phe Asn Gly Leu Ser Asp Leu Ser Phe Glu Val Tyr Cys Asp Asn Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg
                325                 330                 335

Gln Ser Lys Ser Gln Tyr Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly
            340                 345                 350

His Leu Val Trp Gln Glu Gly Glu Gly Lys Ser Glu Pro Trp Asn Leu
        355                 360                 365

Asn Arg Leu Asn Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp Thr Ala
    370                 375                 380

Asp Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Glu Glu Ile Ser Lys
385                 390                 395                 400

Leu Ile Thr Lys Met Lys Glu Lys Ser Asp Leu Lys Asp Thr Gln Lys
```

```
                405                 410                 415

Ala Phe Ile Gln Arg Lys Glu Ser Thr Leu Asn Arg Met Asn Asn Ser
            420                 425                 430

Phe Glu Arg Pro Ser Gln Pro Leu Tyr Gln Gly Gln Ser His Ile Leu
        435                 440                 445

Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val
    450                 455                 460

Asp Ala Ile Ala Gly Lys Val Leu Ala Tyr Arg Ser Ile Arg Gln Leu
465                 470                 475                 480

Leu Gly Asp Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Arg
                485                 490                 495

Ser Ser Ser His Glu Arg His Lys Ala Gln Lys Ser Phe Ser Pro Asn
            500                 505                 510

Gln Phe Gly Thr Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Ile Ala Ile Ala Gln Thr Tyr Lys Ala Gly Asn Ile Val
    530                 535                 540

Leu Pro Lys Leu Gly Asp Met Arg Glu Ile Val Gln Ser Glu Ile Gln
545                 550                 555                 560

Ala Ile Ala Glu Ala Lys Cys Pro Gly Ser Val Glu Val Gln Gln Lys
                565                 570                 575

Tyr Ala Lys Gln Tyr Arg Val Asn Val His Lys Trp Ser Tyr Gly Arg
            580                 585                 590

Leu Ile Gln Ser Ile Gln Ser Lys Gly Ser Gln Ala Gly Ile Val Ile
        595                 600                 605
```

```
Glu Glu Gly Lys Gln Pro Val Arg Gly Ser Pro His Glu Gln Ala Lys
    610                 615                 620


Glu Leu Ala Leu Ser Ala Tyr His Asp Arg Leu Ala Arg Arg Ser
625                 630                 635


<210>  448
<211>  645
<212>  PRT
<213>  Scytonema hofmannii

<400>  448

Met Ser Thr Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Ala Thr
1               5                   10                  15


Leu Arg Tyr Phe Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Glu Gln Leu Gly Gln His Pro Asp Phe Asp Thr Trp
        35                  40                  45


Val Gln Ala Gly Lys Met Pro Glu Lys Thr Val Glu Asn Leu Cys Lys
    50                  55                  60


Ser Leu Glu Asp Arg Glu Pro Phe Ala Asn Gln Pro Gly Arg Phe Arg
65                  70                  75                  80


Thr Ser Ala Val Ala Leu Val Lys Tyr Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95


Leu Gln Lys Arg Arg Ala Asp Arg Leu Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110


Lys Met Leu Lys Ser Asp Val Glu Leu Glu Arg Glu Ser Asn Cys Ser
        115                 120                 125


Leu Asp Ile Ile Arg Ala Lys Ala Gly Glu Ile Leu Ala Lys Val Thr
    130                 135                 140
```

```
Glu Gly Cys Ala Pro Ser Asn Gln Thr Ser Ser Lys Arg Lys Lys Lys
145                 150                 155                 160

Lys Thr Lys Lys Ser Gln Ala Thr Lys Asp Leu Pro Thr Leu Phe Glu
                165                 170                 175

Ile Ile Leu Lys Ala Tyr Glu Gln Ala Glu Glu Ser Leu Thr Arg Ala
            180                 185                 190

Ala Leu Ala Tyr Leu Leu Lys Asn Asp Cys Glu Val Ser Glu Val Asp
        195                 200                 205

Glu Asp Ser Glu Lys Phe Lys Lys Arg Arg Arg Lys Lys Glu Ile Glu
    210                 215                 220

Ile Glu Arg Leu Arg Asn Gln Leu Lys Ser Arg Ile Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Asp Lys Trp Leu Lys Thr Leu Glu Glu Ala Thr Arg
                245                 250                 255

Asn Val Pro Glu Asn Glu Asp Glu Ala Lys Ala Trp Gln Ala Gln Leu
            260                 265                 270

Leu Arg Glu Ala Ser Ser Val Pro Phe Pro Val Ala Tyr Glu Thr Ser
        275                 280                 285

Glu Asp Met Thr Trp Phe Thr Asn Glu Gln Gly Arg Ile Phe Val Tyr
    290                 295                 300

Phe Asn Gly Ser Ala Lys His Lys Phe Gln Val Tyr Cys Asp Arg Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Val Glu Asp Phe Gln Ile Lys Lys
                325                 330                 335
```

```
Asn Gly Asp Lys Lys Gly Ser Glu Lys Glu Tyr Pro Ala Gly Leu Leu
            340                 345                 350

Thr Leu Cys Ser Thr Arg Leu Arg Trp Lys Glu Ser Ala Glu Lys Gly
        355                 360                 365

Asp Pro Trp Asn Val His Arg Leu Ile Leu Ser Cys Thr Ile Asp Thr
    370                 375                 380

Arg Leu Trp Thr Leu Glu Gly Thr Glu Gln Val Arg Ala Glu Lys Ile
385                 390                 395                 400

Ala Gln Val Glu Lys Thr Ile Ser Lys Arg Glu Gln Glu Val Asn Leu
                405                 410                 415

Ser Lys Thr Gln Leu Glu Arg Leu Gln Ala Lys His Ser Glu Arg Glu
            420                 425                 430

Arg Leu Asn Asn Ile Phe Pro Asn Arg Pro Ser Lys Pro Ser Tyr Arg
        435                 440                 445

Gly Lys Ser His Ile Ala Ile Gly Val Ser Phe Ser Leu Glu Asn Pro
    450                 455                 460

Ala Thr Val Ala Val Val Asp Val Ala Thr Lys Lys Val Leu Thr Tyr
465                 470                 475                 480

Arg Ser Phe Lys Gln Leu Leu Gly Asp Asn Tyr Asn Leu Ala Asn Arg
                485                 490                 495

Leu Arg Gln Gln Lys Gln Arg Leu Ser His Glu Arg His Lys Ala Gln
            500                 505                 510

Lys Gln Gly Ala Pro Asn Ser Phe Gly Asp Ser Glu Leu Gly Gln Tyr
        515                 520                 525

Val Asp Arg Leu Leu Ala Lys Ser Ile Val Ala Ile Ala Lys Thr Tyr
    530                 535                 540
```

```
Gln Ala Ser Ser Ile Val Leu Pro Lys Leu Arg Tyr Met Arg Glu Ile
545                 550                 555                 560


Ile His Asn Glu Val Gln Ala Lys Ala Glu Lys Lys Ile Pro Gly Tyr
                565                 570                 575


Lys Glu Gly Gln Lys Gln Tyr Ala Lys Gln Tyr Arg Ile Ser Val His
            580                 585                 590


Gln Trp Ser Tyr Asn Arg Leu Ser Gln Ile Leu Glu Ser Gln Ala Thr
        595                 600                 605


Lys Ala Gly Ile Ser Ile Glu Arg Gly Ser Gln Val Ile Gln Gly Ser
    610                 615                 620


Ser Gln Glu Gln Ala Arg Asp Leu Ala Leu Phe Ala Tyr Asn Glu Arg
625                 630                 635                 640


Gln Leu Ser Leu Gly
                645


<210>  449
<211>  646
<212>  PRT
<213>  Nostoc carneum

<400>  449

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Lys Leu Met Ala Asp Leu Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Glu Gln Leu Ala Lys His Pro Asp Phe Glu Lys Trp
        35                  40                  45


Arg Gln Lys Gly Lys Leu Pro Ala Ser Val Val Met Lys Leu Cys Gln
```

```
    50                  55                  60

Pro Leu Lys Asn Asp Pro Arg Phe Ala Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80

Ile Ser Ala Ile His Ile Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Thr Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Pro Glu Leu Val Glu Ala Ser Ala Ser Ser
        115                 120                 125

Leu Glu Val Ile Arg Thr Lys Ala Ala Glu Ile Leu Ala Ile Ala Met
    130                 135                 140

Thr Ala Ser Asp Ser Asp Asn Ser Ser Pro Asn Gly Lys Lys Ser Lys
145                 150                 155                 160

Lys Ala Lys Lys Ala Ser Ser Asn Pro Lys Arg Lys Leu Phe Asn Thr
                165                 170                 175

Leu Phe Asp Ala Tyr Gln Glu Thr Glu Asp Val Leu Ser Arg Ser Ala
            180                 185                 190

Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Ser Asp Lys Asp Glu
        195                 200                 205

Asp Pro Glu Lys Phe Ala Gln Arg Arg Arg Gln Leu Glu Ile Gln Ile
    210                 215                 220

Gln Arg Leu Thr Glu Lys Leu Thr Ser Arg Ile Pro Lys Gly Arg Asp
225                 230                 235                 240

Leu Thr His Ala Lys Trp Leu Glu Thr Leu Phe Thr Ala Thr Thr Thr
                245                 250                 255
```

```
Val Pro Lys Asp Asn Ala Glu Ala Lys His Trp Gln Asp Ile Leu Leu
            260                 265                 270

Thr Arg Ser Ser Ser Val Pro Phe Pro Val Val Phe Glu Thr Asn Glu
        275                 280                 285

Asp Leu Val Trp Ser Thr Asn Glu Lys Ser Arg Leu Cys Val His Phe
    290                 295                 300

Asn Gly Leu Ser Asp Leu Thr Phe Glu Val Tyr Cys Asp Ser Arg Gln
305                 310                 315                 320

Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg Lys
                325                 330                 335

Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly Arg
            340                 345                 350

Leu Ala Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp Gln Leu His
        355                 360                 365

Arg Leu Thr Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp Thr Ala Glu
    370                 375                 380

Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Glu Glu Ile Thr Lys Phe
385                 390                 395                 400

Ile Thr Lys Met Asn Glu Lys Ser Asp Leu Ser Asp Thr Gln Phe Ala
                405                 410                 415

Phe Ile Lys Arg Lys Glu Ser Thr Leu Thr Arg Ile Asn Asn Ser Phe
            420                 425                 430

Asp Arg Pro Ser Lys Pro Leu Tyr Gln Gly Gln Ser His Ile Leu Val
        435                 440                 445

Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val Asp
```

```
    450                 455                 460

Ala Met Pro Asp Gly Lys Ala Asp Ala Asn Ala Gly Lys Val Leu Thr
465                 470                 475                 480

Tyr Arg Ser Ile Arg Gln Leu Leu Gly Asp Asn Tyr Lys Leu Leu Asn
                485                 490                 495

Arg Tyr Arg Arg Glu Gln Arg Ser Leu Ser His Glu Arg His Lys Ala
            500                 505                 510

Gln Lys Ser Phe Ser Pro Asn Gln Phe Gly Ala Ser Glu Leu Gly Gln
        515                 520                 525

Tyr Ile Asp Arg Leu Leu Ala Lys Glu Ile Ile Ala Ile Ala Gln Thr
    530                 535                 540

Tyr Lys Val Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Met Arg Glu
545                 550                 555                 560

Ile Val Gln Ser Glu Ile Gln Ala Ile Ala Glu Ala Lys Cys Pro Gly
                565                 570                 575

Ser Leu Glu Ile Gln Gln Lys Tyr Ala Lys Gln Tyr Arg Val Asn Val
            580                 585                 590

His Ser Trp Ser Tyr Gly Arg Leu Ile Gln Ser Ile Gln Ser Lys Ala
        595                 600                 605

Ala Gln Ala Gly Ile Met Ile Glu Ala Gly Lys Gln Pro Ile Arg Gly
    610                 615                 620

Ser Pro Gln Asp Lys Ala Lys Glu Leu Ala Leu Ser Ala Tyr His Asp
625                 630                 635                 640

Arg Leu Ala Arg Arg Ser
                645
```

<210> 450
<211> 639
<212> PRT
<213> Hassallia byssoidea VB512170

<400> 450

Met Ser Gln Ile Thr Ile Gln Cys Cys Leu Ile Ala Ser Glu Ser Thr
1   5   10   15

Arg Gln Lys Leu Trp Lys Leu Met Ala His Leu Asn Thr Pro Leu Ile
            20   25   30

Asn Glu Leu Leu Gln Gln Leu Ser Lys His Pro Asp Phe Glu Lys Trp
        35   40   45

Arg Lys Asn Gly Lys Leu Pro Ser Thr Val Val Asn Gln Leu Cys Gln
    50   55   60

Pro Leu Lys Thr Asp Pro Ser Phe Thr Gly Gln Pro Ser Arg Leu Tyr
65   70   75   80

Leu Ser Ala Ile His Val Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85   90   95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Ile Arg Trp Leu
            100   105   110

Glu Met Leu Asn Ser Asp Ala Glu Leu Ile Glu Ile Ser Gly Cys Ser
        115   120   125

Leu Glu Ala Ile Arg Thr Lys Ala Ala Glu Ile Leu Ala Ile Ala Thr
    130   135   140

Pro Asp Ser Asp Val Ala Ala Pro Leu Thr Lys Thr Gly Lys Ala Lys
145   150   155   160

Lys Ser Lys Lys Ser Ser Ala Ser Asn Pro Asp Arg Ser Leu Ser His
                165   170   175

```
Lys Leu Phe Asp Ala Tyr Gln Glu Thr Asp Asp Ile Leu Ser Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Arg Asn Gly Cys Lys Leu Asn Asp Lys Glu
        195                 200                 205

Glu Asp Leu Glu Lys Phe Ala Lys Arg Arg Arg Lys Val Glu Ile Gln
    210                 215                 220

Ile Gln Arg Leu Thr Asp Lys Leu Thr Ser Arg Ile Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Asn Ala Lys Trp Leu Glu Thr Leu Phe Thr Ala Thr Thr
                245                 250                 255

Thr Val Pro Glu Asp Asn Val Glu Ala Lys Arg Trp Gln Asp Ile Leu
            260                 265                 270

Leu Thr Arg Ser Ser Ser Val Pro Phe Pro Leu Ile Phe Glu Thr Asn
        275                 280                 285

Glu Asp Leu Val Trp Ser Lys Asn Glu Lys Gly Arg Leu Cys Val His
    290                 295                 300

Phe Asn Gly Leu Ser Asp Leu Thr Phe Glu Val Tyr Cys Asp Arg Arg
305                 310                 315                 320

Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg
                325                 330                 335

Lys Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly
            340                 345                 350

Arg Leu Ala Trp Gln Glu Gly Glu Gly Lys Gly Glu Pro Trp Gln Ile
        355                 360                 365
```

```
Asn Arg Leu Thr Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp Ser Ala
    370                 375                 380

Glu Gly Thr Glu Gln Val Arg Gln Glu Lys Glu Glu Glu Ile Thr Lys
385                 390                 395                 400

Phe Ile Thr Lys Met Asn Glu Lys Ser Asp Leu Ser Glu Thr Gln Gln
                405                 410                 415

Ala Phe Ile Lys Arg Lys Glu Ser Thr Leu Thr Arg Ile Asn Asn Ser
            420                 425                 430

Phe Glu Arg Pro Ser Gln Phe Leu Tyr Gln Gly Gln Ser His Ile Leu
        435                 440                 445

Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val
    450                 455                 460

Asp Ala Ile Ala Gly Lys Val Leu Ala Tyr Arg Ser Ile Lys Gln Leu
465                 470                 475                 480

Leu Gly Asp Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Gln
                485                 490                 495

Tyr Leu Ser His Glu Arg His Lys Ala Gln Lys Ser Phe Ser Pro Asn
            500                 505                 510

Gln Phe Gly Thr Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Ile Ala Ile Ala Gln Thr His Lys Ala Gly Ser Ile Val
    530                 535                 540

Leu Pro Lys Leu Gly Asp Met Arg Glu Ile Val Gln Ser Glu Ile Gln
545                 550                 555                 560

Ala Ile Ala Glu Glu Lys Phe Pro Gly Tyr Val Glu Gly Gln Gln Lys
                565                 570                 575
```

```
Tyr Ala Lys Gln Tyr Arg Val Asn Val His Gly Trp Ser His Ser Arg
            580                 585                 590


Leu Ile Gln Ser Ile Gln Ser Lys Ala Ala Gln Ile Gly Ile Val Ile
        595                 600                 605


Glu Glu Gly Lys Gln Pro Ile Arg Gly Ser Pro Gln Asp Lys Ala Lys
    610                 615                 620


Glu Leu Ala Leu Ser Ala Tyr Asn Leu Arg Leu Ala Arg Arg Ser
625                 630                 635


<210>  451
<211>  647
<212>  PRT
<213>  Nostocales

<400>  451

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Ile Ala Ser Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Lys Leu Met Ala Glu Ser Asn Thr Pro Leu Ile
            20                  25                  30


Asn Gln Leu Leu Gln Gln Leu Ser Lys His Pro Asp Phe Glu Lys Trp
        35                  40                  45


Arg Lys Asn Gly Lys Leu Pro Ser Thr Val Val Tyr Gln Leu Cys Gln
    50                  55                  60


Pro Leu Lys Thr His Pro Ser Phe Thr Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80


Leu Ser Ala Ile His Val Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95


Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Leu Arg Trp Ile
```

```
            100                 105                 110

Glu Met Leu Asn Ser Asp Ala Glu Leu Val Glu Ile Ser Gly Cys Ser
        115                 120                 125

Leu Glu Ala Ile Arg Thr Lys Ala Ala Glu Ile Leu Ala Met Thr Thr
    130                 135                 140

Pro Glu Ser Gly Ser Asn Ile Ser Val Thr Lys Thr Arg Lys Thr Lys
145                 150                 155                 160

Lys Ser Lys Asn Ser Asn Ser Ser Ala Ser Asn Ser Asp Arg Ser Leu
                165                 170                 175

Ser His Lys Leu Phe Asp Ala Tyr Gln Glu Thr Asp Asp Ile Leu Ser
            180                 185                 190

Arg Ser Ala Ile Ser Tyr Leu Leu Lys Asn Ala Cys Lys Leu Asn Asn
        195                 200                 205

Lys Glu Glu Asp Pro Glu Lys Phe Ser Gln Arg Arg Arg Lys Val Glu
    210                 215                 220

Ile Gln Ile Gln Arg Leu Thr Asp Lys Leu Ile Ser Arg Ile Pro Lys
225                 230                 235                 240

Gly Arg Asp Leu Thr Asn Ser Lys Trp Leu Glu Thr Leu Phe Thr Ala
                245                 250                 255

Thr Thr Thr Val Pro Glu Asp Asn Thr Glu Ala Lys Arg Trp Gln Asp
            260                 265                 270

Val Leu Leu Thr Arg Ser Ser Ser Val Pro Phe Pro Val Ile Phe Glu
        275                 280                 285

Thr Asn Glu Asp Leu Val Trp Ser Lys Asn Glu Lys Gly Arg Leu Cys
    290                 295                 300
```

```
Val His Phe Asn Gly Leu Ser Asp Leu Thr Phe Glu Val Tyr Cys Asp
305                 310                 315                 320

Ser Arg Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr
                325                 330                 335

Lys Arg Lys Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg
            340                 345                 350

Asn Gly Arg Leu Ala Trp Gln Glu Gly Lys Gly Lys Glu Glu Pro Trp
        355                 360                 365

Asn Ile His His Leu Thr Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp
    370                 375                 380

Thr Glu Asp Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Glu Glu Ile
385                 390                 395                 400

Thr Lys Phe Ile Thr Lys Met Asn Glu Lys Ser Asp Leu Ser Asp Thr
                405                 410                 415

Gln Leu Ala Phe Ile Lys Arg Lys Glu Ser Thr Leu Thr Arg Ile Asn
            420                 425                 430

Asn Ser Phe Asp Arg Pro Ser Lys Pro Leu Tyr Gln Gly Gln Ser His
        435                 440                 445

Ile Leu Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Ile Ala
    450                 455                 460

Val Val Asp Ala Met Pro Asp Gly Lys Ala Asp Ala Asn Ala Gly Lys
465                 470                 475                 480

Val Leu Thr Tyr Arg Ser Ile Arg Gln Leu Leu Gly Asp Asn Tyr Glu
                485                 490                 495

Leu Leu Asn Arg Gln Arg Arg Gln Gln Arg Ser Leu Ser His Glu Arg
```

```
            500                 505                 510

His Lys Ala Gln Lys Ser Phe Ser Ser Asn Gln Phe Gly Thr Ser Glu
        515                 520                 525

Leu Gly Gln His Ile Asp Arg Leu Leu Ala Lys Glu Ile Val Ala Ile
    530                 535                 540

Ala Gln Thr Tyr Lys Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp
545                 550                 555                 560

Met Arg Glu Ile Val Gln Ser Glu Ile Gln Ala Ile Ala Glu Ala Lys
                565                 570                 575

Cys Pro Gly Tyr Val Glu Ile Gln Gln Lys Tyr Ala Lys Gln Tyr Arg
            580                 585                 590

Val Asn Val His Gln Trp Ser Tyr Gly Arg Leu Ile Gln Ser Ile Gln
        595                 600                 605

Ser Lys Ala Ala Gln Val Gly Ile Met Val Glu Glu Gly Lys Gln Pro
    610                 615                 620

Ile Arg Gly Ser Pro Gln Asp Lys Ala Lys Glu Leu Ala Leu Ser Thr
625                 630                 635                 640

Tyr His Ser Arg Leu Ala Arg
                645
```

<210> 452
<211> 648
<212> PRT
<213> Nostoc sp. PCC 7120

<400> 452

```
Met Cys Phe Val Trp Tyr Phe Ile Phe Met Ser Gln Lys Thr Ile Gln
1               5                   10                  15
```

```
Cys Arg Leu Ile Ala Ser Glu Ser Thr Arg Gln Lys Leu Trp Lys Leu
            20                  25                  30

Met Ala Glu Ser Asn Thr Pro Leu Ile Asn Glu Leu Leu Gln Gln Leu
        35                  40                  45

Ser Lys His Pro Asp Phe Glu Lys Trp Arg Arg Asn Gly Lys Leu Pro
    50                  55                  60

Ser Thr Val Val Ser Gln Leu Cys Gln Pro Leu Lys Thr Asp Pro Ser
65                  70                  75                  80

Phe Thr Gly Gln Pro Ser Arg Phe Tyr Ile Ser Ala Ile His Ile Val
                85                  90                  95

Asp Tyr Ile Tyr Lys Ser Trp Leu Thr Ile Gln Lys Arg Leu Gln Gln
            100                 105                 110

Gln Leu Asp Gly Lys Leu Arg Trp Ile Glu Met Phe Asn Ser Asp Val
        115                 120                 125

Glu Leu Val Glu Ile Ser Gly Phe Ser Leu Glu Ala Ile Arg Thr Lys
    130                 135                 140

Ala Ser Glu Ile Leu Ala Ile Thr Thr Pro Glu Ser Asp Pro Lys Thr
145                 150                 155                 160

Leu Leu Thr Lys Arg Gly Lys Thr Lys Gln Ser Lys Lys Ser Ser Ala
                165                 170                 175

Ser Asn Pro Asp Arg Ser Leu Ser Arg Lys Leu Phe Asp Ala Tyr Gln
            180                 185                 190

Glu Thr Asp Asp Ile Leu Ser Arg Ser Ala Ile Ser Tyr Leu Leu Lys
        195                 200                 205

Asn Gly Cys Lys Leu Asn Asp Lys Glu Glu Asn Pro Glu Lys Phe Ala
    210                 215                 220
```

```
Lys Arg Arg Arg Lys Val Glu Ile Gln Ile Gln Arg Leu Thr Asp Lys
225                 230                 235                 240

Leu Thr Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Tyr Ser Lys Trp
                245                 250                 255

Leu Glu Thr Leu Phe Thr Ala Thr Thr Thr Val Pro Glu Asn Asn Ala
            260                 265                 270

Glu Ala Lys Arg Trp Gln Asp Ile Leu Leu Thr Arg Ser Ser Ser Ile
        275                 280                 285

Pro Phe Pro Val Val Phe Glu Thr Asn Glu Asp Leu Val Trp Ser Thr
    290                 295                 300

Asn Glu Lys Gly Arg Leu Cys Val His Phe Asn Gly Leu Ser Asp Leu
305                 310                 315                 320

Ile Phe Glu Val Tyr Cys Asp Ser Arg Gln Leu Tyr Trp Phe Lys Arg
                325                 330                 335

Phe Leu Glu Asp Gln Gln Thr Lys Arg Lys Ser Lys Asn Gln His Ser
            340                 345                 350

Ser Gly Leu Phe Thr Leu Arg Asn Gly Arg Leu Ala Trp Gln Gln Gly
        355                 360                 365

Glu Gly Lys Gly Glu Pro Trp Asn Ile Gly His Leu Ala Leu Tyr Cys
    370                 375                 380

Cys Val Asp Asn Arg Leu Trp Thr Ala Glu Gly Thr Glu Gln Val Arg
385                 390                 395                 400

Gln Glu Lys Ala Glu Glu Ile Thr Lys Phe Ile Thr Lys Met Lys Asp
                405                 410                 415
```

```
Lys Ser Asp Leu Ser Glu Thr Gln Leu Ala Phe Ile Lys Arg Lys Glu
            420                 425                 430

Ser Thr Leu Thr Arg Ile Asn Asn Ser Phe Asp Arg Pro Ser Lys Pro
        435                 440                 445

Leu Tyr Gln Gly Gln Ser His Ile Leu Val Gly Val Ser Leu Gly Leu
    450                 455                 460

Glu Lys Pro Ala Thr Ile Ala Val Val Asp Ala Ile Ala Gly Lys Val
465                 470                 475                 480

Leu Thr Tyr Arg Ser Leu Arg Gln Leu Leu Gly Asp Asn Tyr Glu Leu
                485                 490                 495

Leu Asn Arg Gln Arg Arg Gln Gln Arg Ser Leu Ser His Glu Arg His
            500                 505                 510

Lys Ala Gln Lys Ser Phe Ser Pro Asn Gln Phe Gly Ala Ser Glu Leu
        515                 520                 525

Gly Gln Tyr Val Asp Arg Leu Leu Ala Lys Glu Ile Val Ala Ile Ala
    530                 535                 540

Gln Thr Tyr Lys Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Ile
545                 550                 555                 560

Arg Glu Ile Val Gln Ser Glu Ile Gln Ala Ile Ala Glu Ala Lys Cys
                565                 570                 575

Pro Ser Ser Ser Glu Ile Gln Gln Lys Tyr Ala Lys Gln Tyr Arg Val
            580                 585                 590

Asn Val His Gln Trp Ser Tyr Gly Arg Leu Ile Gln Ser Ile Gln Ser
        595                 600                 605

Lys Ala Ala Gln Ile Gly Ile Val Ile Glu Glu Gly Lys Gln Pro Ile
    610                 615                 620
```

Arg Gly Ser Pro Gln Asp Lys Ala Lys Glu Leu Ala Leu Tyr Ala Tyr
625 630 635 640

Ser Leu Arg Leu Ala Arg Arg Ser
645

<210> 453
<211> 636
<212> PRT
<213> Nostoc sp. 'Peltigera membranacea cyanobiont' 232

<400> 453

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ser Ser
1 5 10 15

Arg His Gln Leu Trp Lys Leu Met Ala Glu Leu Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu His Arg Val Asn Gln His Pro Glu Phe Glu Thr Trp
35 40 45

Arg Gln Lys Gly Lys His Pro Thr Ser Val Val Lys Glu Leu Cys Glu
50 55 60

Pro Leu Lys Thr Asp Ser Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Ile Ala Leu Val Asn Tyr Ile Tyr Lys Ser Trp Phe Ala
85 90 95

Leu Met Lys Arg Ser Gln Phe Gln Leu Glu Gly Lys Asn Arg Trp Leu
100 105 110

Gln Met Leu Asn Ser Asp Val Glu Leu Ile Glu Ser Ser Gly Val Ser
115 120 125

Leu Asp Ser Leu Arg Thr Lys Ala Ala Glu Ile Leu Ala Gln Phe Ala

```
    130                 135                 140

Ser Leu Asn Thr Ala Glu Thr Pro Ser Thr Asn Val Lys Lys Ala Lys
145                 150                 155                 160

Lys Arg Lys Lys Ala Gln Asn Ser Asp Ser Asp Arg Asn Leu Ser Lys
                165                 170                 175

Asn Leu Phe Glu Ser Tyr Pro Lys Thr Glu Asp Asn Leu Thr Arg Cys
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Ile Asn Asp Lys Glu
        195                 200                 205

Glu Asp Ala Lys Lys Phe Val Gln Arg Arg Arg Lys Leu Glu Ile Gln
    210                 215                 220

Ile Glu Arg Ile Arg Glu Gln Leu Glu Thr Arg Thr Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Ala Thr Lys Trp Leu Ala Thr Leu Phe Thr Ala Thr His
                245                 250                 255

Asn Val Pro Thr Asn Glu Ala Glu Ala Lys Ser Trp Gln Asp Ser Leu
            260                 265                 270

Leu Arg Gln Phe Ser Lys Val Pro Phe Pro Val Ala Tyr Glu Ser Asn
        275                 280                 285

Glu Asp Met Thr Trp Phe Lys Asn Gln Phe Gly Arg Ile Cys Val Lys
    290                 295                 300

Phe Asn Gly Leu Ser Glu His Ser Phe Gln Val Tyr Cys Asp Ser Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Ile Lys Lys
                325                 330                 335
```

```
Asn Ser Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly
            340                 345                 350

Arg Leu Ala Trp Gln Glu Glu Glu Gly Lys Gly Asp Pro Trp Lys Ala
        355                 360                 365

Asn His Leu Thr Leu Tyr Cys Ser Val Asp Thr Arg Leu Trp Thr Thr
    370                 375                 380

Glu Gly Thr Asn Gln Val Arg Glu Glu Lys Ala Glu Glu Ile Ala Lys
385                 390                 395                 400

Ile Ile Thr Asn Thr Lys Ala Lys Gly Asp Leu Asn Glu Lys Gln Gln
                405                 410                 415

Ala His Ile Lys Arg Lys Asn Ser Thr Leu Asp Arg Ile Asn Asn Pro
            420                 425                 430

Phe Pro Arg Pro Thr Lys Thr Leu Tyr Lys Gly Gln Ser His Ile Leu
        435                 440                 445

Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Leu Ala Val Val
    450                 455                 460

Asp Gly Thr Thr Gly Gln Val Ile Thr Tyr Arg Ser Ile Lys Gln Leu
465                 470                 475                 480

Leu Gly Asp Asn Tyr Lys Leu Val Asn Arg Gln Arg Lys Gln Lys His
                485                 490                 495

Ser Leu Ser His Gln Arg Gln Ile Ala Gln Thr Leu Ala Ala Pro Asn
            500                 505                 510

Gln Phe Gly Glu Ser Glu Leu Gly Glu Tyr Ile Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Ile Ala Ile Ala Gln Thr Tyr Ser Ala Gly Ser Ile Val
```

```
    530                 535                 540

Leu Pro Lys Leu Asp Asn Met Arg Glu Gln Val Gln Ser Glu Val Gln
545                 550                 555                 560

Ala Lys Ala Glu Gln Lys Ser Asp Leu Ile Glu Val Gln Lys Gln Tyr
                565                 570                 575

Ala Lys Gln Tyr Arg Val Ser Val His Gln Trp Ser Tyr Gly Arg Leu
            580                 585                 590

Met Ala Asn Ile His Ser Ser Ala Val Lys Ala Gly Ile Val Ile Glu
        595                 600                 605

Glu Ser Lys Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Lys Glu
    610                 615                 620

Leu Ala Ile Ala Ala Tyr His Ser Arg Lys Ile Asn
625                 630                 635
```

<210> 454
<211> 635
<212> PRT
<213> Microcoleus sp. PCC 7113

<400> 454

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Asn Val Ser Thr
1               5                   10                  15

Arg His Gln Ile Trp Thr Leu Met Ala Glu Arg Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Glu Gln Ile Gly Gln His Pro Asp Phe Glu Thr Trp
        35                  40                  45

Arg Gln Lys Arg Lys Ile Pro Ala Gly Ile Ile Lys Gln Leu Cys Glu
    50                  55                  60
```

```
Pro Leu Arg Thr Asp Ser Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Ala Ser Ala Ser Ala Leu Val Asp Tyr Ile Tyr Lys Ser Trp Leu Lys
                85                  90                  95

Val Gln Gln Arg Leu Gln Arg Lys Leu Glu Gly Gln Met Arg Trp Leu
            100                 105                 110

Gly Met Leu Lys Ser Asp Glu Glu Leu Val Asn Gln Ser Gly Cys Thr
        115                 120                 125

Leu Glu Val Ile Arg Thr Lys Ala Ser Glu Ile Leu Val Pro Leu Thr
    130                 135                 140

Ser Lys Asn Glu Ser Pro Gln Pro Thr Gln Thr Lys Gly Lys Lys Ser
145                 150                 155                 160

Lys Lys Pro Gln Asp Leu Gly Ser Asn Arg Ser Ile Ser Lys Thr Leu
                165                 170                 175

Phe Gln Val Tyr Asp Asp Ile Glu Asp Leu Leu Thr Lys Asn Ala Ile
            180                 185                 190

Cys Tyr Leu Leu Lys Asn Gly Cys Lys Ile Pro Asp Gln Glu Glu Asp
        195                 200                 205

Lys Glu Lys Phe Ala Lys Arg Arg Arg Lys Thr Glu Ile Lys Ile Ser
    210                 215                 220

Arg Leu Glu Glu Gln Leu Ala Ser Arg Ile Pro Lys Gly Arg Asn Leu
225                 230                 235                 240

Thr Gly Glu Lys Trp Leu Glu Thr Leu Ile Ala Ala Thr Ser Thr Val
                245                 250                 255

Pro Glu Asn Glu Ser Gln Ala Arg Ser Trp Gln Asp Arg Leu Leu Thr
            260                 265                 270
```

```
Lys Pro Gln Ser Val Pro Phe Pro Val Thr Tyr Glu Ser Asn Glu Asp
        275                 280                 285

Leu Thr Trp Ser Lys Asn Ser Lys Gly Arg Leu Cys Val Lys Phe Asn
    290                 295                 300

Gly Leu Ser Glu His Thr Phe Gln Ile Tyr Cys Asp Gln Arg Gln Leu
305                 310                 315                 320

Lys Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Ile Lys Arg Glu Ser
                325                 330                 335

Lys Asp Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Gln Ile
            340                 345                 350

Ala Trp Ala Leu Gly Lys Gly Lys Gly Asp Ala Trp Asn Ile His His
        355                 360                 365

Leu Thr Leu Tyr Cys Thr Leu Asp Thr Arg Leu Trp Thr Ala Glu Gly
    370                 375                 380

Thr Glu Gln Val Arg Gln Glu Lys Ala Asp Asp Ile Ala Lys Thr Leu
385                 390                 395                 400

Ala Arg Met Lys Glu Lys Gly Asp Leu Asn Asp Lys Gln Gln Ala Phe
                405                 410                 415

Ile Lys Arg Lys Asn Ser Thr Leu Ala Arg Leu Asn Asn Pro Phe Pro
            420                 425                 430

Arg Pro Ser Gln Pro Leu Tyr Gln Gly Arg Ser His Ile Ala Val Gly
        435                 440                 445

Ile Ser Leu Gly Leu Gly Lys Pro Ala Thr Ala Ala Ile Val Asp Gly
    450                 455                 460
```

```
Thr Thr Gly Glu Ala Ile Ala Tyr Arg Ser Ile Arg Gln Leu Leu Gly
465                 470                 475                 480

Asp Asn Tyr Lys Leu Phe Asn Arg Gln Arg Gln Glu Lys Gln Arg Gln
                485                 490                 495

Ser His Gln Arg His Lys Ala Gln Lys Asn Ala Thr Ser Asn Gln Phe
            500                 505                 510

Gly Glu Ser Glu Leu Gly Glu Tyr Val Asp Arg Leu Leu Ala Lys Glu
        515                 520                 525

Ile Val Thr Leu Ala Gln Thr Tyr Gln Ala Gly Ser Ile Val Leu Pro
    530                 535                 540

Lys Leu Gly Asp Met Arg Glu Leu Val His Ser Glu Ile Gln Thr Arg
545                 550                 555                 560

Ala Glu Gln Lys Ile Pro Ser Tyr Val Glu Gly Gln Gln Lys Tyr Ala
                565                 570                 575

Lys Gln Tyr Arg Val Asn Val His Gln Trp Ser Tyr Gly Arg Leu Ile
            580                 585                 590

Glu Asn Ile Gln Val Gln Ala Ala Lys Ile Gly Ile Ser Ile Glu Gln
        595                 600                 605

Gly Gln Gln Pro Val Arg Gly Ser Pro Gln Glu Lys Ala Lys Glu Met
    610                 615                 620

Ala Ile Ala Ala Tyr His Ser Arg Leu Asn Pro
625                 630                 635
```

<210> 455
<211> 639
<212> PRT
<213> Nostocaceae

<400> 455

```
Met Ser Gln Lys Thr Ile Gln Cys Arg Leu Ile Ala Ser Glu Ser Thr
1               5                  10                  15

Arg Gln Lys Leu Trp Lys Leu Met Ala Glu Ser Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Gln Gln Leu Ser Lys His Pro Asp Phe Glu Lys Trp
        35                  40                  45

Arg Arg Asn Gly Lys Leu Pro Ser Thr Val Val Ser Gln Leu Cys Gln
    50                  55                  60

Pro Leu Lys Thr Asp Pro Ser Phe Thr Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80

Ile Ser Ala Ile His Ile Val Asp Tyr Ile Tyr Lys Ser Trp Leu Thr
                85                  90                  95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Leu Arg Trp Ile
            100                 105                 110

Glu Met Phe Asn Ser Asp Val Glu Leu Val Glu Ile Ser Gly Phe Ser
        115                 120                 125

Leu Glu Ala Ile Arg Thr Lys Ala Ser Glu Ile Leu Ala Ile Thr Thr
    130                 135                 140

Pro Glu Ser Asp Pro Lys Thr Leu Leu Thr Lys Arg Gly Lys Thr Lys
145                 150                 155                 160

Gln Ser Lys Lys Ser Ser Ala Ser Asn Pro Asp Arg Ser Leu Ser Arg
                165                 170                 175

Lys Leu Phe Asp Ala Tyr Gln Glu Thr Asp Asp Ile Leu Ser Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Asn Asp Lys Glu
```

```
        195                 200                 205

Glu Asn Pro Glu Lys Phe Ala Lys Arg Arg Arg Lys Val Glu Ile Gln
    210                 215                 220

Ile Gln Arg Leu Thr Asp Lys Leu Thr Ser Arg Ile Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Tyr Ser Lys Trp Leu Glu Thr Leu Phe Thr Ala Thr Thr
                245                 250                 255

Thr Val Pro Glu Asn Asn Ala Glu Ala Lys Arg Trp Gln Asp Ile Leu
            260                 265                 270

Leu Thr Arg Ser Ser Ser Ile Pro Phe Pro Val Val Phe Glu Thr Asn
        275                 280                 285

Glu Asp Leu Val Trp Ser Thr Asn Glu Lys Gly Arg Leu Cys Val His
    290                 295                 300

Phe Asn Gly Leu Ser Asp Leu Ile Phe Glu Val Tyr Cys Asp Ser Arg
305                 310                 315                 320

Gln Leu Tyr Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg
                325                 330                 335

Lys Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly
            340                 345                 350

Arg Leu Ala Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp Asn Ile
        355                 360                 365

Gly His Leu Ala Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp Thr Ala
    370                 375                 380

Glu Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Glu Glu Ile Thr Lys
385                 390                 395                 400
```

```
Phe Ile Thr Lys Met Lys Asp Lys Ser Asp Leu Ser Glu Thr Gln Leu
               405                 410                 415

Ala Phe Ile Lys Arg Lys Glu Ser Thr Leu Thr Arg Ile Asn Asn Ser
            420                 425                 430

Phe Asp Arg Pro Ser Lys Pro Leu Tyr Gln Gly Gln Ser His Ile Leu
        435                 440                 445

Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Ile Ala Val Val
    450                 455                 460

Asp Ala Ile Ala Gly Lys Val Leu Thr Tyr Arg Ser Leu Arg Gln Leu
465                 470                 475                 480

Leu Gly Asp Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Arg
               485                 490                 495

Ser Leu Ser His Glu Arg His Lys Ala Gln Lys Ser Phe Ser Pro Asn
            500                 505                 510

Gln Phe Gly Ala Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Val Ala Ile Ala Gln Thr Tyr Lys Ala Gly Ser Ile Val
    530                 535                 540

Leu Pro Lys Leu Gly Asp Ile Arg Glu Ile Val Gln Ser Glu Ile Gln
545                 550                 555                 560

Ala Ile Ala Glu Ala Lys Cys Pro Ser Ser Ser Glu Ile Gln Gln Lys
               565                 570                 575

Tyr Ala Lys Gln Tyr Arg Val Asn Val His Gln Trp Ser Tyr Gly Arg
            580                 585                 590

Leu Ile Gln Ser Ile Gln Ser Lys Ala Ala Gln Ile Gly Ile Val Ile
```

595 600 605

Glu Glu Gly Lys Gln Pro Ile Arg Gly Ser Pro Gln Asp Lys Ala Lys
610 615 620

Glu Leu Ala Leu Tyr Ala Tyr Ser Leu Arg Leu Ala Arg Arg Ser
625 630 635

<210> 456
<211> 645
<212> PRT
<213> Calothrix sp. NIES-2100

<400> 456

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ser Thr
1 5 10 15

Arg Gln Gln Leu Trp Lys Leu Met Ala Glu Leu Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Arg Gln Val His Gln His Pro Glu Phe Glu Thr Trp
35 40 45

Arg Gln Lys Gly Lys His Pro Thr Ser Ile Val Lys Glu Leu Cys Gln
50 55 60

Pro Leu Lys Thr Asp Pro Ser Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Ile Ala Thr Val Asn Tyr Ile Tyr Lys Ser Trp Phe Lys
85 90 95

Leu Met Lys Arg Ser Gln Ser Gln Leu Glu Gly Lys Ile Arg Trp Trp
100 105 110

Glu Met Leu Lys Ser Asp Ala Glu Leu Val Glu Val Ser Gly Val Thr
115 120 125

```
Leu Glu Ser Leu Arg Ser Lys Ala Asp Glu Ile Leu Ala His Phe Thr
    130                 135                 140

Pro Gln Ser Asp Thr Val Glu Ala Gln Pro Gly Lys Gly Asn Lys Arg
145                 150                 155                 160

Lys Lys Thr Lys Lys Ser Lys Val Ala Glu Gly Asp Cys Ala Glu Arg
                165                 170                 175

Thr Leu Arg Glu Arg Ser Ile Ser Lys Thr Leu Phe Glu Ala Tyr Arg
            180                 185                 190

Asp Thr Glu Asp Ile Leu Thr His Cys Ala Ile Ser Tyr Leu Leu Lys
        195                 200                 205

Asn Gly Cys Lys Ile Asn Asp Lys Glu Glu Asp Thr Gln Lys Phe Ala
    210                 215                 220

Lys Arg Arg Arg Lys Leu Glu Ile Gln Ile Glu Arg Leu Arg Glu Gln
225                 230                 235                 240

Leu Glu Ala Arg Ile Pro Lys Gly Arg Asp Leu Thr Asn Gly Lys Trp
                245                 250                 255

Leu Glu Thr Leu Leu Leu Ala Thr His Asn Val Pro Glu Ser Glu Thr
            260                 265                 270

Glu Ala Lys Ser Trp Gln Asp Ser Leu Leu Lys Lys Ser Ser Lys Val
        275                 280                 285

Pro Phe Pro Ile Ala Tyr Glu Thr Asn Glu Asp Met Thr Trp Phe Lys
    290                 295                 300

Asn Glu Arg Gly Arg Ile Cys Val Lys Phe Asn Gly Leu Ser Glu His
305                 310                 315                 320

Ser Phe Gln Val Tyr Cys Asp Ser Arg Gln Leu His Trp Phe Gln Arg
                325                 330                 335
```

```
Phe Leu Glu Asp Gln Gln Ile Lys Gln Asn Ser Lys Asn Gln His Ser
            340                 345                 350

Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Ile Ala Trp Gln Glu Gly
        355                 360                 365

Glu Gly Lys Gly Glu Glu Trp Lys Val Asn His Leu Ile Phe Tyr Cys
    370                 375                 380

Ser Val Asp Thr Arg Leu Trp Thr Ala Glu Gly Thr Asn Leu Val Arg
385                 390                 395                 400

Val Glu Lys Ala Glu Glu Ile Ala Lys Thr Ile Thr Gln Thr Lys Ala
                405                 410                 415

Lys Gly Glu Leu Asn Asp Gln Gln Leu Ala His Ile Lys Arg Lys Asn
            420                 425                 430

Ser Ser Leu Ala Arg Ile Asn Asn Ser Phe Pro Arg Pro Ser Lys Pro
        435                 440                 445

Leu Tyr Gln Gly Gln Ser His Ile Leu Val Ala Val Ser Leu Gly Leu
    450                 455                 460

Glu Lys Pro Ala Thr Val Ala Val Val Asp Gly Thr Ile Gly Lys Val
465                 470                 475                 480

Leu Thr Tyr Arg Ser Ile Arg Gln Leu Leu Gly Asp Asn Tyr Lys Leu
                485                 490                 495

Leu Asn Arg Gln Arg Gln Gln Lys His Thr Leu Ser His Gln Arg Gln
            500                 505                 510

Ile Ala Gln Met Leu Ala Ala Pro Asn Glu Leu Gly Glu Ser Glu Leu
        515                 520                 525
```

```
Gly Glu Tyr Ile Glu Arg Leu Leu Ala Lys Glu Ile Ile Ala Ile Ala
    530                 535                 540

Gln Thr Tyr Lys Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Met
545                 550                 555                 560

Arg Glu Gln Val Gln Ser Glu Ile Gln Ala Lys Ala Glu Gln Lys Ser
                565                 570                 575

Asp Leu Ile Glu Val Gln Gln Lys Tyr Ala Lys Gln Tyr Arg Val Ser
            580                 585                 590

Thr His Gln Trp Ser Tyr Gly Arg Leu Ile Glu Asn Ile Arg Ser Ser
        595                 600                 605

Ala Ala Lys Thr Gly Ile Val Ile Glu Glu Ser Lys Gln Pro Ile Arg
    610                 615                 620

Gly Ser Pro Gln Glu Lys Ala Lys Glu Leu Ala Ile Ala Ala Tyr His
625                 630                 635                 640

Ser Arg Gln Lys Thr
                645
```

<210> 457
<211> 639
<212> PRT
<213> Anabaena sp. WA1130

<400> 457

```
Met Ser Gln Ile Thr Val Gln Cys Arg Leu Ile Ala Ser Glu Ser Thr
1               5                   10                  15

Arg Gln Gln Leu Trp Thr Leu Met Ala Glu Leu Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Gln Gln Leu Ser Lys His Pro Asp Phe Glu Lys Trp
        35                  40                  45
```

```
Arg Lys Asp Gly Lys Phe Pro Ser Thr Val Val Ser Gln Leu Cys Gln
    50                  55                  60

Pro Leu Lys Thr Asp Pro Gln Phe Ala Gly Gln Pro Ser Arg Cys Tyr
65                  70                  75                  80

Leu Ser Ala Ile His Val Val Asp Tyr Ile Tyr Lys Ser Trp Leu Thr
                85                  90                  95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Ile Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Ala Glu Leu Val Glu Thr Ser Gly Tyr Ser
        115                 120                 125

Leu Glu Ala Ile Arg Thr Lys Ala Ala Glu Ile Leu Ala Met Thr Thr
    130                 135                 140

Pro Glu Ser Asp Thr Asn Val Pro Leu Thr Lys Lys Arg Asn Thr Lys
145                 150                 155                 160

Lys Ser Lys Lys Ser Ser Ala Ser Asn Pro Glu Pro Ser Leu Ser His
                165                 170                 175

Lys Leu Phe Asn Ala Tyr Gln Glu Thr Asp Asp Ile Leu Ser Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Asn Asp Lys Glu
        195                 200                 205

Glu Asp Thr Glu Lys Phe Ala Lys Arg Arg Arg Lys Val Glu Ile Gln
    210                 215                 220

Ile Gln Arg Leu Thr Asp Lys Leu Thr Ser Arg Ile Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Asn Ser Lys Trp Leu Glu Thr Leu Phe Thr Ala Ile Thr
```

```
                245                 250                 255

Thr Val Pro Glu Asp Asn Ala Glu Ala Lys Arg Trp Gln Asp Ile Leu
            260                 265                 270

Ser Thr Arg Ser Ser Ser Leu Pro Phe Pro Leu Ile Phe Glu Thr Asn
        275                 280                 285

Glu Asp Leu Lys Trp Ser Thr Asn Glu Lys Gly Arg Leu Cys Val His
    290                 295                 300

Phe Asn Gly Leu Thr Asp Leu Thr Phe Glu Val Tyr Cys Asp Ser Arg
305                 310                 315                 320

Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg
                325                 330                 335

Lys Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly
            340                 345                 350

Arg Leu Ala Trp Gln Glu Gly Glu Gly Lys Gly Glu Thr Trp Gln Ile
        355                 360                 365

His Arg Leu Thr Leu Ser Cys Cys Val Asp Asn Arg Leu Trp Thr Ala
    370                 375                 380

Glu Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Glu Asp Ile Thr Lys
385                 390                 395                 400

Phe Ile Thr Lys Met Lys Glu Lys Ser Asp Leu Ser Asp Thr Gln Gln
                405                 410                 415

Ala Phe Ile Gln Arg Lys Gln Ser Thr Leu Thr Arg Ile Asn Asn Ser
            420                 425                 430

Phe Asp Arg Pro Cys Lys Pro Leu Tyr Gln Gly Gln Ser His Ile Leu
        435                 440                 445
```

```
Val Gly Val Ser Met Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val
    450                 455                 460

Asp Ala Ser Ala Asn Lys Val Leu Thr Tyr Arg Ser Ile Lys Gln Ile
465                 470                 475                 480

Leu Gly Glu Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Arg
                485                 490                 495

Ser Ser Ser His Glu Arg His Lys Ala Gln Lys Ser Phe Ser Pro Asn
            500                 505                 510

Gln Phe Gly Thr Ser Glu Leu Gly Gln Tyr Ile Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Val Ala Ile Ala Gln Thr Tyr Lys Ala Gly Ser Ile Val
    530                 535                 540

Leu Pro Lys Leu Gly Asp Met Arg Glu Asn Ile Gln Ser Glu Ile Gln
545                 550                 555                 560

Ala Ile Ala Glu Ile Lys Cys Pro Gly Ser Val Glu Ile Gln Gln Lys
                565                 570                 575

Tyr Ala Lys Gln Tyr Arg Ile Asn Val His Lys Trp Ser Tyr Gly Arg
            580                 585                 590

Leu Ile Gln Ser Ile Gln Ser Lys Ala Ala Gln Val Gly Ile Val Ile
        595                 600                 605

Glu Glu Gly Lys Gln Pro Val Arg Asp Ser Pro Gln Asp Lys Ala Lys
    610                 615                 620

Glu Leu Ala Leu Ser Thr Tyr His Leu Arg Leu Ala Lys Gln Ser
625                 630                 635
```

<210> 458

<211> 635
<212> PRT
<213> Anabaena cylindrica

<400> 458

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Thr Thr
1 5 10 15

Arg Gln Gln Leu Trp Gln Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Ser Gln Ile Gly Lys His Pro Glu Phe Glu Thr Trp
35 40 45

Arg Gln Lys Gly Lys His Pro Thr Gly Ile Val Lys Glu Leu Cys Glu
50 55 60

Pro Leu Lys Thr Asp Pro Arg Phe Ile Gly Gln Pro Ala Arg Phe Tyr
65 70 75 80

Thr Ser Ala Thr Ala Ser Val Asn Tyr Ile Tyr Glu Ser Trp Phe Ala
85 90 95

Leu Met Lys Arg Tyr Gln Ser Gln Leu Asp Gly Lys Leu Arg Trp Leu
100 105 110

Glu Met Phe Asn Ser Asp Ala Glu Leu Val Glu His Ser Gly Val Ser
115 120 125

Leu Asp Thr Leu Arg Ala Thr Ser Ala Glu Ile Leu Ala Gln Phe Ala
130 135 140

Pro Gln Asp Thr Asn Arg Asp Thr Ser Asn Lys Gly Lys Lys Ser Lys
145 150 155 160

Met Gly Lys Lys Ser Gln Lys Ser Asp Ser Glu Gly Asn Leu Ser Lys
165 170 175

```
Lys Leu Phe Asp Ala Tyr Ser Ser Ala Glu Asp Asn Leu Thr Arg Cys
            180                 185                 190

Ala Ile Ser His Leu Leu Lys Asn Gly Cys Lys Val Ser Asn Lys Glu
        195                 200                 205

Glu Asn Ser Glu Lys Phe Thr Gln Arg Arg Arg Lys Leu Glu Ile Gln
    210                 215                 220

Ile Gln Arg Leu Thr Glu Lys Leu Ala Ala Arg Ile Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Asp Thr Gln Trp Leu Glu Thr Leu Phe Thr Ala Thr Tyr
                245                 250                 255

Asn Val Pro Glu Asp Glu Thr Glu Ala Lys Leu Trp Gln Asn Ser Leu
            260                 265                 270

Leu Arg Lys Phe Ser Ser Leu Pro Phe Pro Val Ala Tyr Glu Thr Asn
        275                 280                 285

Glu Asp Leu Val Trp Ser Lys Asn Arg Phe Gly Arg Ile Cys Leu Thr
    290                 295                 300

Phe Pro Thr Leu Arg Glu His Ile Phe Gln Ile Tyr Cys Asp Ser Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Leu Glu Asp Gln Glu Ile Lys Lys
                325                 330                 335

Asn Ser Lys Asn Gln His Ser Ser Ala Leu Phe Thr Leu Arg Ser Gly
            340                 345                 350

Arg Ile Ala Trp Gln Glu Gly Glu Gly Lys Gly Glu Pro Trp Asp Ile
        355                 360                 365

His His Leu Thr Leu Tyr Cys Cys Val Asp Thr Arg Leu Trp Thr Glu
    370                 375                 380
```

```
Glu Gly Thr Asn Leu Val Lys Glu Glu Lys Ala Glu Glu Ile Ala Lys
385                 390                 395                 400

Thr Ile Thr Gln Thr Lys Ala Lys Gly Asp Leu Asn Asp Lys Gln Gln
                405                 410                 415

Ala His Leu Lys Arg Lys Asn Ser Ser Leu Ala Arg Ile Asn Asn Pro
            420                 425                 430

Phe Pro Arg Pro Ser Gln Pro Leu Tyr Lys Gly Gln Ser His Ile Leu
        435                 440                 445

Leu Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val
    450                 455                 460

Asp Gly Thr Thr Gly Lys Val Leu Thr Tyr Arg Asn Ile Lys Gln Leu
465                 470                 475                 480

Leu Gly Asp Asn Tyr Lys Leu Leu Asn Arg Gln Arg Gln Gln Lys His
                485                 490                 495

Leu Leu Ser His Gln Arg His Ile Ala Gln Arg Ile Ala Ala Pro Asn
            500                 505                 510

Asn Phe Gly Asp Ser Glu Leu Gly Glu Tyr Ile Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Ile Ala Ile Ala Gln Thr Tyr Gln Ala Gly Ser Ile Val
    530                 535                 540

Leu Pro Asn Leu Gly Asp Met Arg Glu Gln Ile Gln Ser Glu Ile Lys
545                 550                 555                 560

Ala Lys Ala Glu Gln Lys Ser Asp Leu Val Glu Val Gln Lys Lys Tyr
                565                 570                 575
```

```
Ala Lys Gln Tyr Pro Asn Ser Val His Gln Trp Ser Tyr Gly Arg Leu
            580                 585                 590


Ile Thr Asn Ile Gln Ser Gln Ser Lys Lys Ala Gly Ile Val Ile Glu
        595                 600                 605


Glu Gly Lys Gln Gln Ile Arg Ala Ser Pro Leu Glu Lys Ala Lys Glu
    610                 615                 620


Leu Ala Ile Asn Ala Tyr Gln Ser Arg Lys Ala
625                 630                 635
```

<210> 459
<211> 642
<212> PRT
<213> Trichormus variabilis

<400> 459

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Pro Ser
1               5                   10                  15


Arg His Gln Leu Trp Lys Leu Met Val Asp Leu Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Val Gln Val Ala Gln His Pro Glu Phe Glu Thr Trp
        35                  40                  45


Arg Gln Lys Gly Lys His Pro Ala Lys Ile Val Lys Glu Leu Cys Glu
    50                  55                  60


Pro Leu Arg Thr Asp Pro Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Ala Thr Val Asn Tyr Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95


Leu Met Lys Arg Ser Gln Ser Gln Leu Glu Gly Lys Met Arg Trp Trp
            100                 105                 110
```

```
Glu Met Leu Lys Ser Asp Ala Glu Leu Val Glu Val Ser Gly Val Thr
        115                 120                 125

Leu Glu Ser Leu Arg Thr Lys Ala Ala Glu Ile Leu Ser Gln Phe Ala
    130                 135                 140

Pro Gln Pro Asp Thr Val Glu Ala Gln Pro Ala Lys Gly Lys Lys Arg
145                 150                 155                 160

Lys Lys Thr Lys Lys Ser Asp Gly Asp Cys Ala Glu Arg Thr Leu Arg
                165                 170                 175

Glu Arg Ser Ile Ser Asp Tyr Leu Phe Glu Ala Tyr Arg Asp Thr Glu
            180                 185                 190

Glu Ile Leu Thr Arg Cys Ala Ile Asn Tyr Leu Leu Lys Asn Gly Cys
        195                 200                 205

Lys Ile Ser Asn Lys Glu Glu Asn Ala Glu Lys Phe Ala Lys Arg Arg
    210                 215                 220

Arg Lys Leu Glu Ile Gln Ile Glu Arg Leu Arg Glu Lys Leu Glu Ala
225                 230                 235                 240

Arg Ile Pro Lys Gly Arg Asp Leu Thr Asp Ala Lys Trp Leu Glu Thr
                245                 250                 255

Leu Leu Leu Ala Thr Leu Asn Val Pro Glu Asn Glu Ala Glu Ala Lys
            260                 265                 270

Ser Trp Gln Asp Ser Leu Leu Lys Lys Ser Ile Thr Val Pro Phe Pro
        275                 280                 285

Val Ala Tyr Glu Thr Asn Glu Asp Met Thr Trp Phe Lys Asn Glu Arg
    290                 295                 300

Gly Arg Ile Cys Val Lys Phe Ser Gly Leu Ser Glu His Thr Phe Gln
```

```
305                 310                 315                 320

Val Tyr Cys Asp Ser Arg Gln Leu Gln Trp Phe Gln Arg Phe Leu Glu
                325                 330                 335

Asp Gln Gln Ile Lys Arg Asn Ser Lys Asn Gln His Ser Ser Ser Leu
            340                 345                 350

Phe Thr Leu Arg Ser Gly Arg Ile Ala Trp Gln Glu Gly Glu Gly Lys
        355                 360                 365

Ser Glu Pro Trp Lys Val Asn Arg Leu Ile Leu Tyr Cys Ser Val Asp
    370                 375                 380

Thr Arg Leu Trp Thr Ala Glu Gly Thr Asn Leu Val Arg Glu Glu Lys
385                 390                 395                 400

Ala Glu Glu Ile Ala Lys Ala Ile Ala Gln Thr Lys Ala Lys Gly Lys
                405                 410                 415

Leu Asn Asp Lys Gln Gln Ala His Ile Lys Arg Lys Asn Ser Ser Leu
            420                 425                 430

Ala Arg Ile Asn Asn Leu Phe Pro Arg Pro Ser Lys Pro Leu Tyr Lys
        435                 440                 445

Gly Gln Ser His Ile Leu Val Gly Val Ser Leu Gly Leu Glu Lys Pro
    450                 455                 460

Thr Thr Leu Ala Val Val Asp Gly Ser Ile Gly Lys Val Leu Thr Tyr
465                 470                 475                 480

Arg Asn Ile Lys Gln Leu Leu Gly Asp Asn Tyr Arg Leu Leu Asn Arg
                485                 490                 495

Gln Arg Gln Gln Lys His Thr Leu Ser His Gln Arg Gln Val Ala Gln
            500                 505                 510
```

```
Ile Leu Ala Ser Pro Asn Gln Leu Gly Glu Ser Glu Leu Gly Gln Tyr
        515                 520                 525

Val Asp Arg Leu Leu Ala Lys Glu Ile Val Ala Ile Thr Gln Thr Tyr
    530                 535                 540

Lys Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Met Arg Glu Gln
545                 550                 555                 560

Val Gln Ser Glu Ile Gln Ala Lys Ala Glu Gln Lys Ser Asp Leu Ile
                565                 570                 575

Glu Val Gln Gln Lys Tyr Ser Lys Gln Tyr Arg Val Ser Val His Gln
            580                 585                 590

Trp Ser Tyr Gly Arg Leu Ile Ala Ser Ile Arg Ser Ser Ala Ala Lys
        595                 600                 605

Val Gly Ile Val Ile Glu Glu Ser Lys Gln Pro Ile Arg Gly Ser Pro
    610                 615                 620

Gln Glu Lys Ala Arg Glu Leu Ala Ile Ala Ala Tyr Asn Ser Arg Arg
625                 630                 635                 640

Arg Thr
```

<210> 460
<211> 639
<212> PRT
<213> Nostoc punctiforme

<400> 460

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Ile Ala Ser Glu Ser Thr
1               5                   10                  15

Arg Gln Lys Leu Trp Lys Leu Met Ala Thr Leu Asn Thr Pro Leu Ile
            20                  25                  30
```

```
Asn Glu Leu Ile Glu Gln Leu Gly Lys His Pro Asp Phe Glu Asn Trp
        35                  40                  45

Arg Gln Gln Gly Lys Leu Pro Thr Thr Val Val Ser Gln Leu Cys Gln
    50                  55                  60

Pro Leu Lys Thr Asp Pro Arg Phe Val Gly Gln Pro Ser Arg Leu Tyr
65                  70                  75                  80

Met Ser Ala Ile His Ile Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Met Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Val Glu Leu Val Glu Thr Ser Gly Ser Ser
        115                 120                 125

Met Gly Ala Ile Arg Thr Lys Ala Ser Glu Ile Leu Ala Lys Ala Met
    130                 135                 140

Pro Thr Ser Asp Ser Asp Ser Ser Gln Pro Lys Thr Lys Lys Gly Lys
145                 150                 155                 160

Glu Ala Lys Lys Ser Ser Ser Ser Ser Ser Asp Arg Ser Leu Ser Asn
                165                 170                 175

Lys Leu Phe Glu Ala Tyr Gln Glu Thr Glu Asp Ile Leu Ser Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Ser Asp Lys Glu
        195                 200                 205

Glu Asp Ser Glu Lys Phe Ala Lys Arg Arg Arg Gln Val Glu Ile Gln
    210                 215                 220
```

```
Ile Gln Arg Leu Thr Glu Lys Leu Ile Ser Arg Met Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Asn Arg Lys Trp Leu Glu Thr Leu Phe Thr Ala Thr Thr
                245                 250                 255

Thr Phe Pro Glu Asp Asn Ala Glu Ala Lys Arg Trp Gln Asp Ile Leu
            260                 265                 270

Leu Thr Arg Pro Ser Ser Leu Pro Phe Pro Leu Val Phe Glu Thr Asn
        275                 280                 285

Glu Asp Met Val Trp Ser Lys Asn Gln Lys Gly Arg Leu Cys Val His
    290                 295                 300

Phe Asn Gly Leu Ser Asp Leu Ser Phe Glu Val Tyr Cys Asp Asn Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg
                325                 330                 335

Gln Ser Lys Ser Gln Tyr Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly
            340                 345                 350

His Leu Val Trp Gln Glu Gly Glu Gly Lys Ser Glu Pro Trp Asn Leu
        355                 360                 365

Asn Arg Leu Asn Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp Thr Ala
    370                 375                 380

Asp Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Glu Glu Ile Ser Lys
385                 390                 395                 400

Leu Ile Thr Lys Met Lys Glu Lys Ser Asp Leu Lys Asp Thr Gln Lys
                405                 410                 415

Ala Phe Ile Gln Arg Lys Glu Ser Thr Leu Asn Arg Met Asn Asn Ser
            420                 425                 430
```

```
Phe Glu Arg Pro Ser Gln Pro Leu Tyr Gln Gly Gln Ser His Ile Leu
        435                 440                 445

Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val
    450                 455                 460

Asp Ala Ile Ala Gly Lys Val Leu Ala Tyr Arg Ser Ile Arg Gln Leu
465                 470                 475                 480

Leu Gly Asp Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Arg
                485                 490                 495

Ser Ser Ser His Glu Arg His Lys Ala Gln Lys Ser Phe Ser Pro Asn
            500                 505                 510

Gln Phe Gly Thr Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala
        515                 520                 525

Lys Glu Ile Ile Ala Ile Ala Gln Thr Tyr Lys Ala Gly Asn Ile Val
    530                 535                 540

Leu Pro Lys Leu Gly Asp Met Arg Glu Ile Val Gln Ser Glu Ile Gln
545                 550                 555                 560

Ala Ile Ala Glu Ala Lys Cys Pro Gly Ser Val Glu Val Gln Gln Lys
                565                 570                 575

Tyr Ala Lys Gln Tyr Arg Val Asn Val His Lys Trp Ser Tyr Gly Arg
            580                 585                 590

Leu Ile Gln Ser Ile Gln Ser Lys Gly Ser Gln Ala Gly Ile Val Ile
        595                 600                 605

Glu Glu Gly Lys Gln Pro Val Arg Gly Ser Pro His Glu Gln Ala Lys
    610                 615                 620
```

```
Glu Leu Ala Leu Ser Ala Tyr His Asp Arg Leu Ala Arg Arg Ser
625                 630                 635


<210>  461
<211>  645
<212>  PRT
<213>  Nostoc linckia

<400>  461

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Gly Ser Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Lys Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Leu Lys Val Ala Gln Gln Pro Glu Phe Glu Ser Trp
        35                  40                  45


Arg Gln Lys Gly Lys His Pro Ala Lys Ile Val Lys Glu Leu Cys Glu
    50                  55                  60


Pro Leu Lys Thr Asp Pro Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Ala Leu Val Asn Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95


Leu Met Lys Arg Ser Gln Ser Gln Leu Glu Gly Lys Met Arg Trp Leu
            100                 105                 110


Glu Met Leu Lys Ser Asp Ala Glu Leu Val Glu Ala Ser Gly Val Thr
        115                 120                 125


Leu Glu Asn Leu Arg Thr Lys Ala Ala Glu Ile Leu Ala Gln Leu Ala
    130                 135                 140


Pro Gln Ser Asp Thr Val Glu Ala Lys Ser Pro Lys Gly Asn Lys Arg
145                 150                 155                 160
```

```
Lys Lys Thr Lys Lys Ser Lys Lys Ser Asp Gly Asp Cys Ala Glu Arg
                165                 170                 175

Thr Leu Arg Glu Arg Ser Ile Ser Gln Ile Leu Phe Glu Ala Tyr Arg
            180                 185                 190

Asn Thr Glu Glu Thr Leu Thr Arg Cys Ala Ile Gly Tyr Leu Leu Lys
        195                 200                 205

Asn Gly Cys Lys Ile Ser Asn Gln Asp Glu Asp Ala Asp Lys Phe Ala
    210                 215                 220

Lys Arg Arg Arg Lys Leu Glu Ile Gln Ile Glu Arg Leu Lys Gln Gln
225                 230                 235                 240

Leu Glu Ala Arg Ile Pro Lys Gly Arg Asp Leu Thr Asp Ala Lys Trp
                245                 250                 255

Leu Glu Thr Leu Leu Leu Val Thr Asn Asn Ala Pro Glu Asn Glu Ala
            260                 265                 270

Glu Ala Lys Phe Trp Gln Asp Ser Leu Leu Lys Gln Ser Ser Lys Leu
        275                 280                 285

Pro Phe Pro Val Ala Tyr Glu Thr Asn Glu Asp Met Thr Trp Phe Lys
    290                 295                 300

Asn Glu Arg Gly Arg Ile Cys Val Lys Phe Asn Gly Leu Ser Glu His
305                 310                 315                 320

Ser Phe Gln Val Tyr Cys Asp Ser Arg His Leu His Trp Phe Gln Arg
                325                 330                 335

Phe Leu Glu Asp Gln Gln Ile Lys His Asn Ser Lys Asn Gln His Ser
            340                 345                 350

Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Ile Ala Trp Gln Glu Gly
```

```
        355                 360                 365

Glu Gly Lys Gly Asp His Trp Lys Val Asn Arg Leu Ile Leu Tyr Cys
    370                 375                 380

Ser Val Asp Thr Arg Leu Trp Thr Ala Glu Gly Thr Asn Leu Ile Arg
385                 390                 395                 400

Glu Glu Lys Ala Glu Glu Ile Ala Lys Thr Ile Thr Gln Thr Lys Ala
                405                 410                 415

Lys Gly Glu Leu Asn Asp Gln Gln Leu Ala His Ile Lys Arg Lys Asn
            420                 425                 430

Ser Ser Leu Ala Arg Ile Asn Asn Pro Phe Pro Arg Pro Ser Lys Pro
        435                 440                 445

Leu Tyr Lys Gly Gln Ser His Ile Leu Val Ala Val Ser Leu Gly Leu
    450                 455                 460

Glu Asn Pro Thr Thr Val Ala Val Val Asp Ser Ser Ile Gly Lys Val
465                 470                 475                 480

Leu Thr Tyr Arg Ser Ile Lys Gln Leu Leu Gly Asp Asn Tyr Arg Leu
                485                 490                 495

Leu Asn Arg Gln Arg Gln Gln Lys His Thr Leu Ser His Gln Arg Gln
            500                 505                 510

Val Ala Gln Ile Leu Ala Ser Pro Asn Gln Ile Gly Glu Ser Glu Leu
        515                 520                 525

Gly Gln Tyr Val Asp Arg Leu Leu Ala Gln Glu Ile Val Ala Ile Ala
    530                 535                 540

Ile Thr Tyr Lys Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Met
545                 550                 555                 560
```

```
Arg Glu Gln Val Gln Ser Glu Val Gln Ala Lys Ala Glu Gln Lys Ser
                565                 570                 575


Asp Leu Ile Glu Val Gln Gln Lys Tyr Ala Lys Gln Tyr Arg Val Ser
            580                 585                 590


Val His Gln Trp Ser Tyr Gly Arg Leu Ile Ala Asn Ile Glu Ser Gln
        595                 600                 605


Ser Ala Lys Ala Gly Ile Phe Ile Glu Glu Ala Lys Gln Pro Ile Arg
    610                 615                 620


Gly Ser Pro Gln Glu Lys Ala Lys Glu Leu Ala Ile Ala Ala Tyr Asp
625                 630                 635                 640


Ser Arg Lys Ile Asn
                645
```

<210> 462
<211> 614
<212> PRT
<213> Crinalium epipsammum

<400> 462

```
Met Ser Gln Ile Thr Val Gln Cys Arg Leu Val Ala Ser Glu Ser Thr
1               5                   10                  15


Arg His His Leu Trp Lys Leu Met Ala Asp Leu Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Ala Arg Met Ala Gln His Gln Asp Phe Glu Thr Trp
        35                  40                  45


Arg Lys Lys Gly Lys Leu Pro Asp Gly Ile Val Lys Gln Leu Tyr Gln
    50                  55                  60


Pro Leu Lys Thr Asp Pro Arg Phe Thr Asn Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80
```

```
Thr Ser Ala Ile Thr Val Val Asp Tyr Ile Tyr Lys Ser Trp Phe Lys
                85                  90                  95

Ile Gln Gln Arg Leu Glu Gln Lys Leu Lys Gly Gln Ile Arg Trp Leu
            100                 105                 110

Gly Met Leu Lys Ser Asp Glu Glu Leu Ala Ala Glu Ser Asn Thr Ser
        115                 120                 125

Ile Glu Val Ile Arg Thr Asn Ala Ala Glu Leu Ile Thr Ser Leu Ser
    130                 135                 140

Ser Glu Asp Gly Ser Val Ser Thr Arg Leu Trp Lys Thr Tyr Asp Glu
145                 150                 155                 160

Thr Asp Asp Ile Leu Thr His Cys Val Ile Cys Tyr Leu Leu Lys Asn
                165                 170                 175

Gly Ser Lys Val Pro Lys Lys Pro Glu Glu Asn Leu Glu Lys Phe Ala
            180                 185                 190

Lys Arg Arg Arg Lys Val Glu Ile Lys Ile Glu Arg Leu Arg Arg Gln
        195                 200                 205

Leu Glu Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly Lys Asn Trp
    210                 215                 220

Leu Glu Thr Leu Ala Ile Ala Ser Thr Thr Ala Pro Ala Asp Glu Pro
225                 230                 235                 240

Glu Ala Gln Ser Trp Gln Asp Thr Leu Leu Thr Glu Ser Lys Leu Val
                245                 250                 255

Pro Phe Pro Val Ala Tyr Glu Thr Asn Glu Asn Leu Thr Trp Ser Lys
            260                 265                 270
```

```
Asn Glu Lys Gly Arg Leu Cys Val Gln Ile Ser Gly Leu Ser Lys His
        275                 280                 285

Ile Phe Gln Ile Tyr Cys Asp Gln Arg Gln Leu Lys Trp Phe Gln Arg
    290                 295                 300

Phe Tyr Glu Asp Gln Glu Ile Lys Lys Ala Asn Lys Asp Gln Tyr Ser
305                 310                 315                 320

Ser Gly Leu Phe Thr Leu Arg Ser Gly Arg Ile Ala Trp Gln Glu Gly
                325                 330                 335

Thr Asp Lys Gly Glu Pro Trp Asn Ile His His Leu Ile Leu Tyr Cys
            340                 345                 350

Thr Val Asp Thr Arg Leu Trp Thr Ala Glu Gly Thr Glu Gln Val Cys
        355                 360                 365

Gln Glu Lys Ala Glu Asp Ile Ala Lys Thr Leu Thr Arg Met Lys Lys
    370                 375                 380

Lys Gly Asp Leu Asn Asp Arg Gln Gln Ala Phe Ile Arg Arg Gln Gln
385                 390                 395                 400

Ser Thr Leu Ala Arg Leu Asn Asn Pro Tyr Pro Arg Pro Ser Gln Pro
                405                 410                 415

Leu Tyr Gln Gly Gln Pro His Ile Leu Val Gly Leu Ala Phe Gly Leu
            420                 425                 430

Asp Lys Pro Ala Thr Ala Ala Val Val Asp Gly Thr Thr Gly Lys Ala
        435                 440                 445

Ile Thr Tyr Arg Ser Leu Lys Gln Leu Leu Gly Asp Asn Tyr Glu Leu
    450                 455                 460

Leu Asn Lys Gln Arg Lys Arg Lys Gln Gln Gln Ser His Gln Arg His
465                 470                 475                 480
```

```
Lys Ala Gln Ser Asn Gly Arg Ser Asn Gln Phe Gly Asp Ser Asp Leu
                485                 490                 495


Gly Glu Tyr Val Asp Arg Leu Leu Ala Lys Ala Leu Val Thr Leu Ala
            500                 505                 510


Gln Ser Tyr Gln Ala Gly Ser Ile Val Leu Pro Lys Leu Gly Asp Ile
        515                 520                 525


Arg Glu Leu Ile Gln Ser Glu Ile Gln Ala Lys Ala Glu Gln Lys Ile
    530                 535                 540


Pro Gly Tyr Ile Ala Gly Gln Glu Lys Tyr Ala Lys Gln Tyr Lys Ile
545                 550                 555                 560


Ser Val His Gln Trp Ser Tyr Gly Arg Leu Ile Asp Asn Ile Lys Ala
                565                 570                 575


Gln Ala Ala Lys Ile Ser Ile Val Ile Glu Glu Gly Gln Gln Pro Ile
            580                 585                 590


Arg Gly Ser Pro Gln Glu Lys Ala Lys Glu Met Ala Ile Ser Ala Tyr
        595                 600                 605


Asp Asp Arg Thr Lys Ser
    610
```

<210> 463
<211> 632
<212> PRT
<213> Cuspidothrix issatschenkoi

<400> 463

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Leu Ala Ser Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Gln Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
```

```
            20                  25                  30

Asn Glu Leu Leu Met Gln Met Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Arg Gln Lys Gly Lys His Pro Thr Gly Val Val Lys Glu Leu Cys Glu
    50                  55                  60

Pro Leu Lys Thr Asp Pro Arg Phe Met Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Thr Ala Ser Val Asn Tyr Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Met Lys Arg Phe Gln Ser Gln Leu Asp Gly Lys Leu Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Thr Glu Leu Glu Ala Ala Ser Gly Val Ser
        115                 120                 125

Leu Asp Val Leu Gln Thr Lys Ser Ala Glu Ile Leu Ala Gln Phe Ala
    130                 135                 140

Ala Gln Asn Pro Ala Glu Thr Gln Pro Ala Lys Gly Lys Lys Gly Lys
145                 150                 155                 160

Lys Ser Pro Thr Ser Asp Ser Glu Arg Asn Leu Ser Lys Asn Leu Phe
                165                 170                 175

Asp Ala Tyr Ser Asn Thr Glu Asp Asn Leu Thr Arg Cys Ala Ile Ser
            180                 185                 190

Tyr Leu Leu Lys Asn Gly Cys Lys Ile Ser Asn Lys Ala Glu Asn Thr
        195                 200                 205

Asp Lys Phe Ala Gln Arg Arg Arg Lys Val Glu Ile Gln Ile Gln Arg
    210                 215                 220
```

```
Leu Thr Glu Lys Leu Ala Ala Arg Ile Pro Lys Gly Arg Asp Leu Thr
225                 230                 235                 240

Asp Thr Leu Arg Leu Glu Thr Leu Phe Asn Ala Thr Gln Thr Val Pro
                245                 250                 255

Glu Asn Glu Thr Glu Ala Lys Leu Trp Gln Asn Ile Leu Leu Arg Lys
            260                 265                 270

Ser Ser Gln Val Pro Phe Pro Val Ala Tyr Glu Thr Asn Glu Asp Leu
        275                 280                 285

Val Trp Phe Lys Asn Gln Phe Gly Arg Ile Cys Val Lys Phe Ser Gly
    290                 295                 300

Leu Ser Glu His Thr Phe Gln Ile Tyr Cys Asp Ser Arg Gln Leu His
305                 310                 315                 320

Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Ile Lys Lys Asp Ser Lys
                325                 330                 335

Asn Gln His Ser Ser Ala Leu Phe Thr Leu Arg Ser Gly Arg Ile Ser
            340                 345                 350

Trp Gln Glu Gly Gln Gly Lys Gly Glu Pro Trp Asn Ile His His Leu
        355                 360                 365

Thr Leu Tyr Cys Ser Val Asp Thr Arg Leu Trp Thr Glu Glu Gly Thr
    370                 375                 380

Asn Leu Val Lys Glu Glu Lys Ala Glu Glu Ile Ala Lys Thr Ile Thr
385                 390                 395                 400

Gln Thr Lys Thr Lys Gly Asp Leu Asn Asp Lys Gln Gln Ala His Leu
                405                 410                 415

Lys Arg Lys Ser Ser Ser Leu Ala Arg Ile Asn Asn His Phe Pro Arg
```

```
            420                 425                 430

Pro Ser Gln Pro Leu Tyr Lys Gly Leu Ser His Ile Leu Val Gly Val
        435                 440                 445

Ser Leu Gly Leu Glu Asn Pro Ala Thr Ile Ala Val Val Asp Gly Thr
    450                 455                 460

Thr Gly Lys Val Leu Thr Tyr Arg Asn Ile Lys Gln Leu Leu Gly Glu
465                 470                 475                 480

Ser Tyr Lys Leu Leu Asn Arg Gln Arg Gln Gln Lys His Leu Leu Ser
                485                 490                 495

His Glu Arg His Val Ala Gln Arg Met Ser Ala Pro Asn Gln Phe Gly
            500                 505                 510

Asp Ser Glu Leu Gly Glu Tyr Ile Asp Arg Leu Leu Ala Lys Glu Ile
        515                 520                 525

Ile Ala Val Ala Gln Thr Tyr Lys Ala Gly Ser Ile Val Ile Pro Lys
    530                 535                 540

Leu Gly Asp Met Arg Glu Gln Ile Gln Ser Glu Ile Gln Ser Lys Ala
545                 550                 555                 560

Glu Gln Lys Ser Asp Ile Ile Glu Val Gln Gln Lys Tyr Ala Lys Gln
                565                 570                 575

Tyr Arg Thr Thr Val His Gln Trp Ser Tyr Gly Arg Leu Ile Ser Asn
            580                 585                 590

Ile Gln Ser Gln Ala Ser Lys Ala Gly Ile Ala Ile Glu Glu Gly Lys
        595                 600                 605

Gln Pro Ile Arg Ala Ser Pro Leu Glu Lys Ala Lys Glu Leu Ala Ile
    610                 615                 620
```

```
Ser Ala Tyr Gln Ser Arg Lys Ala
625                 630


<210>  464
<211>  632
<212>  PRT
<213>  Anabaena sp. WA102

<400>  464

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Gln Leu Thr Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Ser Gln Ile Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45


Arg Gln Gln Gly Lys His Pro Thr Gly Ile Val Lys Glu Leu Cys Glu
    50                  55                  60


Pro Leu Lys Thr Asp Pro Arg Phe Ile Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Thr Ala Ser Val Asn Tyr Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95


Leu Met Lys Arg Phe Gln Ser Gln Leu Asp Gly Lys Leu Arg Trp Leu
            100                 105                 110


Glu Met Leu Asn Ser Asp Thr Glu Leu Val Glu Ala Ser Gly Val Ser
        115                 120                 125


Leu Asp Ile Leu Gln Thr Lys Ser Ala Glu Ile Leu Ala Gln Phe Ala
    130                 135                 140


Pro Gln Asn Pro Ala Glu Thr Gln Pro Ala Lys Gly Lys Lys Gly Lys
145                 150                 155                 160
```

```
Lys Ser Pro Asn Ser Asp Ser Asp Arg Asn Leu Ser Lys Asn Leu Phe
                165                 170                 175

Asp Gly Tyr Ser Asn Thr Glu Asp Asn Leu Thr Arg Cys Ala Ile Ser
            180                 185                 190

Tyr Leu Leu Lys Asn Gly Cys Lys Ile Ser Asn Lys Ala Glu Asn Thr
        195                 200                 205

Asp Lys Phe Ala Gln Arg Arg His Lys Val Glu Ile Gln Ile Gln Arg
    210                 215                 220

Leu Thr Glu Lys Leu Ala Ala Arg Ile Pro Lys Gly Arg Asp Leu Thr
225                 230                 235                 240

Asp Thr Ile Arg Leu Glu Thr Leu Phe Asn Ala Thr Gln Thr Val Pro
                245                 250                 255

Glu Asn Glu Thr Glu Ala Lys Phe Trp Gln Asn Ile Leu Leu Arg Lys
            260                 265                 270

Ser Ser Gln Val Pro Phe Pro Val Ala Tyr Glu Thr Asn Glu Asp Met
        275                 280                 285

Thr Trp Leu Lys Asn Gln Phe Gly Arg Ile Cys Val Lys Phe Asn Gly
    290                 295                 300

Leu Ser Glu His Thr Phe Gln Ile Tyr Cys Asp Ser Arg Gln Leu His
305                 310                 315                 320

Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Ile Lys Lys Asp Ser Lys
                325                 330                 335

Asn Gln His Ser Ser Ala Leu Phe Thr Leu Arg Ser Gly Arg Ile Ser
            340                 345                 350
```

```
Trp Gln Glu Glu Glu Asp Lys Gly Glu Pro Trp Asp Val Asn His Leu
        355                 360                 365

Thr Leu Tyr Cys Ser Val Tyr Thr Arg Leu Trp Thr Glu Glu Gly Thr
    370                 375                 380

Asn Leu Val Lys Glu Glu Lys Ala Glu Glu Ile Ala Lys Thr Ile Thr
385                 390                 395                 400

Gln Thr Lys Ala Lys Gly Asp Leu Asn Asp Lys Gln Gln Ala His Leu
                405                 410                 415

Lys Arg Lys Asn Ser Ser Leu Ala Arg Ile Asn Asn Pro Phe Pro Arg
            420                 425                 430

Pro Ser Gln Pro Leu Tyr Lys Gly Gln Ser His Ile Leu Val Gly Val
        435                 440                 445

Ser Leu Gly Leu Glu Asn Pro Ala Thr Ile Ala Val Val Asp Gly Thr
    450                 455                 460

Thr Gly Lys Val Leu Thr Tyr Arg Asn Ile Lys Gln Leu Leu Gly Glu
465                 470                 475                 480

Asn Tyr Lys Leu Leu Asn Arg Gln Gln Gln Gln Lys His Leu Leu Cys
                485                 490                 495

His Gln Arg His Ile Ala Gln Arg Met Ser Ala Pro Asn Gln Phe Gly
            500                 505                 510

Asp Ser Glu Leu Gly Glu Tyr Ile Asp Arg Leu Leu Ala Lys Glu Ile
        515                 520                 525

Ile Ala Leu Ala Gln Thr Tyr Lys Ala Gly Ser Ile Val Ile Pro Lys
    530                 535                 540

Leu Gly Asp Met Arg Glu Gln Ile Gln Ser Glu Ile Gln Ser Lys Ala
545                 550                 555                 560
```

```
Glu Gln Lys Ser Asp Ile Ile Glu Val Gln Lys Lys Tyr Ala Lys Gln
                565                 570                 575


Tyr Arg Val Ser Val His Gln Trp Ser Tyr Gly Arg Leu Ile Ala Asn
            580                 585                 590


Ile Gln Ser Gln Ala Asn Lys Ala Gly Ile Ala Ile Glu Glu Gly Lys
        595                 600                 605


Gln Pro Ile Arg Ala Ser Pro Gln Glu Lys Ala Lys Glu Leu Ala Ile
    610                 615                 620


Ser Ala Tyr Gln Ser Arg Lys Ala
625                 630


<210>  465
<211>  635
<212>  PRT
<213>  Nostoc sp. MBR 210

<400>  465

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Thr
1               5                   10                  15


Leu Arg Lys Leu Trp Glu Leu Met Ala Gly Lys Asn Thr Pro Leu Val
            20                  25                  30


Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45


Leu Glu Lys Gly Lys Ile Pro Thr Glu Phe Leu Arg Thr Leu Val Asn
    50                  55                  60


Ser Leu Lys Thr Gln Glu Arg Phe Ala Asp Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
```

```
                85                  90                  95

Leu Gln Lys Arg Arg Lys Tyr Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Lys Ile Leu Lys Thr Asp Leu Glu Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125

Leu Asn Leu Ile Arg Thr Thr Ala Asn Glu Ile Leu Thr Lys Leu Thr
    130                 135                 140

Pro Gln Ser Glu Gln Asn Lys Asn Gln Arg Lys Gly Lys Lys Thr Lys
145                 150                 155                 160

Lys Ser Thr Lys Pro Lys Lys Pro Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175

Thr Tyr Lys Glu Thr Glu Asp Pro Leu Thr Arg Cys Ala Ile Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu Asp Glu Asp Ser Glu
        195                 200                 205

Glu Phe Thr Lys Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220

Lys Asn Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Leu Lys Thr Leu Glu Ile Ser Thr Ala Asn Val Pro Gln
                245                 250                 255

Asn Glu Asn Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Ser
            260                 265                 270

Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285
```

```
Trp Leu Gln Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320

Phe Lys Arg Phe Leu Glu Asp Gln Glu Leu Lys Ser Asn Ser Lys Asn
                325                 330                 335

Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ala Trp
            340                 345                 350

Ser Pro Gly Glu Glu Lys Gly Glu Pro Trp Lys Val Asn Gln Leu His
        355                 360                 365

Leu Tyr Cys Ala Leu Asp Thr Arg Met Trp Thr Ile Glu Gly Thr Gln
    370                 375                 380

Gln Val Val Asp Glu Lys Ser Thr Lys Ile Thr Glu Thr Leu Thr Lys
385                 390                 395                 400

Ala Thr Gln Lys Asp Glu Leu Asn Asp Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg Pro
            420                 425                 430

Ser Lys Pro Asn Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Glu Lys Pro Val Thr Ile Ala Val Val Asp Val Val Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
```

```
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Lys Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Gly Ile Val
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Ala Ser Ser Ile Val Ile Pro Lys Leu
    530                 535                 540

Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560

Lys Lys Cys Pro Gly Tyr Lys Glu Ala Gln Gln Lys Tyr Ala Lys Glu
                565                 570                 575

Tyr Arg Met Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Ser
            580                 585                 590

Ile Lys Ser Gln Ala Ala Lys Asp Gly Ile Ser Thr Glu Ile Gly Thr
        595                 600                 605

Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala Val
    610                 615                 620

Phe Ala Tyr Gln Gln Arg Gln Val Ala Val Ile
625                 630                 635


<210>  466
<211>  632
<212>  PRT
<213>  Anabaena sp. 4-3

<400>  466

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Thr
1               5                   10                  15
```

```
Leu Arg Thr Leu Trp Glu Leu Met Ala Asp Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Ile Leu Ala Gln Val Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Leu Glu Lys Gly Lys Ile Pro Thr Glu Leu Leu Lys Thr Leu Val Asn
    50                  55                  60

Ser Leu Lys Thr Gln Glu Arg Phe Ala Ser Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Leu Glu Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125

Leu Asn Ile Ile Arg Thr Lys Ala Thr Glu Ile Ile Thr Glu Phe Thr
    130                 135                 140

Pro Gln Ser Asp Gln Asn Asn Ser Gln Lys Lys Arg Lys Lys Thr Thr
145                 150                 155                 160

Lys Ser Thr Lys Pro Ser Leu Phe Gln Ile Leu Leu Asn Asn Tyr Glu
                165                 170                 175

Glu Thr Gln Asp Ile Leu Thr Arg Cys Ala Leu Ala Tyr Leu Leu Lys
            180                 185                 190

Asn Asn Cys Gln Ile Ser Glu Arg Asp Glu Asn Pro Glu Glu Phe Thr
        195                 200                 205

Arg Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu Lys Asp Gln
    210                 215                 220
```

```
Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly Glu Glu Trp
225                 230                 235                 240

Leu Lys Thr Leu Glu Val Val Arg Ala Asn Val Thr Gln Asn Glu Asn
                245                 250                 255

Glu Ala Lys Ala Trp Gln Ala Ala Ile Leu Arg Lys Ser Ala Asp Val
            260                 265                 270

Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr Trp Leu Gln
        275                 280                 285

Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu Gly Lys Leu
    290                 295                 300

Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr Phe Lys Arg
305                 310                 315                 320

Phe Leu Glu Asp Gln Glu Leu Lys Arg Asn Ser Lys Asn Gln Tyr Ser
                325                 330                 335

Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ala Trp Ser Pro Gly
            340                 345                 350

Glu Glu Lys Gly Glu Pro Trp Lys Val Asn Gln Leu His Leu Tyr Cys
        355                 360                 365

Thr Leu Asp Thr Arg Met Trp Thr Ile Glu Gly Thr Gln Gln Val Val
    370                 375                 380

Asp Glu Lys Ser Thr Lys Ile Thr Glu Thr Leu Thr Lys Ala Lys Gln
385                 390                 395                 400

Lys Asp Asp Leu Asn Asp Lys Gln Gln Ala Phe Val Thr Arg Gln Gln
                405                 410                 415
```

```
Ser Thr Leu Asn Arg Ile Asn Asn Leu Phe Pro Arg Pro Ser Lys Ser
            420                 425                 430

Arg Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser Phe Gly Leu
        435                 440                 445

Glu Asn Pro Val Thr Leu Ala Val Val Asp Val Val Lys Asn Glu Val
    450                 455                 460

Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys Asn Tyr Asn Leu
465                 470                 475                 480

Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His Lys Arg His
                485                 490                 495

Lys Ala Gln Lys Arg Asn Ala Pro Asn Ser Phe Gly Glu Ser Glu Leu
            500                 505                 510

Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile Ile Ala Ile Ala
        515                 520                 525

Lys Thr Tyr Gln Ala Gly Ser Ile Val Ile Pro Lys Leu Arg Asp Met
    530                 535                 540

Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu Lys Lys Phe
545                 550                 555                 560

Pro Gly Tyr Lys Glu Ala Gln Gln Lys Tyr Ala Lys Glu Tyr Arg Met
                565                 570                 575

Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Ser Ile Lys Ser
            580                 585                 590

Gln Ala Ala Lys Ala Gly Ile Ser Thr Glu Ile Gly Thr Gln Pro Ile
        595                 600                 605

Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala Val Phe Ala Tyr
    610                 615                 620
```

```
Gln Glu Arg Gln Ala Ala Leu Ile
625                 630
```

<210> 467
<211> 635
<212> PRT
<213> Trichormus variabilis

<400> 467

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Ile
1               5                   10                  15

Leu Arg Gln Leu Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Leu Asp Lys Gly Arg Ile Pro Thr Glu Leu Leu Lys Thr Leu Val Asn
    50                  55                  60

Ser Phe Lys Thr Gln Glu Arg Phe Ala Asp Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Leu Gln Leu Glu Gln Glu Ser Gln Cys Asn
        115                 120                 125

Leu Asn Val Ile Arg Thr Lys Ala Asn Glu Ile Leu Thr Gln Phe Thr
    130                 135                 140

Pro Gln Ser Asp Gln Asn Lys Asn Pro Arg Lys Ser Lys Lys Ala Lys
```

```
145                 150                 155                 160

Lys Ser Ala Lys Leu Gln Lys Ser Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175

Thr His Glu Gln Thr Gln Glu Thr Leu Thr Arg Cys Ala Ile Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Arg Asp Glu Asp Pro Glu
        195                 200                 205

Glu Phe Asn Arg Asn Arg Arg Thr Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220

Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Leu Glu Thr Leu Glu Ile Ala Thr Val Asn Val Pro Gln
                245                 250                 255

Asn Glu Lys Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Thr
            260                 265                 270

Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285

Trp Leu Gln Asn Asp Lys Asp Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Met Thr Phe Glu Val Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320

Phe Lys Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys Asn
                325                 330                 335

Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ala Trp
            340                 345                 350
```

```
Leu Pro Gly Lys Gln Lys Gly Glu Pro Trp Lys Ile Asn Gln Leu His
        355                 360                 365

Leu Tyr Cys Thr Leu Asp Thr Arg Met Trp Thr Ala Glu Gly Thr Gln
    370                 375                 380

Gln Val Val Asn Glu Lys Ile Thr Lys Ile Thr Glu Thr Leu Thr Lys
385                 390                 395                 400

Ala Lys Gln Lys Asp Glu Leu Asn Asp Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg Pro
            420                 425                 430

Ser Gln Pro Asn Tyr Gln Gly Arg Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Glu Lys Pro Val Thr Leu Ala Val Val Asp Val Val Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Gln Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Glu Ile Val
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Ala Gly Ser Ile Val Ile Pro Lys Leu
    530                 535                 540

Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
```

545 550 555 560

Lys Lys Cys Pro Gly Tyr Lys Glu Val Gln Gln Lys Tyr Ala Lys Glu
565 570 575

Tyr Arg Met Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Ser
580 585 590

Ile Lys Ser Gln Ala Ala Lys Ala Gly Ile Phe Thr Glu Ile Gly Thr
595 600 605

Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala Val
610 615 620

Phe Ala Tyr Gln Glu Arg Gln Ala Ala Leu Ile
625 630 635

<210> 468
<211> 638
<212> PRT
<213> Chlorogloea sp. CCALA 695

<400> 468

Met Ser Gln Ser Thr Val Gln Cys Arg Leu Ile Ala Ser Thr Ser Thr
1 5 10 15

Arg Gln Gln Leu Trp Lys Leu Met Ala Gln Leu Asn Thr Pro Leu Ile
20 25 30

Asn Glu Ile Leu Gln Gln Leu Asn Lys His Pro Asp Phe Glu Lys Trp
35 40 45

Arg Lys Asn Gly Lys Leu Pro Ser Thr Val Val Ser Gln Leu Cys His
50 55 60

Pro Leu Lys Thr Asp Leu Arg Phe Val Gly Gln Pro Ser Arg Leu Tyr
65 70 75 80

```
Thr Ser Ala Ile His Val Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Ile His Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Ile Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Ala Glu Leu Val Glu Thr Ser Phe Cys Ser
        115                 120                 125

Leu Glu Glu Ile Arg Thr Lys Ala Ala Asp Ile Leu Ala Met Thr Thr
    130                 135                 140

Pro Glu Ser Asp Ala Asn Ala Pro Leu Ile Glu Arg Arg Lys Thr Lys
145                 150                 155                 160

Lys Ser Lys Lys Ser Ser Thr Ser Asn Ser Asp Arg Gly Leu Ser His
                165                 170                 175

Lys Leu Phe Asp Ala Tyr Gln Asn Thr Glu Asp Arg Leu Arg Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Lys Asp Lys Glu
        195                 200                 205

Asp Pro Glu Gln Phe Ala Lys Arg Arg Arg Lys Leu Glu Ile Gln Ile
    210                 215                 220

Gln Arg Leu Thr Glu Lys Leu Thr Ser Arg Ile Pro Lys Gly Arg Asp
225                 230                 235                 240

Leu Ala Asn Ala Lys Trp Leu Glu Thr Leu Phe Thr Ala Thr Thr Thr
                245                 250                 255

Val Pro Glu Asp Asn Ala Glu Ala Lys Arg Trp Gln Asp Ile Leu Leu
            260                 265                 270

Thr Arg Ser Ser Leu Leu Pro Phe Pro Leu Val Phe Glu Thr Asn Glu
        275                 280                 285
```

```
Asp Leu Val Trp Ser Thr Asn Glu Lys Gly Arg Leu Cys Val His Phe
    290                 295                 300

Asn Gly Leu Ser Asp Leu Thr Phe Glu Val Tyr Cys Asp Ser Arg Gln
305                 310                 315                 320

Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg Lys
                325                 330                 335

Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly Arg
            340                 345                 350

Leu Ala Trp Leu Glu Gly Lys Gly Lys Gly Glu Pro Trp Glu Leu His
        355                 360                 365

His Leu Thr Leu Tyr Cys Cys Val Asp Thr Arg Leu Trp Thr Thr Glu
    370                 375                 380

Gly Thr Glu Gln Val Arg Gln Glu Lys Thr Asn Glu Ile Thr Lys Phe
385                 390                 395                 400

Ile Thr Lys Met Lys Glu Lys Thr Asp Leu Ser Val Thr Gln Gln Ala
                405                 410                 415

Phe Val Gln Arg Lys Gln Ser Thr Leu Thr Arg Ile Asn Asn Ser Phe
            420                 425                 430

Glu Arg Pro Asn Lys Pro Val Tyr Gln Gly Gln Ser Asn Ile Leu Val
        435                 440                 445

Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val Asp
    450                 455                 460

Ala Leu Thr Asn Lys Val Leu Ala Cys Arg Ser Thr Arg Gln Leu Leu
465                 470                 475                 480
```

```
Asn Glu Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Gln Ser
                485                 490                 495

Leu Ser His Glu Arg His Lys Ala Gln Lys Ser Phe Ser Pro Asn Gln
            500                 505                 510

Leu Gly Ala Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Lys
        515                 520                 525

Glu Ile Val Ala Ile Ala Gln Ser Tyr Phe Ala Gly Ser Ile Val Leu
    530                 535                 540

Pro Lys Leu Gly Asp Met Arg Glu Ile Ile Gln Cys Glu Ile Gln Ala
545                 550                 555                 560

Ile Ala Glu Ala Lys Cys Pro Gly Ser Lys Glu Ile Gln Lys Asn Tyr
                565                 570                 575

Ala Lys Gln Tyr Arg Val Asn Val His Gln Trp Ser Tyr Gly Arg Leu
            580                 585                 590

Leu Gln Asn Ile Gln Ser Lys Ala Thr Gln Met Gly Ile Val Ile Glu
        595                 600                 605

Glu Gly Lys Gln Pro Val Arg Gly Ser Pro Gln Asp Lys Ala Gln Glu
    610                 615                 620

Leu Ala Leu Ser Ala Tyr Lys Leu Arg Leu Ala Arg Gln Ser
625                 630                 635
```

<210> 469
<211> 635
<212> PRT
<213> Nostoc sp. NIES-3756

<400> 469

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Thr
1               5                   10                  15
```

```
Leu Arg Gln Val Trp Glu Leu Met Thr Asp Lys Asn Thr Pro Leu Val
            20                  25                  30

Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Leu Glu Lys Gly Lys Ile Pro Thr Glu Phe Leu Lys Thr Leu Val Asn
    50                  55                  60

Ser Leu Lys Asn Gln Glu Arg Phe Ser Asp Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Ile Ile Leu Lys Ser Asp Leu Gln Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125

Leu Asn Val Ile Arg Thr Glu Ala Asn Glu Ile Leu Ala Lys Phe Thr
    130                 135                 140

Pro Gln Ser Asp Gln Asn Lys Asn Gln Arg Lys Ser Lys Arg Thr Arg
145                 150                 155                 160

Lys Ser Ala Lys Leu Gln Thr Pro Ser Leu Phe Gln Asn Leu Leu Asn
                165                 170                 175

Thr Tyr Glu Gln Thr Gln Glu Thr Leu Thr Arg Cys Ala Ile Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Arg Asp Glu Asp Pro Glu
        195                 200                 205

Glu Phe Asn Arg Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
```

```
    210                 215                 220

Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Leu Lys Thr Leu Glu Ile Ala Thr Thr Asn Val Pro Gln
                245                 250                 255

Asn Glu Asn Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Pro
            260                 265                 270

Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285

Trp Leu Gln Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320

Phe Lys Arg Phe Leu Glu Asp Gln Glu Leu Lys Arg Asn Ser Lys Asn
                325                 330                 335

Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Ile Ala Trp
            340                 345                 350

Ser Leu Gly Glu Glu Lys Gly Glu Pro Trp Lys Val Asn Lys Leu His
        355                 360                 365

Leu Tyr Cys Thr Leu Asp Thr Arg Met Trp Thr Ile Glu Gly Thr Gln
    370                 375                 380

Gln Val Val Ser Glu Lys Thr Thr Lys Ile Thr Glu Thr Leu Asn Gln
385                 390                 395                 400

Ala Lys Arg Lys Asp Val Leu Asn Asp Lys Gln Gln Ala Phe Val Thr
                405                 410                 415
```

```
Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg Pro
            420                 425                 430

Ser Lys Pro Asn Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Glu Lys Pro Val Thr Leu Ala Val Val Asp Val Ile Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Thr Val Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Val Gln Lys Arg Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile Ile
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Ala Gly Ser Ile Val Ile Pro Lys Leu
    530                 535                 540

Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560

Lys Lys Cys Pro Gly Tyr Lys Glu Val Gln Gln Lys Tyr Ala Lys Glu
                565                 570                 575

Tyr Arg Met Ser Val His Arg Trp Gly Tyr Gly Arg Leu Ile Glu Ser
            580                 585                 590

Ile Lys Ser Gln Ala Ala Lys Ala Gly Ile Phe Thr Glu Ile Gly Thr
        595                 600                 605

Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala Val
```

610 615 620

Phe Ala Tyr Gln Glu Arg Gln Ala Ala Leu Ile
625 630 635

<210> 470
<211> 635
<212> PRT
<213> Nostoc piscinale

<400> 470

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Gly Glu Asp Thr
1 5 10 15

Leu Arg Thr Leu Trp Glu Leu Met Ala Asp Lys Asn Thr Pro Leu Val
20 25 30

Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Glu Phe Glu Pro Trp
35 40 45

Leu Glu Lys Gly Lys Ile Pro Thr Glu Phe Leu Lys Thr Leu Val Asn
50 55 60

Ser Leu Lys Thr Gln Glu Arg Phe Ala Asp Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
85 90 95

Leu Gln Lys Arg Arg Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
100 105 110

Thr Ile Leu Lys Ser Asp Leu Gln Leu Glu Gln Glu Ser Gln Cys Ser
115 120 125

Leu Asn Ala Ile Arg Thr Lys Ala Asn Glu Ile Leu Thr Lys Leu Thr
130 135 140

```
Pro Gln Ser Glu Gln Asn Lys Asn Gln Arg Lys Ser Lys Lys Thr Lys
145                 150                 155                 160


Lys Ser Ala Lys Leu Gln Lys Ser Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175


Thr Tyr Glu Gln Thr Gln Glu Thr Leu Thr His Cys Ala Ile Ala Tyr
            180                 185                 190


Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu Glu Glu Asp Ser Glu
        195                 200                 205


Glu Phe Thr Lys Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220


Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Lys Gly
225                 230                 235                 240


Glu Glu Trp Leu Lys Thr Leu Glu Ile Ser Thr Ala Asn Val Pro Gln
                245                 250                 255


Asn Glu Asn Asp Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Ser
            260                 265                 270


Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285


Trp Leu Gln Asn Glu Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300


Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320


Phe Thr Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys Asn
                325                 330                 335


Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ala Trp
            340                 345                 350
```

```
Ser Pro Gly Glu Asp Arg Gly Glu Pro Trp Lys Val Asn Gln Leu His
        355                 360                 365

Leu Tyr Cys Ser Leu Asp Thr Arg Met Trp Thr Ile Glu Gly Thr Gln
    370                 375                 380

Gln Val Ala Asp Glu Lys Ser Thr Lys Ile Thr Glu Thr Leu Thr Lys
385                 390                 395                 400

Ala Lys Gln Lys Asp Glu Leu Asn Asp Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg Pro
            420                 425                 430

Ser Lys Pro Asn Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Glu Lys Pro Val Thr Val Ala Val Val Asp Val Ile Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Arg Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile Leu
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Ala Ser Ser Ile Val Ile Pro Lys Leu
    530                 535                 540
```

```
Arg Asp Met Arg Glu Gln Ile Thr Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560


Lys Lys Cys Pro Gly Asn Lys Glu Val Gln Lys Lys Tyr Ala Lys Glu
                565                 570                 575


Tyr Arg Met Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Ser
            580                 585                 590


Ile Lys Ser Gln Ala Ala Lys Thr Gly Ile Phe Thr Glu Ile Gly Thr
        595                 600                 605


Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Thr Val
    610                 615                 620


Phe Ala Tyr Gln Glu Arg Gln Ala Ser Val Ile
625                 630                 635


<210>  471
<211>  639
<212>  PRT
<213>  Scytonema hofmanni

<400>  471

Met Ser Gln Ile Thr Ile Gln Ala Arg Leu Ile Ser Phe Glu Ser Asn
1               5                   10                  15


Arg Gln Gln Leu Trp Lys Leu Met Ala Asp Leu Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Cys Gln Leu Gly Gln His Pro Asp Phe Glu Lys Trp
        35                  40                  45


Gln Gln Lys Gly Lys Leu Pro Ser Thr Val Val Ser Gln Leu Cys Gln
    50                  55                  60


Pro Leu Lys Thr Asp Pro Arg Phe Ala Gly Gln Pro Ser Arg Leu Tyr
65                  70                  75                  80
```

```
Met Ser Ala Ile His Ile Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Thr Arg Trp Leu
            100                 105                 110

Glu Met Leu Asn Ser Asp Ala Glu Leu Val Glu Leu Ser Gly Asp Thr
        115                 120                 125

Leu Glu Ala Ile Arg Val Lys Ala Ala Glu Ile Leu Ala Ile Ala Met
    130                 135                 140

Pro Ala Ser Glu Ser Asp Ser Ala Ser Pro Lys Gly Lys Lys Gly Lys
145                 150                 155                 160

Lys Glu Lys Lys Pro Ser Ser Ser Ser Pro Lys Arg Ser Leu Ser Lys
                165                 170                 175

Thr Leu Phe Asp Ala Tyr Gln Glu Thr Glu Asp Ile Lys Ser Arg Ser
            180                 185                 190

Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Thr Asp Lys Glu
        195                 200                 205

Glu Asp Ser Glu Lys Phe Ala Lys Arg Arg Arg Gln Val Glu Ile Gln
    210                 215                 220

Ile Gln Arg Leu Thr Glu Lys Leu Ile Ser Arg Met Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Asn Ala Lys Trp Leu Glu Thr Leu Leu Thr Ala Thr Thr
                245                 250                 255

Thr Val Ala Glu Asp Asn Ala Gln Ala Lys Arg Trp Gln Asp Ile Leu
            260                 265                 270

Leu Thr Arg Ser Ser Ser Leu Pro Phe Pro Leu Val Phe Glu Thr Asn
```

```
        275                 280                 285

Glu Asp Met Val Trp Ser Lys Asn Gln Lys Gly Arg Leu Cys Val His
    290                 295                 300

Phe Asn Gly Leu Ser Asp Leu Ile Phe Glu Val Tyr Cys Gly Asn Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Leu Glu Asp Gln Gln Thr Lys Arg
                325                 330                 335

Lys Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg Asn Gly
            340                 345                 350

His Leu Val Trp Leu Glu Gly Glu Gly Lys Gly Glu Pro Trp Asn Leu
        355                 360                 365

His His Leu Thr Leu Tyr Cys Cys Val Asp Asn Arg Leu Trp Thr Glu
    370                 375                 380

Glu Gly Thr Glu Ile Val Arg Gln Glu Lys Ala Asp Glu Ile Thr Lys
385                 390                 395                 400

Phe Ile Thr Asn Met Lys Lys Lys Ser Asp Leu Ser Asp Thr Gln Gln
                405                 410                 415

Ala Leu Ile Gln Arg Lys Gln Ser Thr Leu Thr Arg Ile Asn Asn Ser
            420                 425                 430

Phe Glu Arg Pro Ser Gln Pro Leu Tyr Gln Gly Gln Ser His Ile Leu
        435                 440                 445

Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val
    450                 455                 460

Asp Ala Ile Ala Asn Lys Val Leu Ala Tyr Arg Ser Ile Lys Gln Leu
465                 470                 475                 480
```

```
Leu Gly Asp Asn Tyr Glu Leu Leu Asn Arg Gln Arg Arg Gln Gln Gln
                485                 490                 495

Tyr Leu Ser His Glu Arg His Lys Ala Gln Lys Asn Phe Ser Pro Asn
            500                 505                 510

Gln Phe Gly Ala Ser Glu Leu Gly Gln His Ile Asp Arg Leu Leu Ala
        515                 520                 525

Lys Ala Ile Val Ala Leu Ala Arg Thr Tyr Lys Ala Gly Ser Ile Val
    530                 535                 540

Leu Pro Lys Leu Gly Asp Met Arg Glu Val Val Gln Ser Glu Ile Gln
545                 550                 555                 560

Ala Ile Ala Glu Gln Lys Phe Pro Gly Tyr Ile Glu Gly Gln Gln Lys
                565                 570                 575

Tyr Ala Lys Gln Tyr Arg Val Asn Val His Arg Trp Ser Tyr Gly Arg
            580                 585                 590

Leu Ile Gln Ser Ile Gln Ser Lys Ala Ala Gln Thr Gly Ile Val Ile
        595                 600                 605

Glu Glu Gly Lys Gln Pro Ile Arg Gly Ser Pro His Asp Lys Ala Lys
    610                 615                 620

Glu Leu Ala Leu Ser Ala Tyr Asn Leu Arg Leu Thr Arg Arg Ser
625                 630                 635
```

<210> 472
<211> 638
<212> PRT
<213> Mastigocoleus testarum

<400> 472

```
Met Thr Gln Ile Thr Val Gln Cys Arg Leu Val Ala Thr Glu Thr Thr
1               5                   10                  15
```

```
Arg Gln Glu Leu Trp Asp Leu Met Ala Asp Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Lys Gln Val Ala Glu His Ser Asp Phe Glu Ala Trp
        35                  40                  45

Arg Gln Lys Gly Lys Ile Pro Thr Gly Thr Ile Lys Gln Leu Cys Glu
    50                  55                  60

Pro Leu Lys Thr Asp Ser Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Ser Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Leu Met Lys Arg Leu Gln Tyr Lys Leu Glu Gly Lys Ile His Trp Leu
            100                 105                 110

Glu Met Leu Lys Ser Asp Glu Glu Leu Val Glu Ile Ser Gly Val Asn
        115                 120                 125

Leu Glu Ala Leu Arg Ser Lys Ala Ala Glu Ile Leu Ala Gln Phe Ser
    130                 135                 140

Pro Gln Ile Asp Thr Asn Asn Ser Gln Asn Lys Arg Lys Thr Lys Ser
145                 150                 155                 160

Lys Asn Ser Lys Lys Ser Lys Ser Ser Asp Ile Ser Lys Asn Leu Ser
                165                 170                 175

Gln Gln Leu Phe Asp Thr Tyr Arg Asp Thr Glu Asp Ile Val Thr His
            180                 185                 190

Cys Ala Ile Ser Tyr Leu Leu Lys Asn Gly Ser Lys Leu Pro Asn Lys
        195                 200                 205
```

```
Glu Glu Ser Pro Glu Lys Phe Thr Gln Arg Arg Arg Lys Ile Glu Ile
    210                 215                 220

Gln Ile Gln Arg Leu Arg Glu Gln Leu Glu Ala Arg Ile Pro His Gly
225                 230                 235                 240

Arg Asp Leu Thr Asp Leu Asn Trp Leu Asn Thr Leu Asp Ile Ala Thr
                245                 250                 255

Asn Gln Val Pro Gln Ser Glu Thr Glu Ala Lys Ser Trp Gln Asn Asn
            260                 265                 270

Leu Leu Arg Lys Ser His Ala Val Pro Phe Pro Val Ser Tyr Glu Thr
        275                 280                 285

Asn Glu Asp Met Thr Trp Phe Lys Asn Arg Lys Gly Arg Ile Cys Val
    290                 295                 300

Lys Phe Asn Gly Leu Ser Glu His Thr Phe Glu Ile Tyr Cys Asp Asn
305                 310                 315                 320

Arg Gln Leu His Trp Phe Lys Arg Phe Leu Ser Asp Gln Gln Ile Lys
                325                 330                 335

Lys Asn Ser Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser
            340                 345                 350

Gly Arg Ile Ser Trp Gln Glu Glu Val Gly Lys Asp Arg Pro Trp Asn
        355                 360                 365

Val Asn His Leu Lys Leu Asp Cys Thr Val Asp Thr Arg Leu Trp Thr
    370                 375                 380

Ala Glu Gly Thr Asn Gln Val Arg Glu Glu Lys Ala Glu Glu Ile Ala
385                 390                 395                 400

Lys Thr Ile Thr Lys Ser Lys Glu Lys Gly Glu Leu Asn Asp Arg Gln
                405                 410                 415
```

```
Leu Ala His Ile Lys Arg Lys Gln Ser Thr Leu Asp Arg Ile Asn Asn
            420                 425                 430

Pro Tyr Pro Arg Pro Asn Lys Pro Leu Tyr Lys Gly Leu Ser Asn Ile
        435                 440                 445

Leu Val Gly Val Ser Leu Gly Leu Glu Lys Thr Ala Thr Val Ala Ile
    450                 455                 460

Leu Asp Ala Ser Thr Asp Lys Val Val Thr Tyr Arg Ser Ile Lys Gln
465                 470                 475                 480

Leu Leu Gly Glu Asn Tyr Lys Leu Leu Asn Arg Gln Arg Gln Gln Lys
                485                 490                 495

Gly Glu Leu Ser His Gln Arg Lys Ile Ala Gln Thr Gln Ala Ala Ser
            500                 505                 510

Asn Gln Tyr Gly Glu Ser Glu Leu Gly Gln Tyr Ile Asp Arg Leu Leu
        515                 520                 525

Ala Lys Glu Ile Val Ala Ile Ala Gln Lys Tyr Ser Ala Gly Ser Ile
    530                 535                 540

Val Leu Pro Lys Leu Ser Asp Met Arg Glu Gln Ile Asn Ser Glu Ile
545                 550                 555                 560

Gln Ala Lys Ala Leu Glu Lys Cys Pro Asp Cys Ile Glu Ala Gln Lys
                565                 570                 575

Lys Tyr Ala Lys Gln Tyr Arg Arg Ser Val Asn Gln Trp Ser Tyr Gly
            580                 585                 590

Arg Leu Ile Glu Asn Ile Lys Ser Gln Ala Ile Lys Thr Gly Ile Val
        595                 600                 605
```

```
Ile Glu Glu Ser Lys Gln Pro Ile Arg Gly Ser Ser Gln Asp Lys Ala
    610                 615                 620

Lys Glu Leu Ala Thr Thr Ala Tyr Lys Ser Arg Lys Lys Ser
625                 630                 635
```

<210> 473
<211> 635
<212> PRT
<213> Nostoc sp. NIES-4103

<400> 473

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Glu Thr
1               5                   10                  15

Leu Ser Gln Leu Trp Glu Leu Met Ala Asp Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Asp Phe Glu Thr Trp
        35                  40                  45

Leu Glu Gln Gly Lys Ile Pro Thr Glu Leu Leu Lys Thr Leu Val Asn
    50                  55                  60

Ser Leu Lys Thr Gln Glu Arg Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Ile Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys His Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Gln Gln Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125

Leu Asn Val Ile Arg Thr Lys Ala Ile Glu Ile Leu Ser Gln Phe Thr
    130                 135                 140
```

```
Pro Gln Ser Asp Gln Asn Lys Asn Gln Arg Lys Ser Lys Lys Thr Lys
145                 150                 155                 160

Lys Ser Ala Lys Leu His Lys Ser Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175

Thr Tyr Glu Gln Thr Gln Asp Pro Leu Thr Arg Cys Ala Val Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu His Glu Asp Pro Glu
        195                 200                 205

Lys Phe Thr Arg Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220

Lys Asp Gln Leu Gln Gly Arg Leu Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Leu Glu Thr Leu Glu Ile Ala Thr Asp Asn Val Pro Gln
                245                 250                 255

Asn Glu Asn Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Ser
            260                 265                 270

Ala Glu Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285

Trp Leu Lys Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320

Phe Gln Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys Asn
                325                 330                 335

Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ala Trp
```

```
            340                 345                 350

Leu Pro Gly Glu Glu Lys Gly Glu Pro Trp Lys Val Asn Gln Leu His
        355                 360                 365

Leu Tyr Cys Ala Leu Asp Thr Arg Met Trp Thr Thr Glu Gly Thr Gln
    370                 375                 380

Lys Val Ile Asn Glu Lys Ser Ile Lys Ile Thr Glu Thr Leu Thr Lys
385                 390                 395                 400

Ala Lys Gln Lys Glu Asp Leu Asn Asp Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Arg Ile His Asn Pro Phe Pro Arg Pro
            420                 425                 430

Ser Lys Pro Asn Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Glu Lys Pro Val Thr Val Ala Val Val Asp Val Val Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Gln Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile Val
        515                 520                 525

Ala Ile Ala Lys Ser Tyr Gln Ala Gly Gly Ile Val Ile Pro Lys Leu
    530                 535                 540
```

```
His Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560


Asn Lys Cys Pro Gly Tyr Lys Glu Ala Gln Gln Lys Tyr Ala Lys Glu
                565                 570                 575


Tyr Arg Met Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Asp Ser
            580                 585                 590


Ile Lys Ser Gln Ala Ala Lys Val Gly Ile Ser Thr Glu Ile Gly Thr
        595                 600                 605


Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala Val
    610                 615                 620


Phe Thr Tyr Gln Glu Arg Gln Ala Ala Leu Ile
625                 630                 635


<210>  474
<211>  635
<212>  PRT
<213>  Nostoc sp. CENA543

<400>  474

Met Ser Ile Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Glu Thr
1               5                   10                  15


Leu Arg Lys Leu Trp Glu Leu Met Thr Asp Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Ala Gln Val Gly Gln His Pro Asp Phe Glu Asn Trp
        35                  40                  45


Leu Glu Lys Gly Lys Ile Pro Thr Glu Leu Leu Lys Thr Leu Val Asn
    50                  55                  60


Ser Leu Lys Thr Gln Glu Arg Phe Ser Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80
```

```
Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Lys Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Leu Gln Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125

Leu Asn Ala Ile Arg Thr Lys Ala Asn Glu Ile Leu Thr Lys Leu Thr
    130                 135                 140

Pro Gln Ser Glu Gln Asn Lys Asn Gln Arg Lys Ser Lys Arg Thr Lys
145                 150                 155                 160

Lys Ser Ala Lys Leu Gln Lys Ser Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175

Thr Tyr Glu Glu Thr Gln Asp Ala Leu Thr Arg Cys Ala Ile Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu Asp Glu Asp Leu Glu
        195                 200                 205

Ala Phe Thr Arg His Lys Arg Lys Lys Glu Ile Glu Ile Gln Arg Leu
    210                 215                 220

Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Phe Lys Ile Leu Glu Ile Ala Thr Gly Asn Val Pro Gln
                245                 250                 255

Asn Glu Asn Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Ser
            260                 265                 270
```

```
Ala Asp Val Pro Phe Pro Val Ala Tyr Gly Ser Gly Glu Asp Met Thr
        275                 280                 285

Trp Leu Gln Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320

Phe Lys Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys Asp
                325                 330                 335

Glu Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Val Trp
            340                 345                 350

Leu Pro Arg Glu Lys Lys Gly Glu Ala Trp Lys Val Asn Gln Leu Asn
        355                 360                 365

Leu Phe Cys Ala Leu Asp Thr Arg Thr Leu Thr Asn Glu Gly Thr Gln
    370                 375                 380

Gln Val Ile Leu Glu Lys Ser Ala Lys Ile Thr Lys Lys Leu Thr Lys
385                 390                 395                 400

Ala Lys Gln Lys Asp Asp Leu Asn Asp Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Met Ile Asn Asn Pro Phe Pro Arg Pro
            420                 425                 430

Thr Lys Pro Asn Tyr Gln Gly Gln Pro Ser Ile Ser Val Gly Val Ser
        435                 440                 445

Leu Gly Leu Glu Lys Pro Val Thr Leu Ala Val Val Asp Val Val Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480
```

```
Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Arg Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Gly Ile Val
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Ala Ser Ser Ile Val Ile Pro Lys Leu
    530                 535                 540

Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560

Lys Lys Cys Pro Gly Tyr Lys Glu Ala Gln Gln Lys Tyr Ala Lys Glu
                565                 570                 575

Tyr Arg Met Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Ser
            580                 585                 590

Ile Lys Ser Gln Ala Ser Lys Ala Gly Ile Ser Thr Glu Ile Gly Thr
        595                 600                 605

Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala Val
    610                 615                 620

Phe Ala Tyr Gln Glu Arg Gln Ala Ala Leu Ile
625                 630                 635
```

<210> 475
<211> 636
<212> PRT
<213> Nostoc sp. HK-01

<400> 475

```
Met Ser Ile Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Glu Thr
```

```
1               5                   10                  15

Leu Arg Gln Leu Trp Glu Leu Met Thr Asp Lys Asn Thr Pro Leu Val
            20                  25                  30

Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Asp Phe Glu Thr Trp
        35                  40                  45

Leu Glu Lys Gly Lys Ile Pro Thr Glu Leu Leu Lys Thr Leu Val Asn
    50                  55                  60

Ser Leu Lys Thr Gln Glu Arg Phe Val Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Ile Gln Ile Glu Gln Glu Ser Gln Ser Thr
        115                 120                 125

Leu Asn Val Ile Arg Thr Lys Ala Thr Glu Ile Leu Thr Lys Phe Thr
    130                 135                 140

Pro Gln Ser Glu Gln Asn His Asn Gln Arg Lys Ser Lys Arg Thr Lys
145                 150                 155                 160

Lys Lys Ser Thr Asn Ser Lys Lys Ser Ser Leu Phe Gln Ile Leu Leu
                165                 170                 175

Asn Thr Tyr Glu Glu Thr Gln Asp Thr Leu Thr Arg Cys Ala Leu Ala
            180                 185                 190

Tyr Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu Asp Glu Asp Pro
        195                 200                 205
```

```
Glu Glu Phe Thr Arg Lys Lys Arg Lys Lys Glu Ile Glu Ile Gln Arg
    210                 215                 220

Leu Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr
225                 230                 235                 240

Gly Glu Glu Trp Leu Glu Thr Leu Glu Leu Ala Arg Ala Asn Val Pro
                245                 250                 255

Gln Asn Glu Lys Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys
            260                 265                 270

Ser Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met
        275                 280                 285

Thr Trp Trp Gln Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly
    290                 295                 300

Leu Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His
305                 310                 315                 320

Tyr Phe Lys Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys
                325                 330                 335

Asn Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ser
            340                 345                 350

Trp Arg Pro Gly Glu Glu Lys Gly Glu Pro Trp Lys Val Asn Gln Leu
        355                 360                 365

His Leu His Cys Ala Leu Ala Thr Arg Met Trp Thr Thr Glu Gly Thr
    370                 375                 380

Gln Gln Val Val Asn Glu Lys Thr Thr Lys Ile Thr Lys Thr Leu Thr
385                 390                 395                 400

Gln Ala Lys Gln Lys Asn Glu Leu Asn Glu Lys Gln Gln Ala Phe Ile
```

```
                405                 410                 415

Thr Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg
            420                 425                 430

Pro Ser Lys Ala Asn Tyr Gln Gly Gln Ser Ser Ile Leu Val Gly Val
        435                 440                 445

Ser Phe Gly Leu Glu Lys Pro Val Thr Ile Ala Val Val Asp Val Val
    450                 455                 460

Lys Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Lys
465                 470                 475                 480

Asn Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Arg Leu Ser
                485                 490                 495

His Glu Arg His Lys Ala Gln Lys Gln Asn Val Pro Asn Ser Phe Gly
            500                 505                 510

Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile
        515                 520                 525

Ile Ala Ile Ala Lys Thr Tyr Gln Ala Gly Ser Ile Val Ile Pro Lys
    530                 535                 540

Leu Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Lys Ala
545                 550                 555                 560

Glu Lys Lys Cys Pro Gly Tyr Lys Glu Ala Gln Gln Lys Tyr Ala Lys
                565                 570                 575

Glu Tyr Arg Met Thr Ile His Arg Trp Ser Tyr Gly Arg Leu Ile Glu
            580                 585                 590

Ser Ile Lys Ser Gln Ala Ala Lys Ala Gly Ile Pro Thr Glu Ile Gly
        595                 600                 605
```

```
Thr Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Leu Ala
    610                 615                 620


Val Leu Ala Tyr Gln Glu Arg Gln Val Ala Val Ile
625                 630                 635


<210>  476
<211>  633
<212>  PRT
<213>  Nostoc sp. 'Peltigera malacea cyanobiont' DB3992

<400>  476

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Thr
1               5                   10                  15


Leu Arg Gln Leu Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Leu Gln Val Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45


Leu Glu Glu Gly Lys Ile Pro Thr Glu Leu Leu Lys Thr Leu Val Asn
    50                  55                  60


Ser Leu Lys Thr Gln Glu Arg Phe Ala Gly Gln Ser Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95


Leu Gln Lys Arg Arg Lys Tyr Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110


Lys Met Leu Lys Ser Asp Leu Glu Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125


Leu Asn Val Ile Arg Thr Lys Ala Thr Glu Ile Leu Thr Lys Phe Thr
    130                 135                 140
```

```
Pro Gln Ser Glu Gln Asn Ser Lys Gln Lys Lys Gly Lys Lys Thr Lys
145                 150                 155                 160

Lys Ser Thr Lys Ser Lys Lys Ser Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175

Thr Tyr Gly Glu Thr Glu Asp Pro Leu Thr Arg Cys Ala Leu Ala Tyr
            180                 185                 190

Met Leu Lys Asn Lys Cys Lys Ile Ser Glu Ile Asp Glu Asp Pro Glu
        195                 200                 205

Glu Phe Thr Arg Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220

Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Leu Glu Thr Leu Glu Ile Val Thr Ala Asn Val Ala Gln
                245                 250                 255

Asn Glu Lys Glu Ala Lys Thr Trp Gln Ala Ala Leu Leu Arg Lys Thr
            260                 265                 270

Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285

Trp Leu Lys Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu Gln Tyr
305                 310                 315                 320

Phe Gln Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys Asn
                325                 330                 335
```

```
Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser Ala Arg Leu Ala Trp
            340                 345                 350

Leu Pro Gly Glu Glu Lys Gly Glu Val Trp Lys Val Asn Gln Leu Asn
        355                 360                 365

Leu Tyr Cys Ser Leu Asp Thr Arg Met Trp Thr Thr Glu Gly Thr Gln
    370                 375                 380

Gln Val Val Glu Glu Lys Val Thr Arg Ile Thr Asn Thr Leu Thr Lys
385                 390                 395                 400

Val Lys Gln Lys Asp Asp Leu Lys Asp Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg Pro
            420                 425                 430

Ser Lys Pro Asn Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Lys Lys Pro Val Thr Val Ala Val Val Asp Val Val Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Glu Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Gln Asn Ala Pro Thr Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile Ile
        515                 520                 525

Val Ile Ala Lys Thr Tyr Gln Ala Asp Ser Ile Val Ile Pro Lys Leu
    530                 535                 540
```

```
Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560


Lys Lys Cys Pro Gly Tyr Lys Glu Ala Gln Gln Lys Tyr Ala Lys Glu
                565                 570                 575


Tyr Arg Ile Ser Ile His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Ser
            580                 585                 590


Ile Lys Ser Gln Ala Ala Lys Val Gly Ile Ser Thr Glu Ile Gly Thr
        595                 600                 605


Gln Pro Ile Lys Gly Ser Pro Gln Glu Lys Ala Gly Asn Leu Ala Val
    610                 615                 620


Phe Ala Tyr Gln Glu Arg Gln Ala Ala
625                 630
```

<210> 477
<211> 627
<212> PRT
<213> Spirulina major

<400> 477

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ala Thr
1               5                   10                  15


Arg Gln Val Leu Trp Thr Leu Met Ala Glu Arg Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Ala Gln Met Ala Gln His Pro Asp Leu Glu Glu Trp
        35                  40                  45


Arg Gln Lys Gly Lys Pro Thr Pro Gly Val Val Lys Lys Leu Cys Asp
    50                  55                  60


Pro Leu Arg Gln Asp Pro Arg Phe Met Gly Gln Pro Gly Arg Phe Tyr
```

```
65                  70                  75                  80

Ser Ser Ala Ile Ala Leu Val Glu Tyr Ile Tyr Lys Ser Trp Leu Lys
                85                  90                  95

Leu Gln Gln Arg Leu Gln Arg Lys Leu Glu Gly Gln Gln Arg Trp Leu
            100                 105                 110

Gly Met Leu Lys Ser Asp Pro Glu Leu Cys Glu Glu Asn His Cys Thr
        115                 120                 125

Leu Asp Thr Leu Arg Asp Lys Ala Ala Glu Ile Leu Ala Ser Leu Glu
    130                 135                 140

Ser Pro Gln Pro Lys Gln Gly Lys Val Lys Thr Lys Lys Ala Lys Ala
145                 150                 155                 160

Gln Ser Ser Pro Arg Gln Ser Leu Phe Glu Met His Asp Gly Ala Glu
                165                 170                 175

Asp Gly Phe Val Lys Ser Ala Ile Ala Tyr Leu Leu Lys Asn Gly Gly
            180                 185                 190

Lys Leu Pro Thr His Glu Glu Asp Pro Lys Lys Phe Ala Lys Arg Arg
        195                 200                 205

Arg Lys Ala Glu Val Lys Val Glu Arg Leu Ile His Gln Ile Thr Ala
    210                 215                 220

Ser Leu Pro Lys Gly Arg Asp Leu Thr Gly Glu Arg Trp Leu Glu Thr
225                 230                 235                 240

Leu Leu Thr Ala Ser Tyr Thr Ala Pro Lys Asp Ala Gln Gln Thr Lys
                245                 250                 255

Val Trp Gln Ser Ile Leu Leu Thr Lys Thr Lys Ala Val Pro Tyr Pro
            260                 265                 270
```

```
Ile Asn Tyr Glu Thr Asn Glu Asp Leu Thr Trp Ser Lys Asn Glu Lys
        275                 280                 285

Gly Arg Leu Cys Val Arg Phe Asn Gly Leu Ser Glu His Thr Phe Gln
    290                 295                 300

Ile Tyr Cys Asp Gln Arg Gln Leu Lys Trp Phe Gln Arg Phe Tyr Glu
305                 310                 315                 320

Asp Gln Glu Val Lys Arg Thr Ser Lys Asn Gln His Ser Thr Ser Leu
                325                 330                 335

Phe Thr Leu Arg Ser Gly Arg Ile Val Trp Gln Glu Ser Asp Arg Asn
            340                 345                 350

Asp Lys Pro Trp Thr Ala Asn His Ile Thr Leu Cys Cys Thr Leu Asp
        355                 360                 365

Thr Arg Leu Trp Ser Ala Glu Gly Thr Glu Glu Val Arg Thr Glu Lys
    370                 375                 380

Ala Ile Asp Ile Ala Lys Thr Leu Thr Asn Met Asn Glu Lys Gly Asp
385                 390                 395                 400

Leu Asn Asp Lys Gln Gln Ala Phe Ile Lys Arg Lys Thr Ala Thr Leu
                405                 410                 415

Asp Arg Ile Asn Asn Pro Tyr Pro Arg Pro Ser Lys Pro Leu Tyr His
            420                 425                 430

Gly Gln Ser His Ile Leu Val Gly Val Ala Leu Gly Leu Asp Lys Pro
        435                 440                 445

Ala Thr Val Ala Val Val Asp Gly Thr Thr Gly Lys Ala Ile Thr Tyr
    450                 455                 460

Arg Asn Leu Lys Gln Leu Leu Gly Glu Asn Tyr Lys Leu Val Asn Arg
```

```
465                 470                 475                 480

Gln Arg Gln Gln Lys Gln Ala Gln Ser His Gln Arg His Lys Ala Gln
                485                 490                 495

Lys Arg Ser Gly Thr Asp Gln Phe Gly Asp Ser Glu Leu Gly Gln His
            500                 505                 510

Ile Asp Arg Leu Leu Ala Lys Ala Ile Val Ala Phe Ala His Ser Gln
        515                 520                 525

Ser Ala Gly Ser Ile Val Val Pro Lys Leu Glu Asp Ile Arg Glu Ile
    530                 535                 540

Val Gln Ser Glu Ile Gln Ala Arg Ala Glu Glu Lys Val Pro Gly Tyr
545                 550                 555                 560

Ile Glu Gly Gln Lys Gln Tyr Ala Lys Arg Tyr Arg Val Gln Val His
                565                 570                 575

Gln Trp Ser Tyr Gly Arg Leu Ile Asp Ser Ile Lys Ser Lys Ala Thr
            580                 585                 590

Gln Gln Gln Val Val Ile Glu Glu Gly Lys Gln Pro Val Arg Gly Ser
        595                 600                 605

Pro Glu Ala Gln Ala Thr Glu Leu Ala Ile Ser Thr Tyr His Leu Arg
    610                 615                 620

Ala Ser Ser
625
```

<210> 478
<211> 635
<212> PRT
<213> Nostoc sp. PCC 7107

<400> 478

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Ile
1               5                  10                  15

Leu Arg Gln Leu Trp Glu Leu Met Ala Asp Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Ala Gln Val Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Leu Asp Lys Gly Arg Ile Pro Thr Lys Leu Leu Lys Thr Leu Val Asn
    50                  55                  60

Ser Phe Lys Thr Gln Glu Arg Phe Ala Asp Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Leu Gln Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125

Leu Ser Ala Ile Arg Thr Lys Ala Asn Glu Ile Leu Thr Gln Phe Thr
    130                 135                 140

Pro Gln Ser Glu Gln Asn Lys Asn Gln Arg Lys Gly Lys Lys Thr Lys
145                 150                 155                 160

Lys Ser Thr Lys Ser Glu Lys Ser Ser Leu Phe Gln Ile Leu Leu Asn
                165                 170                 175

Thr Tyr Glu Gln Thr Gln Asn Pro Leu Thr Arg Cys Ala Ile Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu Asp Glu Asp Ser Glu
        195                 200                 205
```

```
Glu Phe Thr Lys Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220

Lys Asn Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Trp Leu Lys Thr Leu Glu Ile Ser Thr Ala Asn Val Pro Gln
                245                 250                 255

Asn Glu Asn Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Ser
            260                 265                 270

Ala Asp Val Pro Phe Pro Val Ala Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285

Trp Leu Gln Asn Asp Lys Gly Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu His Tyr
305                 310                 315                 320

Phe Lys Arg Phe Leu Glu Asp Gln Glu Leu Lys Arg Asn His Lys Asn
                325                 330                 335

Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Arg Leu Ala Trp
            340                 345                 350

Ser Pro Gly Glu Glu Lys Gly Glu Pro Trp Lys Val Asn Gln Leu His
        355                 360                 365

Leu Tyr Cys Thr Leu Asp Thr Arg Met Trp Thr Ile Glu Gly Thr Gln
    370                 375                 380

Gln Val Val Asp Glu Lys Ser Thr Lys Ile Asn Glu Thr Leu Thr Lys
385                 390                 395                 400
```

```
Ala Lys Gln Lys Asp Asp Leu Asn Asp Gln Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asp Arg Ile Asn Asn Leu Phe Pro Arg Pro
            420                 425                 430

Ser Lys Ser Arg Tyr Gln Gly Gln Pro Ser Ile Leu Val Gly Val Ser
        435                 440                 445

Phe Gly Leu Lys Lys Pro Val Thr Val Ala Val Val Asp Val Val Lys
    450                 455                 460

Asn Glu Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Glu Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Lys Ala Gln Lys Gln Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Ile Asp Arg Leu Leu Ala Asp Ala Ile Ile
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Ala Gly Ser Ile Val Leu Pro Lys Leu
    530                 535                 540

Arg Asp Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545                 550                 555                 560

Lys Lys Cys Pro Gly Tyr Lys Glu Val Gln Gln Lys Tyr Ala Lys Glu
                565                 570                 575

Tyr Arg Met Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Glu Cys
            580                 585                 590

Ile Lys Ser Gln Ala Ala Lys Ala Gly Ile Ser Thr Glu Ile Gly Thr
        595                 600                 605
```

```
Gln Pro Ile Arg Gly Ser Pro Gln Glu Lys Ala Arg Asp Val Ala Val
    610                 615                 620


Phe Ala Tyr Gln Glu Arg Gln Ala Ala Leu Ile
625                 630                 635


<210>  479
<211>  635
<212>  PRT
<213>  Chlorogloea sp. CCALA 695

<400>  479

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Phe
1               5                   10                  15


Leu Arg Gln Leu Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Ala Gln Leu Gly Lys His Pro Glu Leu Glu Thr Trp
        35                  40                  45


Leu Glu Lys Gly Lys Ile Pro Thr Glu Leu Leu Lys Ala Leu Gly Asn
    50                  55                  60


Ala Leu Lys Thr Gln Glu Pro Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Ala Leu Val Asn Tyr Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95


Leu Gln Lys Arg Arg Lys Tyr Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110


Lys Met Leu Lys Ser Asp Leu Asp Leu Glu Gln Glu Ser Gln Cys Ser
        115                 120                 125


Leu Asp Val Ile Arg Ile Lys Ala Thr Glu Leu Leu Thr Lys Phe Thr
```

```
    130                 135                 140

Pro Gln Phe Asp Thr Asn Asn Lys Gln Arg Lys Gly Lys Lys Asn Lys
145                 150                 155                 160

Lys Ala Ser Lys Thr Gln Lys Pro Ser Val Phe Lys Val Leu Leu Asn
                165                 170                 175

Thr Tyr Glu Glu Thr Gln Cys Leu Leu Thr Arg Cys Ala Leu Ala Tyr
            180                 185                 190

Leu Leu Lys Asn Asn Cys Gln Ile Ser Glu Leu Asn Glu Asn Leu Glu
        195                 200                 205

Glu Phe Thr Arg Asn Arg Arg Lys Lys Glu Ile Glu Ile Glu Arg Leu
    210                 215                 220

Lys Asp Gln Leu Gln Ser Arg Ile Pro Lys Gly Arg Asp Leu Lys Gly
225                 230                 235                 240

Glu Glu Trp Leu Lys Ile Leu Lys Ile Ala Thr Ala Asn Val Ala Gln
                245                 250                 255

Asp Glu Asn Glu Ala Lys Ala Trp Gln Ala Ala Leu Leu Arg Lys Thr
            260                 265                 270

Lys Asn Val Pro Phe Pro Val Asp Tyr Glu Ser Asn Glu Asp Met Thr
        275                 280                 285

Trp Leu Lys Asn Asp Lys Asn Arg Leu Phe Val Arg Phe Asn Gly Leu
    290                 295                 300

Gly Lys Leu Thr Phe Glu Ile Tyr Cys Asp Lys Arg His Leu Pro Tyr
305                 310                 315                 320

Phe Gln Arg Phe Leu Glu Asp Gln Glu Ile Lys Arg Asn Ser Lys Asn
                325                 330                 335
```

```
Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Ala Arg Ile Ser Trp
            340                 345                 350

Leu Pro Gly Lys Glu Lys Gly Glu Ala Trp Lys Val Asn Gln Leu Asn
        355                 360                 365

Leu Tyr Cys Ser Leu Asp Thr Arg Met Trp Thr Thr Glu Gly Thr Ile
    370                 375                 380

Gln Val Val Glu Glu Lys Val Met Ala Ile Thr Glu Thr Leu Thr Lys
385                 390                 395                 400

Thr Lys Gln Lys Asp Asp Leu Asn His Lys Gln Gln Ala Phe Ile Thr
                405                 410                 415

Arg Gln Gln Ser Thr Leu Asn Arg Ile Thr Asn Pro Phe Pro Arg Pro
            420                 425                 430

Cys Lys Pro Thr Tyr Gln Gly Lys Pro Ser Ile Leu Leu Gly Val Ser
        435                 440                 445

Phe Gly Leu Asp Lys Pro Ala Thr Val Ala Val Val Asp Ala Ala Asn
    450                 455                 460

Lys Lys Val Leu Ala Tyr Arg Ser Thr Lys Gln Leu Leu Gly Lys Asn
465                 470                 475                 480

Tyr Asn Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ser His
                485                 490                 495

Glu Arg His Ile Ala Gln Lys Gln Asn Ala Pro Asn Ser Phe Gly Glu
            500                 505                 510

Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Asp Ala Ile Ile
        515                 520                 525

Ala Ile Ala Lys Thr Tyr Gln Val Gly Asn Ile Val Leu Pro Lys Leu
```

530 535 540

Arg Tyr Met Arg Glu Gln Ile Ser Ser Glu Ile Gln Ser Arg Ala Glu
545 550 555 560

Lys Lys Cys Pro Gly Phe Lys Glu Ala Gln Gln Lys Tyr Ala Gln Glu
565 570 575

Tyr Arg Ile Ser Val His Arg Trp Ser Tyr Gly Arg Leu Val Glu Ser
580 585 590

Ile Lys Ser Gln Ala Ala Lys Ala Gly Ile Ser Thr Glu Ile Val Thr
595 600 605

Leu Leu Thr Arg Gly Ser Pro Glu Glu Lys Ala Arg Asp Leu Ala Val
610 615 620

Phe Ala Tyr Gln Glu Arg Gln Ala Ala Leu Ile
625 630 635

<210> 480
<211> 670
<212> PRT
<213> Cyanothece sp. PCC 8802

<400> 480

Met Ser Thr Ile Thr Ile Gln Cys Arg Leu Val Ala Pro Glu Ala Thr
1 5 10 15

Arg Gln Ala Leu Trp Gln Leu Met Ala Gln Lys Asn Thr Pro Leu Val
20 25 30

Ser Glu Leu Leu Arg Gln Val Ala Gln His Pro Asp Phe Glu Thr Trp
35 40 45

Arg Gln Gln Gly Lys Leu Glu Ala Gly Ile Ile Lys Lys Leu Cys Glu
50 55 60

```
Pro Leu Lys Lys Asp Pro Arg Phe Tyr Glu Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ser Leu Val Asp Tyr Ile Tyr Lys Ser Trp Leu Lys
                85                  90                  95

Val Gln Arg Arg Leu Gln Asn Lys Leu Glu Gly Gln Asn Arg Trp Leu
            100                 105                 110

Val Met Leu Lys Ser Asp Glu Glu Leu Val Gln Ile Ser Gln Ser Ser
        115                 120                 125

Leu Glu Thr Ile Gln Ala Lys Ala Thr Asp Ile Leu Ser Thr Leu Lys
    130                 135                 140

Pro Glu Lys Pro Asp Lys Phe Pro Glu Thr Ser Thr Thr Lys Gly Lys
145                 150                 155                 160

Lys Ser Lys Lys Tyr Lys Asn Asn Asn Ser Leu Phe Thr Gln Leu Tyr
                165                 170                 175

Asn Leu Tyr Glu Lys Ala Asp Asp Thr Leu Thr His Cys Ala Ile Arg
            180                 185                 190

Tyr Leu Leu Lys Asn Gly Cys Lys Ile Pro Gln Lys Pro Glu Asp Pro
        195                 200                 205

Glu Lys Phe Ala Gln Arg Arg Arg Lys Val Glu Ile Lys Ile Glu Arg
    210                 215                 220

Ile Ile Glu Gln Ile Glu Ser Ser Ile Pro Gln Gly Arg Asp Leu Thr
225                 230                 235                 240

Gly Asp Ser Trp Leu Glu Thr Leu Ile Ile Ala Ala Asn Thr Ala Thr
                245                 250                 255

Val Glu Ala Ser Glu Ile Lys Ser Trp Gln Asp Lys Leu Leu Ser Gln
            260                 265                 270
```

```
Ser Lys Ser Ile Pro Tyr Pro Val Ala Tyr Glu Thr Asn Glu Asp Leu
        275                 280                 285

Thr Trp Ser Ile Asn Glu Lys Gly Arg Leu Cys Val Arg Phe Asn Gly
    290                 295                 300

Leu Gly Lys His Thr Phe Gln Ile Tyr Cys Asp Gln Arg Gln Leu Lys
305                 310                 315                 320

Trp Phe Gln Arg Phe Tyr Glu Asp Gln Gln Ile Lys Lys Asp Gly Lys
                325                 330                 335

Asp His His Ser Ser Ala Leu Phe Ser Leu Arg Ser Gly Arg Ile Val
            340                 345                 350

Trp Gln Glu Gly Leu Gly Lys Gly Lys Pro Trp Asn Ile His Arg Leu
        355                 360                 365

Thr Leu His Cys Ser Leu Asp Thr Arg Phe Trp Thr Glu Glu Gly Thr
    370                 375                 380

Gln Gln Val Gln Gln Glu Lys Ser Lys Lys Phe Gln Thr Asn Arg Leu
385                 390                 395                 400

Arg Met Lys Pro Glu Leu Thr Phe Ser Ile Phe Phe Arg Ser Gln Thr
                405                 410                 415

Leu Glu Thr Tyr Leu Gln Val Trp Leu Val Ile Thr Ala Tyr Arg Leu
            420                 425                 430

Gln Ser Phe Leu Asp Lys Gly Asn Val Ala Lys Ala His Gln Glu Phe
        435                 440                 445

Gln Lys Ala Ile Lys Arg Asn Glu Ser Ser Leu Gln Lys Ile Thr Ser
    450                 455                 460
```

```
Ser Tyr Asn Arg Pro His Lys Thr Leu Tyr Gln Gly Lys Ser His Ile
465                 470                 475                 480


Phe Val Gly Val Ala Met Gly Leu Glu Lys Pro Ala Thr Val Ala Val
                485                 490                 495


Val Asp Gly Thr Thr Gly Lys Ala Ile Ala Tyr Arg Ser Leu Lys Gln
            500                 505                 510


Leu Leu Gly Asn Asn Tyr His Leu Phe Asn Arg Gln Gly Lys Gln Lys
        515                 520                 525


Gln Asn Thr Ser His Gln Arg His Lys Ser Gln Lys His Phe Ala Asp
    530                 535                 540


Asn Gln Phe Gly Glu Ser Gln Leu Gly Gln Tyr Ile Asp Cys Leu Leu
545                 550                 555                 560


Ala Lys Ala Ile Ile Ser Val Ala Gln Thr Tyr Cys Ala Gly Ser Ile
                565                 570                 575


Val Val Pro Lys Leu Lys Asp Met Arg Glu Leu Ile Gln Ser Glu Ile
            580                 585                 590


Gln Ala Lys Ala Glu Ala Lys Ile Pro Gly Tyr Val Glu Gly Gln Ala
        595                 600                 605


Lys Tyr Ala Lys Ser Tyr Arg Val Gln Val His Gln Trp Ser His Gly
    610                 615                 620


Arg Leu Ile Asp Asn Ile Thr Ser Gln Ala Ser Lys Phe Asn Ile Thr
625                 630                 635                 640


Val Glu Glu Gly Glu Gln Pro His Gln Gly Asn Pro Gln Asp Lys Ala
                645                 650                 655


Lys Leu Leu Ala Ile Ala Ala Tyr His Ser Arg Leu Cys Ala
            660                 665                 670
```

<210> 481
<211> 615
<212> PRT
<213> Myxosarcina sp. GI1

<400> 481

Met Ser Gln Asn Ala Ile Gln Cys Arg Leu Ile Ala Pro Glu Thr Thr
1 5 10 15

Arg Arg Gln Gln Trp Gln Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Lys Gln Leu Ala Glu His Pro Glu Leu Glu Thr Trp
35 40 45

Lys Arg Lys Gly Lys Ile Pro Pro Gly Thr Val Lys Asn Leu Cys Gln
50 55 60

Pro Leu Arg Thr Cys Pro Gln Tyr Ile Asn Gln Pro Gly Arg Phe Tyr
65 70 75 80

Ser Ser Val Ile Ser Leu Ala Glu Tyr Ile Tyr Arg Ser Trp Leu Lys
85 90 95

Leu Gln Arg Arg Leu Ile Phe Arg Leu Asn Gly Gln Gln Arg Trp Leu
100 105 110

Gln Met Leu Lys Ser Asp Glu Glu Leu Val Ala Glu Ser Gly Arg Ser
115 120 125

Leu Lys Glu Ile Glu Ala Lys Ala Ser Glu Ala Leu Asp Arg Leu Asn
130 135 140

Arg Glu Glu Asn Pro Ser Ile Ser Asn Arg Leu Phe Asp Leu Tyr Asp
145 150 155 160

Glu Thr Glu Asp Ile Leu Ile Arg Ser Ala Ile Val Tyr Leu Leu Lys

```
                165                 170                 175

Asn Gly Cys Lys Ile Arg Gln Lys Pro Glu Asp Pro Lys Lys Phe Ala
            180                 185                 190

Arg Arg Arg Arg Lys Thr Glu Ile Arg Val Lys Arg Leu Gln Glu Lys
        195                 200                 205

Leu Asn Gly Lys Ala Pro Gln Gly Arg Asp Leu Thr Gly Glu Lys Trp
    210                 215                 220

Leu Asn Thr Leu Phe Thr Ala Thr Ser Gln Val Pro Gln Asp Glu Ala
225                 230                 235                 240

Gln Ala Lys Ser Trp Gln Asp Ile Leu Leu Thr Lys Ser Lys Leu Val
                245                 250                 255

Pro Tyr Pro Ile Val Tyr Glu Ser Asn Glu Asp Leu Thr Trp Ser Lys
            260                 265                 270

Asn Glu Arg Gly Arg Leu Cys Val Lys Phe Asn Gly Leu Ser Asp His
        275                 280                 285

Thr Phe Gln Ile Tyr Cys Asp Arg Arg Gln Leu Lys Ile Phe Asn Arg
    290                 295                 300

Phe Tyr Glu Asp Gln Gln Ile Lys Lys Ala Ser Lys Asn Ser His Ser
305                 310                 315                 320

Ser Ala Leu Phe Thr Leu Arg Ser Ala Thr Ile Ala Trp Gln Glu Gly
                325                 330                 335

Lys Gly Lys Gly Glu Pro Trp Asn Val Asn Arg Leu Ile Leu Tyr Cys
            340                 345                 350

Thr Phe Asp Asn Leu Leu Leu Thr Thr Glu Gly Thr Glu Val Val Arg
        355                 360                 365
```

```
Gln Glu Lys Ala Glu Ala Ile Ala Asn Thr Leu Thr Lys Ile Lys Glu
    370                 375                 380

Lys Gly Asp Leu Asn Gln Lys Gln Gln Ala Phe Ile Arg Arg Lys Glu
385                 390                 395                 400

Thr Ser Leu Ser Arg Ile Asn Asn Pro Phe Pro Arg Pro Ser Arg Pro
                405                 410                 415

Leu Tyr Lys Gly Lys Ser Asn Ile Leu Leu Gly Val Ala Ile Arg Leu
            420                 425                 430

Asp Lys Pro Ala Thr Val Ala Ile Val Asp Gly Ala Thr Asp Lys Ala
        435                 440                 445

Ile Ala Tyr Leu Ser Thr Lys Gln Leu Leu Gly Lys Asn Tyr His Leu
    450                 455                 460

Leu Asn Arg Lys Arg Gln Gln Gln His Ile Leu Ser His Gln Arg Asn
465                 470                 475                 480

Val Ala Gln Arg His His Ala Asn Asn Lys Phe Gly Glu Ser Glu Leu
                485                 490                 495

Gly Gln Tyr Ile Asp Arg Leu Leu Ala Lys Ala Ile Ile Gln Leu Ala
            500                 505                 510

Lys Asp Tyr Arg Val Gly Ser Ile Val Val Pro Tyr Met Glu Asp Thr
        515                 520                 525

Arg Glu Ile Ile Gln Ala Glu Val Gln Ala Arg Ala Glu Ala Lys Ile
    530                 535                 540

Pro Gly Cys Ile Glu Lys Gln Lys Glu Tyr Ala Lys Lys Tyr Arg Thr
545                 550                 555                 560

Asn Ile His Lys Trp Ser Tyr Gly Arg Leu Ile Asp Leu Ile Lys Ala
```

```
                565                 570                 575

Gln Ala Ala Lys Ala Gly Ile Val Ile Glu Glu Ser Lys Gln Ser Ile
            580                 585                 590

Arg Gly Asp Pro Lys Lys Gln Ala Lys Glu Ile Ala Val Cys Ala Tyr
        595                 600                 605

Arg Asp Arg Ile Val Pro Phe
    610                 615
```

<210> 482
<211> 642
<212> PRT
<213> Aphanizomenon flos-aquae

<400> 482

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Ser
1               5                   10                  15

Leu Arg Gln Leu Trp Glu Leu Met Thr Glu Lys Asn Thr Pro Phe Ile
            20                  25                  30

Asn Glu Ile Leu Leu His Leu Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Leu Glu Lys Gly Arg Ile Pro Ala Glu Ser Leu Lys Thr Leu Gly Asn
    50                  55                  60

Ser Leu Lys Thr Gln Glu Pro Phe Thr Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Leu Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Lys Arg Arg Lys Asn Gln Ile Glu Gly Lys Gln Arg Trp Leu
            100                 105                 110
```

```
Lys Met Leu Lys Ser Asp Pro Glu Leu Glu Gln Glu Ser Gln Ser Ser
        115                 120                 125

Leu Glu Val Ile Arg Thr Lys Ala Thr Glu Leu Phe Ser Lys Phe Thr
    130                 135                 140

Pro Gln Ser Asp Ser Glu Ala Leu Arg Arg Asn Gln Asn Asp Lys Ser
145                 150                 155                 160

Lys Lys Gly Lys Lys Thr Lys Lys Pro Thr Lys Ala Lys Thr Ser Ser
                165                 170                 175

Ile Phe Lys Ile Leu Leu Asn Thr Tyr Glu Glu Ala Glu Asp Pro Leu
            180                 185                 190

Thr Arg Cys Ala Leu Ala Tyr Leu Leu Lys Asn Asn Cys Gln Ile Ser
        195                 200                 205

Glu Leu Asp Glu Asn Pro Glu Glu Phe Thr Arg Asn Lys Arg Arg Lys
    210                 215                 220

Glu Ile Glu Ile Glu Arg Leu Lys Asp Gln Leu Gln Ser Arg Ile Pro
225                 230                 235                 240

Lys Gly Arg Asp Leu Thr Gly Glu Gln Trp Leu Glu Thr Leu Glu Ile
                245                 250                 255

Ala Thr Val Lys Val Pro Gln Asn Glu Asn Glu Ala Lys Ala Trp Gln
            260                 265                 270

Ala Ala Leu Leu Arg Lys Thr Ala Asn Val Pro Phe Pro Val Ala Tyr
        275                 280                 285

Glu Ser Asn Glu Asp Met Thr Trp Leu Lys Asn Asp Lys Asn Arg Leu
    290                 295                 300

Phe Val Arg Phe Asn Gly Leu Gly Lys Leu Asn Phe Glu Ile Tyr Cys
305                 310                 315                 320
```

```
Asp Lys Arg His Leu His Tyr Phe Gln Arg Phe Leu Glu Asp Gln Glu
                325                 330                 335

Ile Leu Arg Ser Ser Lys Arg Gln His Ser Ser Ser Leu Phe Thr Leu
            340                 345                 350

Arg Ser Gly Arg Ile Ala Trp Leu Pro Gly Glu Glu Lys Gly Glu His
        355                 360                 365

Trp Lys Val Asn Gln Leu Asn Phe Tyr Cys Ser Leu Asp Thr Arg Met
    370                 375                 380

Leu Thr Thr Glu Gly Thr Gln Gln Val Val Glu Glu Lys Val Thr Ala
385                 390                 395                 400

Ile Thr Glu Ile Leu Thr Lys Thr Lys Gln Lys Asp Asp Leu Asn Asp
                405                 410                 415

Lys Gln Gln Ala Phe Ile Thr Arg Gln Gln Ser Thr Leu Ser Arg Ile
            420                 425                 430

Asn Asn Pro Phe Pro Arg Pro Ser Lys Pro Asn Tyr Gln Gly Lys Ser
        435                 440                 445

Ser Ile Leu Ile Gly Val Ser Phe Gly Leu Glu Lys Pro Val Thr Val
    450                 455                 460

Ala Val Val Asp Val Val Lys Asn Gln Val Ile Ala Tyr Arg Ser Val
465                 470                 475                 480

Lys Gln Leu Leu Gly Glu Asn Tyr Asn Leu Leu Asn Arg Gln Arg Gln
                485                 490                 495

Gln Gln Gln Arg Leu Ser His Glu Arg His Lys Ala Gln Lys Gln Asn
            500                 505                 510
```

```
Ala Pro Asn Ser Phe Gly Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg
        515                 520                 525

Leu Leu Ala Asp Ala Ile Ile Ala Ile Ala Lys Lys Tyr Gln Ala Gly
    530                 535                 540

Ser Ile Val Leu Pro Lys Leu Arg Asp Met Arg Glu Gln Ile Ser Ser
545                 550                 555                 560

Glu Ile Gln Ser Arg Ala Glu Asn Gln Cys Pro Gly Tyr Lys Glu Gly
                565                 570                 575

Gln Gln Lys Tyr Ala Lys Glu Tyr Arg Ile Asn Val His Arg Trp Ser
            580                 585                 590

Tyr Gly Arg Leu Ile Glu Ser Ile Lys Ser Gln Ala Ala Gln Ala Gly
        595                 600                 605

Ile Ala Ile Glu Thr Gly Thr Gln Pro Ile Arg Ala Ser Pro Gln Glu
    610                 615                 620

Lys Ala Arg Asp Leu Ala Leu Phe Ala Tyr Gln Glu Arg Gln Ala Ala
625                 630                 635                 640

Leu Ile
```

<210> 483
<211> 616
<212> PRT
<213> Xenococcus sp. PCC 7305

<400> 483

```
Met Ser Asn Ile Thr Ile Gln Cys Arg Leu Ile Ala Pro Glu Glu Thr
1               5                   10                  15

Arg Arg Gln Leu Trp Gln Met Met Val Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30
```

```
Asn Glu Leu Leu Arg Leu Leu Ala Glu His Pro Asp Leu Glu Thr Trp
        35                  40                  45

Lys Arg Arg Gly Asn Thr Pro Pro Gly Thr Val Lys Asn Leu Cys Leu
    50                  55                  60

Pro Leu Arg Thr Asp Pro Gln Phe Val Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Ser Ser Ala Ile Ser Leu Val Glu Tyr Ile Tyr Lys Ser Trp Leu Lys
                85                  90                  95

Leu Gln Gln Arg Trp Glu Phe Gln Leu Gln Gly Gln Glu Arg Trp Ile
            100                 105                 110

Ser Met Leu Lys Ser Asp Glu Glu Leu Glu Val Tyr Cys Asp His Thr
        115                 120                 125

Leu Glu Asp Ile Lys Leu Lys Ala Thr Gln Ile Leu Asp Asn Asp Leu
    130                 135                 140

Thr Glu Glu Asn Arg Gly Ile Ser Asn Gln Leu Phe Ser Leu Tyr Asp
145                 150                 155                 160

Glu Thr Glu Asp Thr Phe Thr Arg Asn Ala Ile Ala Tyr Leu Leu Lys
                165                 170                 175

Asn Gly Cys Lys Ile Arg Gln Lys Pro Glu Asp Pro Lys Lys Leu Ala
            180                 185                 190

Lys Arg Arg Arg Lys Thr Glu Ile Lys Ile Ala Arg Leu Thr Glu Lys
        195                 200                 205

Leu Asn Gly Lys Ala Pro Gln Gly Arg Asp Leu Thr Gly Gln Thr Trp
    210                 215                 220

Leu Asp Thr Leu Leu Thr Ala Thr Thr Gln Val Pro Gln Asp Glu Ala
```

```
225                 230                 235                 240

Gln Ala Lys Ser Trp Gln Asp Lys Leu Leu Thr Glu Pro Lys Ser Val
                245                 250                 255

Pro Tyr Pro Ile Ala Tyr Glu Ser Asn Gly Asp Leu Thr Trp Ser Lys
            260                 265                 270

Asn Glu Lys Asp Arg Leu Cys Val Lys Phe Asn Gly Leu Gly Lys His
        275                 280                 285

Ile Phe Gln Ile Tyr Cys Asp Lys Arg Gln Leu Thr Val Phe Gln Arg
    290                 295                 300

Phe Tyr Glu Asp Gln Glu Ile Lys Lys Ala Ser Lys Asn Asn His Ser
305                 310                 315                 320

Ser Ala Leu Phe Ala Leu Arg Ser Ala Arg Ile Phe Trp Gln Glu Arg
                325                 330                 335

Lys Gly Lys Gly Lys Ser Trp Asp Val Asn Arg Leu Ile Leu Arg Cys
            340                 345                 350

Thr Phe Glu Thr Leu Leu Leu Asn Ala Glu Gly Thr Glu Leu Ile Arg
        355                 360                 365

Gln Glu Lys Ala Asn Ala Ile Ala Lys Thr Leu Thr Asp Ile Lys Glu
    370                 375                 380

Lys Gly Asp Leu Asn Gln Lys Gln Gln Ala Phe Val Lys Arg Lys Gln
385                 390                 395                 400

Thr Ser Leu Asp Arg Ile Asn Asn Pro Phe Pro Arg Ser Ser Lys Pro
                405                 410                 415

Leu Tyr Arg Gly Lys Ser Asn Val Leu Leu Gly Ile Ser Met Arg Leu
            420                 425                 430
```

```
Asp Asn Pro Ala Thr Ala Ala Ile Val Asp Gly Glu Thr Gly Lys Val
        435                 440                 445

Ile Val Tyr Gln Ser Thr Lys Gln Leu Leu Gly Lys Lys Asn Tyr His
    450                 455                 460

Leu Leu Asn Arg Gln Arg Gln Gln Lys Gln Leu Leu Ser Arg Lys Arg
465                 470                 475                 480

Asn Val Ala Gln Arg His Asn Ala Asn Asn Lys Phe Gly Glu Ser Glu
                485                 490                 495

Leu Gly Gln Tyr Leu Asp Arg Leu Leu Ala Lys Ala Ile Ile Lys Leu
            500                 505                 510

Ala Lys Asp Tyr Gln Ala Gly Ser Ile Val Val Pro Gln Val Gly Asp
        515                 520                 525

Ile Arg Asp Ile Ile His Thr Glu Val Gln Ala Arg Ala Glu Ser Lys
    530                 535                 540

Ile Pro Gly Cys Ile Glu Lys Gln Lys Glu Tyr Ala Lys Lys Tyr Arg
545                 550                 555                 560

Thr Asn Ala His Ser Trp Ser Tyr Gly Arg Leu Ile Glu Asn Ile Lys
                565                 570                 575

Ser Gln Ala Ser Lys Ala Gly Ile Leu Val Glu Glu Ser Lys Gln Pro
            580                 585                 590

Ile Arg Gly Ser Pro Asn Glu Gln Ala Lys Glu Ile Ala Leu Tyr Ala
        595                 600                 605

Tyr Cys Asp Arg Ser Glu Ser Tyr
    610                 615
```

<210> 484

<211> 655
<212> PRT
<213> Halothece sp. PCC 7418

<400> 484

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Ala Glu Thr
1 5 10 15

Arg Gln His Val Trp Glu Leu Met Ala Glu Gln Asn Thr Pro Leu Val
20 25 30

Asn Glu Leu Leu Lys Gln Val Ala Glu His Pro Glu Phe Glu Thr Trp
35 40 45

Gln Gln Lys Gly Lys Leu Pro Ala Gly Ile Val Ser Lys Leu Cys Lys
50 55 60

Pro Leu Lys Glu Asp Ser Arg Phe Ser Gly Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Thr Lys Leu Val Glu Tyr Ile Tyr Gln Ser Trp Leu Ala
85 90 95

Leu Gln Lys Arg Leu Gln Trp Arg Leu Asn Gly Gln Lys Arg Trp Leu
100 105 110

Glu Ile Leu Lys Ser Asp Gln Glu Leu Cys Gln Gln Ala Asp Cys Ser
115 120 125

Leu Glu Thr Leu Cys His Lys Ala Ser Glu Ile Leu Ala Ser Phe Gln
130 135 140

Ser Ser Thr Thr Lys Ser Lys Lys Lys Ser Lys Lys Gln Lys Asn Ser
145 150 155 160

Ser Arg Lys Ser Leu Phe Asp Ala Tyr Asp Ser Ala Glu Asp Ser Leu
165 170 175

```
Thr Arg Ser Ala Ile Ala Tyr Leu Leu Lys Asn Asn Cys Lys Ile Pro
            180                 185                 190

Glu Gln Gln Glu Asp Pro Glu Lys Phe Thr Gln Arg Arg Arg Lys Ala
        195                 200                 205

Glu Ile Lys Val Glu Arg Leu Thr Arg Gln Ile Asp Ser Ser Leu Pro
    210                 215                 220

Lys Gly Arg Asp Leu Thr Gly Glu Arg Trp Leu Glu Thr Leu Ile Thr
225                 230                 235                 240

Ala Ala Asn Lys Val Pro Gln Asn Ile Glu Glu Phe Lys Ser Trp Gln
                245                 250                 255

Asn Ile Leu Leu Thr Lys Pro Lys Ser Val Pro Phe Pro Ile Ser Tyr
            260                 265                 270

Glu Thr Asn Glu Asp Leu Thr Trp Ser Lys Asn Glu Lys Gly Arg Leu
        275                 280                 285

Cys Val Arg Phe Ser Gly Leu Ser Asp His Thr Leu Gln Ile Tyr Cys
    290                 295                 300

Asp Gln Arg Gln Leu Lys Trp Phe Gln Arg Phe Tyr Glu Asp Gln Glu
305                 310                 315                 320

Thr Lys Arg Ala Ser Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu
                325                 330                 335

Arg Ser Ala Arg Ile Leu Trp Gln Glu Gly Thr Ala Lys Gly Gln Ala
            340                 345                 350

Trp His Arg Asn Tyr Leu Ser Leu Tyr Cys Thr Val Asp Thr Arg Leu
        355                 360                 365

Trp Thr Ala Glu Gly Thr Glu Gln Val Arg Gln Glu Lys Thr Asp Glu
    370                 375                 380
```

```
Ile Thr Lys Ile Leu Thr Asn Met Glu Glu Lys Gly Asp Leu Ser Gln
385                 390                 395                 400

Thr Gln Glu Ala Phe Ile Lys Arg Lys Gln Thr Thr Leu Asp Arg Leu
                405                 410                 415

Asn Asn Ser Tyr Pro Arg Pro Ser Lys Pro Leu Tyr Gln Gly Gln Ser
            420                 425                 430

His Leu Leu Leu Gly Ile Ala Phe Gly Leu Glu Lys Pro Ala Thr Ile
        435                 440                 445

Ala Ile Val Asp Gly Thr Thr Gly Lys Ala Ile Thr Tyr Arg Ser Ile
    450                 455                 460

Lys Gln Leu Leu Gly Glu Asn Tyr Lys Leu Leu Asn Arg His Arg Lys
465                 470                 475                 480

Gln Lys Gln Val Gln Ser His Gln Arg His Lys Asn Gln Lys Lys Phe
                485                 490                 495

Ala Pro Asn Gln Leu Arg Asn Ser Glu Leu Gly Glu Tyr Ile Asp His
            500                 505                 510

Leu Ile Ala Lys Ala Ile Val Asn Ile Ala Gln Lys Tyr Lys Val Gly
        515                 520                 525

Ser Ile Val Leu Pro Lys Leu Asp Asn Ile Arg Glu Val Ile Gln Ser
    530                 535                 540

Glu Val Gln Met Arg Ala Glu Gln Lys Ile Pro Gly Val Val Glu Lys
545                 550                 555                 560

Gln Lys Glu Tyr Ala Lys Gln His Arg Ile Gln Val His Gln Trp Ser
                565                 570                 575
```

```
Tyr Asn Arg Leu Ile Glu Ser Ile Lys Ala Lys Ala Asn Gln Lys Glu
            580                 585                 590

Ile Val Ile Glu Gln Ala Lys Gln Pro Asn Arg Ile Gln Val His Gln
        595                 600                 605

Trp Ser Tyr Asn Arg Leu Ile Glu Ser Ile Lys Ala Lys Ala Asn Gln
    610                 615                 620

Lys Glu Ile Val Ile Glu Gln Ala Lys Gln Pro Ile Arg Asp Ser Ser
625                 630                 635                 640

Gln Glu Glu Ala Lys Glu Leu Ala Thr Ile Ala Tyr Lys Ser Arg
                645                 650                 655
```

<210> 485
<211> 642
<212> PRT
<213> Anabaena cylindrica

<400> 485

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Ser
1               5                   10                  15

Leu Arg Gln Leu Trp Glu Leu Met Ser Glu Lys Asn Thr Pro Phe Ile
            20                  25                  30

Asn Glu Ile Leu Leu Gln Ile Gly Lys His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Leu Glu Lys Gly Arg Ile Pro Ala Glu Leu Leu Lys Thr Leu Gly Asn
    50                  55                  60

Ser Leu Lys Thr Gln Glu Pro Phe Thr Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Thr Leu Val Asp Tyr Leu Tyr Lys Ser Trp Phe Ala
                85                  90                  95
```

```
Leu Gln Lys Arg Arg Lys Gln Gln Ile Glu Gly Lys Gln Arg Trp Leu
            100                 105                 110

Lys Met Leu Lys Ser Asp Gln Glu Leu Glu Gln Glu Ser Gln Ser Ser
        115                 120                 125

Leu Glu Val Ile Arg Asn Lys Ala Thr Glu Leu Phe Ser Lys Phe Thr
    130                 135                 140

Pro Gln Ser Asp Ser Glu Ala Leu Arg Arg Asn Gln Asn Asp Lys Gln
145                 150                 155                 160

Lys Lys Val Lys Lys Thr Lys Lys Ser Thr Lys Pro Lys Thr Ser Ser
                165                 170                 175

Ile Phe Lys Ile Phe Leu Ser Thr Tyr Glu Glu Ala Glu Glu Pro Leu
            180                 185                 190

Thr Arg Cys Ala Leu Ala Tyr Leu Leu Lys Asn Asn Cys Gln Ile Ser
        195                 200                 205

Glu Leu Asp Glu Asn Pro Glu Glu Phe Thr Arg Asn Lys Arg Arg Lys
    210                 215                 220

Glu Ile Glu Ile Glu Arg Leu Lys Asp Gln Leu Gln Ser Arg Ile Pro
225                 230                 235                 240

Lys Gly Arg Asp Leu Thr Gly Glu Glu Trp Leu Glu Thr Leu Glu Ile
                245                 250                 255

Ala Thr Phe Asn Val Pro Gln Asn Glu Asn Glu Ala Lys Ala Trp Gln
            260                 265                 270

Ala Ala Leu Leu Arg Lys Thr Ala Asn Val Pro Phe Pro Val Ala Tyr
        275                 280                 285

Glu Ser Asn Glu Asp Met Thr Trp Leu Lys Asn Asp Lys Asn Arg Leu
```

```
    290                 295                 300

Phe Val Arg Phe Asn Gly Leu Gly Lys Leu Thr Phe Glu Ile Tyr Cys
305                 310                 315                 320

Asp Lys Arg His Leu His Tyr Phe Gln Arg Phe Leu Glu Asp Gln Glu
                325                 330                 335

Ile Leu Arg Asn Ser Lys Arg Gln His Ser Ser Ser Leu Phe Thr Leu
            340                 345                 350

Arg Ser Gly Arg Ile Ala Trp Leu Pro Gly Glu Glu Lys Gly Glu His
        355                 360                 365

Trp Lys Val Asn Gln Leu Asn Phe Tyr Cys Ser Leu Asp Thr Arg Met
    370                 375                 380

Leu Thr Thr Glu Gly Thr Gln Gln Val Val Glu Glu Lys Val Thr Ala
385                 390                 395                 400

Ile Thr Glu Ile Leu Asn Lys Thr Lys Gln Lys Asp Asp Leu Asn Asp
                405                 410                 415

Lys Gln Gln Ala Phe Ile Thr Arg Gln Gln Ser Thr Leu Ala Arg Ile
            420                 425                 430

Asn Asn Pro Phe Pro Arg Pro Ser Lys Pro Asn Tyr Gln Gly Lys Ser
        435                 440                 445

Ser Ile Leu Ile Gly Val Ser Phe Gly Leu Glu Lys Pro Val Thr Val
    450                 455                 460

Ala Val Val Asp Val Val Lys Asn Lys Val Ile Ala Tyr Arg Ser Val
465                 470                 475                 480

Lys Gln Leu Leu Gly Glu Asn Tyr Asn Leu Leu Asn Arg Gln Arg Gln
                485                 490                 495
```

```
Gln Gln Gln Arg Leu Ser His Glu Arg His Lys Ala Gln Lys Gln Asn
            500                 505                 510

Ala Pro Asn Ser Phe Gly Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg
        515                 520                 525

Leu Leu Ala Asp Ala Ile Ile Ala Ile Ala Lys Lys Tyr Gln Ala Gly
    530                 535                 540

Ser Ile Val Leu Pro Lys Leu Arg Asp Met Arg Glu Gln Ile Ser Ser
545                 550                 555                 560

Glu Ile Gln Ser Arg Ala Glu Asn Gln Cys Pro Gly Tyr Lys Glu Gly
                565                 570                 575

Gln Gln Lys Tyr Ala Lys Glu Tyr Arg Ile Asn Val His Arg Trp Ser
            580                 585                 590

Tyr Gly Arg Leu Ile Glu Ser Ile Lys Ser Gln Ala Ala Gln Ala Gly
        595                 600                 605

Ile Ala Ile Glu Thr Gly Lys Gln Ser Ile Arg Gly Ser Pro Gln Glu
    610                 615                 620

Lys Ala Arg Asp Leu Ala Val Phe Thr Tyr Gln Glu Arg Gln Ala Ala
625                 630                 635                 640

Leu Ile
```

<210> 486
<211> 649
<212> PRT
<213> Calothrix sp. PCC 7103

<400> 486

```
Met Ser Ile Ile Thr Ile Gln Cys Arg Leu Val Ala Asn Asp Arg Thr
1               5                   10                  15
```

```
Leu Gln His Leu Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Ser Glu Leu Leu Glu Gln Leu Gly Lys His Pro Asp Phe Glu Thr Trp
        35                  40                  45

Leu Lys Asn Gly Lys Val Pro Lys Asp Thr Ile Lys Ile Leu Cys Asp
    50                  55                  60

Ser Leu Lys Thr Gln Ser Arg Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ser Gln Val Lys Glu Ile Tyr Lys Ser Trp Leu Thr
                85                  90                  95

Leu Gln Lys Arg Arg Gln Arg Gln Ile Glu Gly Lys Gln Arg Trp Leu
            100                 105                 110

Gly Met Leu Lys Ser Asp Val Glu Leu Gln Glu Glu Ser Asn Cys Ser
        115                 120                 125

Leu Glu Lys Ile Arg Ala Lys Gly Thr Glu Ile Leu Ala Glu Phe Val
    130                 135                 140

Ser Lys Phe Thr Lys Asp Thr Thr Lys Lys Ser Lys Thr Lys Ile Lys
145                 150                 155                 160

Ser Thr Lys Lys Ser Asn Lys Lys Thr Lys Lys Asp Thr Glu Glu Ser
                165                 170                 175

Asn Ser Thr Leu Phe Gln Ala Leu Cys Asp Ile Tyr Asp Lys Thr Glu
            180                 185                 190

Asp Thr Leu Ser Lys Cys Ala Ile Ile Tyr Leu Leu Lys Asn Asn Cys
        195                 200                 205
```

```
Gln Val Ile Asp Thr Glu Glu Asn Pro Asp Thr Phe Leu Lys Arg Lys
    210                 215                 220

Arg Ala Lys Glu Ile Glu Ile Lys Arg Leu Gln Asp Gln Ile Val Gly
225                 230                 235                 240

Arg Ile Pro Lys Gly Arg Asp Leu Thr Asp Lys Lys Trp Leu Asp Thr
                245                 250                 255

Ile Lys Leu Ala Ser Ser Gln Val Pro Gln Asp Glu Asn Glu Ala Lys
            260                 265                 270

Ser Trp Gln Asn Gln Leu Leu Lys Thr Ser Ser Ser Val Pro Tyr Ser
        275                 280                 285

Val Asp Tyr Glu Thr Asn Thr Asp Ile Lys Trp Val Lys His Asn Asn
    290                 295                 300

Gly Ser Ile Phe Val Asn Phe Asn Gly Leu Gly Glu His Gln Phe Glu
305                 310                 315                 320

Val Tyr Cys Asp Ser Arg Gln Leu Pro Tyr Phe Gln Arg Phe Cys Glu
                325                 330                 335

Asp Met Gln Ile Trp His Asn Asp Glu Glu Lys Tyr Ser Ser Ala Leu
            340                 345                 350

Phe Met Leu Arg Ser Ala Arg Leu Val Trp Leu Glu Lys Lys Gly Arg
        355                 360                 365

Gly Lys Pro Trp Asn Val Asn Tyr Leu Tyr Leu His Cys Ser Leu Asp
    370                 375                 380

Thr Ser Leu Trp Thr Ala Glu Gly Thr Glu Gln Ile Arg Ile Asn Lys
385                 390                 395                 400

Ile Asn Glu Thr Asp Glu Ala Ile Ala Lys Ala Lys Thr Lys Asp Lys
                405                 410                 415
```

```
Gln Glu Leu Thr Glu Asn Gln Leu Ala Tyr Leu Gln Arg Gln Gln Ser
            420                 425                 430

Thr Arg Asn Lys Leu Asn Asn Ser Phe Pro Gly Arg Pro Ser Lys Pro
        435                 440                 445

Ile Tyr Lys Gly Asn Ser His Ile Leu Val Gly Val Ser Leu Gly Leu
    450                 455                 460

Glu Lys Pro Val Thr Val Ala Ala Val Asp Val Val Ser Asn Lys Val
465                 470                 475                 480

Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Gln Asn Tyr Lys Leu
                485                 490                 495

Leu Asn Arg Gln Arg Gln Gln Gln Lys His Leu Ala Gln Lys Arg His
            500                 505                 510

Glu Ser Gln Lys Lys Gln Ala Pro Asn Gln Phe Gly Glu Ser Glu Leu
        515                 520                 525

Gly Leu Tyr Val Asp Arg Leu Leu Ala Lys Ser Ile Ile Asn Phe Ala
    530                 535                 540

Lys Thr Tyr Gln Ala Ser Ser Ile Ala Leu Pro Lys Leu Arg Asp Met
545                 550                 555                 560

Arg Glu Ile Ile Gln Ser Glu Ile Gln Ala Lys Ala Glu Ser Lys Ile
                565                 570                 575

Pro Gly Tyr Lys Glu Gly Gln Glu Lys Tyr Ala Lys Glu Tyr Arg Met
            580                 585                 590

Ser Val His Arg Trp Ser Tyr Gly Arg Leu Ile Gly Asn Ile Gln Ala
        595                 600                 605
```

```
Gln Ala Ala Gln Ala Gly Ile Leu Ile Glu Thr Ser Ser Gly Gln Ile
    610                 615                 620

Arg Gly Ser Pro Gln Glu Gln Ala Lys His Leu Ala Ile Ser Ala Tyr
625                 630                 635                 640

Ile Glu Arg Gln Thr Ile Leu Asn Lys
                645
```

<210> 487
<211> 667
<212> PRT
<213> Cyanothece sp. PCC 8802

<400> 487

```
Met Ser Thr Ile Thr Ile Gln Cys Arg Leu Val Ala Pro Glu Ala Thr
1               5                   10                  15

Arg Gln Ala Leu Trp Gln Leu Met Ala Gln Lys Asn Thr Pro Leu Val
            20                  25                  30

Ser Glu Leu Leu Arg Gln Val Ala Gln His Pro Asp Phe Glu Thr Trp
        35                  40                  45

Arg Gln Gln Gly Lys Leu Glu Ala Gly Ile Ile Lys Lys Leu Cys Glu
    50                  55                  60

Pro Leu Lys Lys Asp Pro Arg Phe Asn Glu Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Ile Tyr Lys Ser Trp Leu Lys
                85                  90                  95

Leu Gln Gln Arg Leu Gln Arg Lys Leu Glu Gly Gln Asn Arg Trp Leu
            100                 105                 110

Ala Met Leu Lys Ser Asp Asp Glu Leu Ile Gln Ile Ser Gln Thr Asn
        115                 120                 125
```

```
Ile Glu Ile Ile Gln Ala Lys Ala Thr Glu Ile Leu Ser Thr Leu Gln
    130                 135                 140

Pro Gln Asp Arg Glu Gln Ser Ser Lys Lys Lys Ala Lys Lys Cys Lys
145                 150                 155                 160

Lys Ser Thr Asn Lys Asn Ser Leu Phe Ser Gln Leu Asp Lys Leu Tyr
                165                 170                 175

Asn Glu Ile Asn Asn Asn Leu Thr His Cys Ala Ile Arg Tyr Leu Leu
            180                 185                 190

Lys Asn Gly Gly Lys Ile Pro Gln Arg Pro Glu Asp Thr Glu Lys Phe
        195                 200                 205

Ala Gln Arg Arg Arg Lys Val Glu Ile Lys Ile Glu Arg Ile Ile Glu
    210                 215                 220

Gln Ile Glu Ser Ser Ile Pro Gln Gly Arg Asp Leu Thr Gly Asp Ser
225                 230                 235                 240

Trp Leu Glu Thr Leu Ile Ile Ala Ala Asn Thr Ala Thr Val Glu Ala
                245                 250                 255

Glu Asp Val Lys Ser Trp Gln Asp Lys Leu Leu Ser Gln Ser Lys Ser
            260                 265                 270

Ile Pro Tyr Pro Val Ala Tyr Glu Thr Asn Glu Asp Leu Thr Trp Ser
        275                 280                 285

Ile Asn Glu Lys Gly Arg Leu Cys Val Arg Phe Asn Gly Leu Gly Lys
    290                 295                 300

His Thr Phe Gln Ile Tyr Cys Asp Gln Arg Gln Leu Lys Trp Phe Gln
305                 310                 315                 320

Arg Phe Tyr Glu Asp Gln Gln Ile Lys Lys Asp Gly Lys Asp His His
```

```
                325                 330                 335

Ser Ser Ala Leu Phe Ser Leu Arg Ser Gly Arg Ile Val Trp Gln Glu
            340                 345                 350

Gly Leu Gly Lys Gly Lys Pro Trp Asn Ile His Arg Leu Thr Leu His
        355                 360                 365

Cys Ser Leu Asp Thr Arg Phe Trp Thr Glu Glu Gly Thr Gln Gln Val
    370                 375                 380

Gln Gln Glu Lys Ser Lys Lys Phe Gln Thr Asn Arg Leu Arg Met Lys
385                 390                 395                 400

Pro Glu Leu Thr Phe Ser Ile Phe Phe Arg Ser Gln Thr Leu Glu Thr
                405                 410                 415

Tyr Leu Gln Val Trp Leu Val Ile Thr Ala Tyr Arg Leu Gln Ser Phe
            420                 425                 430

Leu Asp Lys Gly Asn Val Ala Lys Ala His Gln Glu Phe Gln Lys Ala
        435                 440                 445

Ile Lys Arg Asn Glu Ser Ser Leu Gln Lys Ile Thr Ser Ser Tyr Asn
    450                 455                 460

Arg Pro His Lys Thr Leu Tyr Gln Gly Lys Ser His Ile Phe Val Gly
465                 470                 475                 480

Val Ala Met Gly Leu Glu Lys Pro Ala Thr Val Ala Val Val Asp Gly
                485                 490                 495

Thr Thr Gly Lys Ala Ile Ala Tyr Arg Ser Leu Lys Gln Leu Leu Gly
            500                 505                 510

Asn Asn Tyr His Leu Phe Asn Arg Gln Gly Lys Gln Lys Gln Asn Thr
        515                 520                 525
```

```
Ser His Gln Arg His Lys Ser Gln Lys His Phe Ala Asp Asn Gln Phe
    530                 535                 540


Gly Glu Ser Gln Leu Gly Gln Tyr Ile Asp Cys Leu Leu Ala Lys Ala
545                 550                 555                 560


Ile Ile Ser Val Ala Gln Thr Tyr Cys Ala Gly Ser Ile Val Val Pro
                565                 570                 575


Lys Leu Lys Asp Met Arg Glu Leu Ile Gln Ser Glu Ile Gln Ala Lys
            580                 585                 590


Ala Glu Ala Lys Ile Pro Gly Tyr Val Glu Gly Gln Ala Lys Tyr Ala
        595                 600                 605


Lys Ser Tyr Arg Val Gln Val His Gln Trp Ser His Gly Arg Leu Ile
    610                 615                 620


Asp Asn Ile Thr Ser Gln Ala Ser Lys Phe Asn Ile Thr Val Glu Glu
625                 630                 635                 640


Gly Glu Gln Pro His Gln Gly Asn Pro Gln Asp Lys Ala Lys Leu Leu
                645                 650                 655


Ala Ile Ala Ala Tyr His Ser Arg Leu Cys Ala
            660                 665


<210>  488
<211>  661
<212>  PRT
<213>  Gloeocapsa sp. PCC 73106

<400>  488

Met Ser Thr Ile Thr Ile Gln Cys Arg Leu Val Ala Pro Glu Thr Thr
1               5                   10                  15


Arg Gln Ala Leu Trp Glu Leu Met Ala Gln Lys Asn Thr Pro Leu Val
            20                  25                  30
```

```
Ser Glu Leu Leu Arg Gln Val Ala Gln His Phe Asp Phe Glu Thr Trp
        35                  40                  45

Arg Gln Lys Gly Lys Leu Glu Val Gly Ile Ile Lys Lys Leu Cys Glu
    50                  55                  60

Pro Leu Lys Lys Asp Pro Arg Phe Ser Asn Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Ile Tyr Gln Ser Trp Leu Lys
                85                  90                  95

Leu Gln Gln Arg Leu Gln Arg Lys Leu Glu Gly Gln Asn Arg Trp Leu
            100                 105                 110

Val Met Leu Lys Ser Asp Glu Glu Leu Val Gln Ile Ser His Ser Ser
        115                 120                 125

Leu Glu Thr Ile Gln Ala Lys Ala Thr Glu Ile Leu Ser Ser Leu Lys
    130                 135                 140

Arg Asp Pro Lys Ser Thr Lys Lys Gly Lys Asn Ser Gln Lys Asn Lys
145                 150                 155                 160

Ser Leu Phe Thr Gln Leu Tyr Asp Leu Tyr Asp Lys Thr Glu Asn Thr
                165                 170                 175

Leu Thr Arg Cys Gly Ile Cys Tyr Leu Leu Lys Asn Gly Cys Lys Ile
            180                 185                 190

Ser Lys Lys Pro Glu Glu Pro Glu Lys Phe Ala Gln Arg Arg Arg Lys
        195                 200                 205

Val Glu Ile Lys Ile Glu Arg Leu Ile Glu Gln Ile Glu Gly Ser Ile
    210                 215                 220
```

```
Pro Gln Gly Arg Asp Leu Thr Ala Asp Cys Trp Leu Glu Thr Leu Asn
225                 230                 235                 240

Ile Ala Ala Asn Thr Ala Thr Val Asp Ala Thr Glu Val Lys Ser Trp
                245                 250                 255

Gln Asp Gln Leu Leu Ser Gln Ser Lys Ser Ile Pro Tyr Pro Val Ala
            260                 265                 270

Tyr Glu Thr Asn Glu Asp Leu Thr Trp Ser Ile Asn Glu Lys Gly Arg
        275                 280                 285

Leu Cys Val Arg Phe Asn Gly Leu Gly Lys His Thr Phe Gln Ile Tyr
    290                 295                 300

Cys Asp Gln Arg Gln Leu Lys Trp Phe Gln Arg Phe Tyr Glu Asp Gln
305                 310                 315                 320

Gln Ile Lys Lys Asn Gly Lys Asn Gln His Ser Ser Ala Leu Phe Thr
                325                 330                 335

Leu Arg Ser Gly Arg Ile Val Trp Gln Glu Gly Lys Ser Lys Gly Lys
            340                 345                 350

Pro Trp Asn Ile His Ser Leu Ala Leu His Cys Ser Leu Asp Thr Arg
        355                 360                 365

Phe Trp Thr Glu Glu Gly Thr Glu Gln Ile Gln Gln Glu Lys Ser Gln
    370                 375                 380

Gln Phe Gln Arg Asn Arg Leu Arg Met Lys Pro Glu Leu Thr Phe Gly
385                 390                 395                 400

Ile Phe Phe Arg Ser Gln Gln Leu Glu Thr Phe Leu Gln Leu Trp Leu
                405                 410                 415

Val Ile Thr Ala Tyr Arg Phe Gln Ser Phe Leu Glu Lys Gly Asn Ile
            420                 425                 430
```

```
Ala Lys Ala Asn His Asp Phe Gln Lys Ala Ile Gln Arg Asn Glu Ser
        435                 440                 445

Ser Arg Gln Lys Ile Thr Asn Ser Tyr Asn Arg Pro His Lys Pro Leu
    450                 455                 460

Tyr Gln Gly Lys Ser Asn Ile Leu Val Gly Val Ala Met Gly Leu Glu
465                 470                 475                 480

Lys Pro Ala Thr Val Ala Val Val Asp Gly Thr Thr Gly Lys Ala Ile
                485                 490                 495

Ala Tyr Arg Ser Leu Lys Gln Leu Leu Gly Glu Asn Tyr Pro Leu Leu
            500                 505                 510

Asn Arg Gln Arg Lys Gln Lys Gln Lys Ser Ser His Gln Arg His Lys
        515                 520                 525

Ala Gln Lys Ser Ser Ser Asn Asn Gln Phe Gly Glu Ser Glu Leu Gly
    530                 535                 540

Gln Tyr Ile Asp Arg Leu Leu Ala Lys Ala Ile Val Ala Val Ala Lys
545                 550                 555                 560

Thr Tyr Gln Gly Gly Ser Ile Ile Val Pro Arg Leu Lys Asp Met Arg
                565                 570                 575

Glu Leu Ile Gln Ser Glu Ile Gln Ala Lys Ala Glu Ala Lys Ile Ser
            580                 585                 590

Gly Tyr Val Glu Gly Gln Lys Lys Tyr Ala Lys Ser Tyr Arg Val Gln
        595                 600                 605

Val His Gln Trp Ser Tyr Gly Arg Leu Ile Thr Glu Ile Thr Ser Gln
    610                 615                 620
```

```
Ala Ser Lys Leu Gly Ile Leu Ile Glu Glu Ser Glu Gln Ile Tyr His
625                 630                 635                 640


Asn Asn Pro Gln Lys Gln Ala Gln Tyr Leu Ala Ile Ser Ala Tyr Cys
                645                 650                 655


Ala Arg Leu Ser Ala
            660
```

<210> 489
<211> 650
<212> PRT
<213> Calothrix parasitica

<400> 489

```
Met Ser Phe Lys Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Gln Leu Met Ala His Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Leu Gln Val Ala Gln His Pro Asp Phe Glu Thr Trp
        35                  40                  45


Arg Lys Lys Gly Lys Ile Ala Lys Gly Ile Ile Thr Gln Leu Cys Gln
    50                  55                  60


Ser Leu Lys Thr Asp Leu Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Thr Phe Val Asp Cys Ile Tyr Lys Ser Trp Leu Glu
                85                  90                  95


Leu Met Lys Leu Asn Gln Arg Arg Leu Glu Gly Lys Asn Arg Trp Gln
            100                 105                 110


Lys Met Leu Lys Ser Asp Ala Glu Leu Val Glu Asp Ser Ser Ala Ser
        115                 120                 125
```

```
Leu Asp Leu Ile Arg Ser Lys Ala Thr Glu Ile Leu Ala Gln Ala Gln
    130                 135                 140

Leu Asn Ser Glu Ser Leu Ser Ala Glu Asn Gln Glu Asn Asn Lys Ser
145                 150                 155                 160

Glu Lys Ser Ile Lys Lys Gln Lys Lys Gly Lys Lys Lys Asn Asn Lys
                165                 170                 175

Lys Ser Glu Glu Ser Glu Glu Asn Lys Ser Leu Ser Lys Ala Leu Phe
            180                 185                 190

Asp Ala Tyr Glu Asn Thr Glu Asp Ile Leu Thr Arg Cys Ala Ile Ser
        195                 200                 205

Tyr Leu Leu Lys Asn Gly Cys Lys Val Thr Asn Lys Glu Glu Asp Pro
    210                 215                 220

Glu Lys Phe Thr Ile Arg Arg Arg Lys Leu Glu Ile Glu Ile Glu Asp
225                 230                 235                 240

Leu Gln Glu Lys Leu Glu Ala Arg Leu Pro Lys Ala Arg Asp Leu Thr
                245                 250                 255

Asp Ser Ser Trp Leu Asn Asn Leu Glu Leu Ala Thr Lys Gln Val Pro
            260                 265                 270

Glu Ser Glu Glu Glu Ala Lys Ser Trp Gln Asp Ala Leu Leu Lys Lys
        275                 280                 285

Ser Ser Ser Val Pro Phe Pro Ile Ala Tyr Glu Thr Asn Glu Asp Met
    290                 295                 300

Thr Trp Phe Lys Asn Glu Lys Gly Arg Ile Cys Val Lys Phe Asn Gly
305                 310                 315                 320

Ile Gly Glu His Thr Phe Glu Ile Tyr Cys Asn Lys Arg Gln Leu His
```

```
                325                 330                 335

Trp Phe Lys Arg Phe Leu Leu Asp Gln Glu Thr Lys Lys Asn Ser Asn
            340                 345                 350

Asp Gln Tyr Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Leu Ile Leu
        355                 360                 365

Trp Gln Glu Arg Asp Lys Lys Gly Lys Pro Trp Asn Ile Asn Tyr Leu
    370                 375                 380

Ala Leu His Cys Cys Val Asp Thr Arg Leu Trp Thr Ala Glu Gly Thr
385                 390                 395                 400

Gln Val Val Ala Glu Glu Lys Ala Glu Glu Ile Thr Arg Ile Ile Ser
                405                 410                 415

Asn Ala Lys Lys Lys Asp Asn Leu Asn Lys Asn Gln Leu Thr Phe Ile
            420                 425                 430

Lys Arg Lys Lys Thr Thr Leu Ala Arg Ile Asn Asn Pro Tyr Pro Arg
        435                 440                 445

Pro Ser Lys Pro Leu Tyr Lys Gly Gln Ser Asn Ile Ile Leu Gly Leu
    450                 455                 460

Tyr Leu Gly Leu Lys Glu Arg Ala Thr Ile Ala Val Val Asp Val Asn
465                 470                 475                 480

Ala Gly Lys Val Leu Ile Asn Gln Ser Thr Lys Gln Leu Leu Gly Asn
                485                 490                 495

Asn Tyr Arg Leu Ile Asp Arg Gln Arg Arg Gln Lys Arg Lys Leu Ser
            500                 505                 510

His Gln Arg Lys Ile Ala Gln Thr Gln Ser Lys Pro Asn Asn Phe Lys
        515                 520                 525
```

```
Glu Ser Asp Leu Gly Glu Tyr Ile Asp Arg Leu Leu Ala Lys Lys Ile
    530                 535                 540

Val Glu Ile Ala Gln Lys Phe Ser Ala Ser Ser Ile Val Leu Pro Lys
545                 550                 555                 560

Leu Thr Asn Met Arg Glu Gln Ile Asn Ser Glu Ile Gln Ala Lys Ala
                565                 570                 575

Glu Lys Lys Cys Pro Glu Ser Ile Glu Val Gln Lys Lys Tyr Ala His
            580                 585                 590

Gln Tyr Arg Ile Asn Leu Asn Asn Trp Ser Tyr Gly Arg Leu Thr Gln
        595                 600                 605

Asn Ile Gln Asn Leu Ala Ser Gln Val Gly Leu Thr Val Glu Glu Asn
    610                 615                 620

Glu Gln Pro Leu Lys Gly Ser Pro Lys Glu Lys Ala Lys Glu Leu Ala
625                 630                 635                 640

Leu Val Ala Tyr Lys Ala Arg Asn Lys Ser
                645                 650
```

<210> 490
<211> 629
<212> PRT
<213> filamentous cyanobacterium CCP3

<400> 490

```
Met Ser Gln Lys Thr Ile Gln Cys Arg Leu Ile Ala Pro Pro Ala Thr
1               5                   10                  15

Arg Gln Tyr Leu Trp Met Leu Ala Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Ala Leu Ile Gln Ala Val Val Thr His Asp Asp Phe Glu Ala Trp
        35                  40                  45
```

```
Arg Leu Lys Gly Arg His Pro Ala Asp Val Val Thr Lys Leu Cys Lys
    50                  55                  60

Ser Leu Lys Asp Glu Ala Pro Phe Ser Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Val Ser Ala Glu Lys Ala Val Asn Tyr Ile Phe Lys Ser Trp Phe Thr
                85                  90                  95

Leu Gln Ser Arg Leu Gln Arg Gln Ile Thr Gly Lys Gln Met Trp Leu
            100                 105                 110

Thr Ile Leu Lys Ser Asp Asp Glu Leu Thr Glu Met Cys Gly Gln Asp
        115                 120                 125

Leu Glu Ala Ile Gln Lys Lys Ala Val Gln Ile Leu Ala Gln Leu Glu
    130                 135                 140

Lys Ala Val Glu Thr Asp Lys Ala Glu Gly Gly Pro Gly Lys Ser Ala
145                 150                 155                 160

Lys Asp Leu Ile Arg Val Gln Leu Phe Lys Lys His Asp Gly Ala Lys
                165                 170                 175

Gln Pro Leu Ile Arg Cys Ala Thr Ala Tyr Leu Leu Lys Asn Gly Gly
            180                 185                 190

Lys Leu Pro Glu Lys Pro Glu Asp Pro Asp Lys Phe Ala Gln Arg Arg
        195                 200                 205

Arg Lys Ala Glu Ile Gln Val Gln Arg Leu Gln Asp Gln Ile Glu Ala
    210                 215                 220

Arg Ile Pro Lys Gly Arg Asp Leu Thr Gly Gln Ala Trp Leu Ser Ala
225                 230                 235                 240
```

```
Leu Leu Thr Ala Thr Thr Thr Val Pro Lys Asp Asn Arg Glu His Lys
                245                 250                 255

Gln Trp Gln Asp Lys Leu Leu Ala Gln Pro Arg Thr Ile Pro Phe Pro
            260                 265                 270

Ile Leu Phe Glu Thr Asn Glu Asp Leu Val Trp Ser Arg Asn Gln Ala
        275                 280                 285

Gly Arg Leu Cys Val Arg Phe Asn Gly Leu Ser Glu His Thr Phe Gln
    290                 295                 300

Ile Tyr Cys Asp Gln Arg Gln Leu Pro Trp Phe Gln Arg Phe Leu Glu
305                 310                 315                 320

Asp Gln Asn Thr Lys Arg Ala Ser Lys Asn Gln His Ser Ser Ala Leu
                325                 330                 335

Phe Ala Leu Arg Ser Ala Arg Ile Ser Trp Gln Glu Ala Glu Arg Lys
            340                 345                 350

Gly His Pro Trp Asp Ala His Tyr Leu Thr Leu Ser Cys Thr Val Asp
        355                 360                 365

Thr Arg Leu Trp Ser Ala Glu Gly Thr Glu Asp Val Arg Gln Glu Lys
    370                 375                 380

Ala Ala Glu Thr Ala Lys Val Leu Ala Arg Leu Ser Glu Lys Gly Arg
385                 390                 395                 400

Leu Ser Asp Thr Gln Gln Ser Tyr Ala Lys Arg Leu Thr Ser Thr Leu
                405                 410                 415

Glu Arg Leu Asn Ser Pro Phe Asp Arg Pro Ser Tyr Pro Arg Tyr Gln
            420                 425                 430

Gly Asn Pro His Ile Ile Val Ser Leu Ser Leu Gly Trp Asp Asn Pro
        435                 440                 445
```

```
Leu Thr Leu Ala Val Trp Asn Ala Lys Thr Gln Glu Val Leu Ala Tyr
    450                 455                 460

Arg Ser Leu Arg Gln Leu Leu Gly Lys Asp Tyr Ala Leu Phe Leu Arg
465                 470                 475                 480

Gln Arg Arg Glu Gln Gly Lys Arg Ser His Asp Arg His Lys Ala Gln
                485                 490                 495

Arg Gln Gly Lys Asn Asn Gln Phe Gly Thr Ser Asn Leu Gly Glu His
            500                 505                 510

Val Asp Arg Leu Leu Ala Lys Ala Val Val Val Thr Ala Gln Gln Tyr
        515                 520                 525

Gly Ala Gly Ser Ile Ala Ile Pro Lys Leu Asp Asn Ile Arg Glu Ile
    530                 535                 540

Leu Gln Ala Glu Ile Gln Ala Lys Ala Glu Gln Lys Ala Pro Gly Ser
545                 550                 555                 560

Ile Glu Gly Gln Lys Arg Tyr Ala Lys Gln Tyr Lys Ser Ser Ile His
                565                 570                 575

Lys Trp Ser Tyr Gly Arg Leu Leu Asp Gln Ile Ala Ser Lys Ala Ala
            580                 585                 590

Gln Asn Gly Met Ala Ile Glu Thr Val Lys Gln Pro Trp Gln Pro Asn
        595                 600                 605

Val Gly Glu Met Ala Lys Ala Val Ala Ile Ala Ala Tyr Glu Ser Arg
    610                 615                 620

Lys Val Val Val His
625
```

<210> 491
<211> 639
<212> PRT
<213> Calothrix parietina

<400> 491

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Asp Glu Glu Thr
1               5                  10                  15


Leu Arg His Leu Trp Thr Leu Met Ala Glu Lys Asn Thr Pro Phe Ala
            20                  25                  30


Asn Glu Ile Leu Glu Gln Leu Ala Gln His Ala Glu Phe Glu Ser Trp
        35                  40                  45


Val Lys Asn Ser Arg Val Pro Ala Thr Val Ile Lys Glu Leu Cys Asp
    50                  55                  60


Ser Leu Lys Asn Gln Glu Leu Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Thr Thr Leu Val Thr Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95


Val Asn Lys Arg Leu Gln Arg Lys Ile Glu Gly Lys Lys Gln Trp Leu
            100                 105                 110


Asp Met Leu Arg Ser Asp Thr Glu Leu Glu Gln Glu Ser Asn Ser Asn
        115                 120                 125


Leu Glu Lys Ile Arg Ala Lys Ala Thr Glu Ile Leu Asp Ser Phe Ala
    130                 135                 140


Thr Arg Gln Ile Asn Gln Val Asn Ser Lys Ser Lys Thr Ser Lys Asn
145                 150                 155                 160


Asn Lys Asn Lys Gln Glu Lys Glu Val Lys Ser Leu Ser Ile Gln Ser
                165                 170                 175
```

```
Asn Ile Leu Phe Glu Thr Tyr Arg Gln Thr Glu Asp Asn Leu Thr Lys
            180                 185                 190

Cys Ala Ile Val Tyr Leu Leu Lys Asn Asn Cys Glu Val Asn Asp Val
        195                 200                 205

Glu Glu Asp Ile Glu Glu Tyr Glu Lys Asn Lys Arg Lys Lys Glu Ile
    210                 215                 220

Gln Ile Lys Arg Leu Glu Asp Gln Leu Lys Ser Arg Val Pro Lys Gly
225                 230                 235                 240

Arg Asp Leu Thr Gly Glu Lys Trp Val Glu Val Leu Glu Lys Ala Val
                245                 250                 255

Asn Ser Val Pro Glu Ser Glu Asn Glu Ala Lys Ser Trp Gln Ala Ser
            260                 265                 270

Leu Leu Arg Lys Ser Ser Gln Ile Pro Phe Pro Val Val Tyr Glu Thr
        275                 280                 285

Asn Glu Asp Ile Lys Trp Ser Ile Asn Glu Lys Gly Arg Ile Phe Val
    290                 295                 300

Ser Phe Asn Gly Leu Gly Lys Leu Lys Phe Glu Ile Phe Cys Asp Lys
305                 310                 315                 320

Arg His Leu His Tyr Phe Gln Arg Phe Leu Glu Asp Gln Asp Ile Lys
                325                 330                 335

Arg Gln Gly Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser
            340                 345                 350

Gly Arg Ile Ser Trp Leu Glu Gln Pro Gly Lys Gly Lys Pro Trp Asn
        355                 360                 365

Ile Asn Arg Leu Leu Leu Phe Cys Ser Ile Asp Thr Arg Met Leu Thr
```

```
    370                 375                 380

Ala Glu Gly Thr Gln Gln Val Ile Glu Glu Lys Ile Ala Asp Thr Gln
385                 390                 395                 400

Asn Lys Ile Ala Lys Ala Gln Glu Lys Cys Glu Gly Glu Leu Asn Pro
                405                 410                 415

Asn Gln Gln Ala His Ile Asn Arg Lys Lys Ser Thr Leu Ala Arg Ile
            420                 425                 430

Asn Thr Pro Phe Pro Arg Pro Ser Lys Pro Leu Tyr Gln Gly Lys Ser
        435                 440                 445

His Ile Val Val Gly Val Ser Leu Gly Leu Lys Ala Thr Ala Thr Ile
    450                 455                 460

Ala Val Phe Asp Ala Met Asn Asn Gln Val Leu Ala Tyr Arg Ser Thr
465                 470                 475                 480

Lys Gln Leu Leu Gly Asp Asn Tyr Lys Leu Leu Asn Arg Gln Gln Gln
                485                 490                 495

Gln Lys Gln Arg Leu Ser Gln Gln Arg His Lys Ser Gln Lys Gln Phe
            500                 505                 510

Ala Ser Asn Ser Phe Gly Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg
        515                 520                 525

Leu Leu Ala Lys Glu Ile Val Ala Val Ala Lys Asn Phe Gly Ala Gly
    530                 535                 540

Ser Ile Val Leu Pro Lys Leu Gly Asp Met Arg Glu Ile Ile Gln Ser
545                 550                 555                 560

Glu Val Gln Ala Lys Ala Glu Lys Lys Ile Pro Gly Phe Ile Glu Leu
                565                 570                 575
```

Gln Lys Asn Tyr Ala Lys Glu Tyr Arg Lys Ser Ala His Asn Trp Ser
580 585 590

Tyr Gly Arg Leu Ile Glu Asn Ile Gln Ser Gln Ala Thr Lys Glu Gly
595 600 605

Ile Glu Ile Glu Thr Gly Lys Gln Pro Thr Arg Gly Ile Pro Gln Glu
610 615 620

Gln Ala Arg Asp Leu Ala Leu Phe Ala Tyr Gln Cys Arg Ile Ala
625 630 635

<210> 492
<211> 616
<212> PRT
<213> Geminocystis sp. NIES-3709

<400> 492

Met Ala His Val Thr Ile Gln Cys Arg Leu Ile Ala Ser Arg Asp Thr
1 5 10 15

Arg Gln Phe Leu Trp Gln Leu Met Ala Gln Lys Asn Thr Pro Leu Ile
20 25 30

Asn Glu Ile Leu Leu Arg Ile Lys Gln His Pro Asp Phe Pro His Trp
35 40 45

Arg Thr Lys Lys Arg Leu Pro Lys Asp Phe Leu Ala Arg Gln Ile Ala
50 55 60

Glu Leu Lys Asn Asn Tyr Pro Phe Glu Glu Gln Pro Ser Arg Phe Tyr
65 70 75 80

Ala Ser Val Asn Lys Val Ile Asp Tyr Ile Tyr Lys Ser Trp Phe Glu
85 90 95

Val Gln Lys Ala Leu Asp Trp Lys Leu Gln Gly Asn Leu Arg Trp Val
100 105 110

```
Glu Met Leu Leu Pro Asp Thr Glu Leu Ile Lys His Phe Asp Asn Ser
        115                 120                 125

Leu Glu Ser Leu Gln Gln Gln Ala Thr Leu Ile Leu Asp Ser Ile Asp
    130                 135                 140

Ser Thr Val Ser His Asp Arg Ile Ser Thr Ile Leu Phe Glu Lys Cys
145                 150                 155                 160

Gly Lys Thr Lys Lys Pro Glu Ile Lys Ser Ala Ile Ile Tyr Leu Leu
                165                 170                 175

Lys Asn Gly Cys Thr Ile Pro Lys Lys Pro Glu Thr Thr Glu Lys Tyr
            180                 185                 190

Gln Asp Leu Lys Arg Lys Val Glu Ile Lys Ile Thr Lys Leu His Arg
        195                 200                 205

Gln Ile Glu Ser Arg Ile Pro Leu Gly Arg Asp Leu Glu Asp Lys Lys
    210                 215                 220

Trp Leu Asp Thr Leu Ile Thr Ala Ser Thr Thr Ala Pro Ile Asp Gln
225                 230                 235                 240

Thr Glu Ala Asn Thr Trp Phe Ser Ile Leu Lys Gln Asn Gln Ser Ser
                245                 250                 255

Ile Pro Tyr Pro Ile Leu Tyr Glu Thr Asn Glu Asp Leu Lys Trp Ser
            260                 265                 270

Leu Asn Glu Lys Asn Arg Leu Ser Ile Arg Phe Ser Gly Leu Gly Glu
        275                 280                 285

His Ser Phe Gln Leu Cys Cys Asp His Arg Gln Leu Pro Tyr Phe Gln
    290                 295                 300
```

```
Arg Phe Tyr Glu Asp Gln Glu Leu Lys Lys Ala Ser Lys Asp Gln Leu
305                 310                 315                 320

Ser Ser Ala Leu Phe Thr Leu Arg Ser Ala Met Ile Leu Trp Lys Glu
                325                 330                 335

Asp Glu Gly Lys Gly Glu Leu Trp Asp Arg His Lys Leu Tyr Leu His
            340                 345                 350

Cys Thr Phe Glu Thr Arg Cys Leu Thr Ala Glu Gly Thr Ser Thr Ile
        355                 360                 365

Val Glu Glu Lys Gln Lys Glu Val Thr Lys Ile Ile Asp Leu Met Lys
    370                 375                 380

Ala Lys Glu Glu Leu Ser Asp Ser Gln Gln Ala Phe Ile Arg Arg Lys
385                 390                 395                 400

Asn Ser Thr Leu Ala Lys Leu Asn Asn Thr Phe Pro Arg Pro Ser Lys
                405                 410                 415

Pro Val Tyr Gln Gly Lys Pro Asn Val His Leu Gly Ile Ala Met Gly
            420                 425                 430

Leu Glu Gln Pro Val Thr Ile Ala Ile Val Asp Ile Glu Thr Asp Lys
        435                 440                 445

Val Ile Thr Tyr Arg Asn Thr Lys Gln Leu Leu Arg Glu Asp Tyr Arg
    450                 455                 460

Leu Leu Arg Arg Arg Arg Ile Glu Lys Gln Lys Leu Ser His Gln Asn
465                 470                 475                 480

His Lys Ala Arg Lys Arg Phe Asn Phe Gln Gln Lys Gly Glu Ser Asn
                485                 490                 495

Leu Gly Glu Tyr Leu Asp Arg Leu Ile Ala Lys Ala Ile Leu Thr Val
            500                 505                 510
```

```
Ala Gln Glu Tyr Gln Val Ser Thr Ile Leu Ile Pro Arg Leu Arg Asp
        515                 520                 525

Met Arg Ser Ile Thr Glu Ala Glu Ile Gln Leu Arg Ala Glu Lys Lys
    530                 535                 540

Ile Pro Glu Tyr Lys Glu Gly Gln Lys Lys Tyr Ala Gln Asp Tyr Arg
545                 550                 555                 560

Val Gln Val His Gln Trp Ser Tyr Gly Arg Leu Ile Glu Asn Val Lys
                565                 570                 575

Leu Ile Cys Glu Lys Val Gly Ile Val Val Val Glu Ala Lys Gln Pro
            580                 585                 590

Lys Gln Gly Thr Leu Thr Glu Lys Ala Leu Gln Leu Val Leu Ser Ala
        595                 600                 605

Thr Glu Lys Asn Leu Lys Lys Lys
    610                 615
```

<210> 493
<211> 612
<212> PRT
<213> Cyanothece sp. PCC 8802

<400> 493

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Lys Glu Pro Thr
1               5                   10                  15

Arg Gln Thr Leu Trp Gln Leu Met Ala Glu Leu Asn Thr Pro Phe Ile
            20                  25                  30

Asn Glu Leu Leu Gln Lys Val Ala Gln Asn Pro Asp Phe Glu Gln Trp
        35                  40                  45

Arg Gln Lys Gly Lys Leu Gln Lys Ser Val Ile Lys Gln Leu Gly Asp
```

```
    50                  55                  60

Lys Leu Lys Lys Asp Pro Arg Tyr Leu Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Gly Ile Ser Leu Val Glu Tyr Ile Phe Lys Ser Trp Leu Lys
                85                  90                  95

Leu Gln Gln Arg Leu Gln Arg Lys Leu Asp Gly Lys Arg Arg Trp Leu
            100                 105                 110

Thr Val Leu Lys Ser Asp Glu Glu Leu Ile Gln Gln Ser Gln Gln Asn
        115                 120                 125

Leu Glu Ala Ile Arg His Lys Ala Ser Glu Ile Leu Gln Thr His Gln
    130                 135                 140

Lys Thr Glu Lys Leu Phe Asn His Leu Phe Gln Leu Tyr Gln Glu Glu
145                 150                 155                 160

Lys Asn Pro Phe Thr His Ile Ala Leu Cys Tyr Leu Leu Lys Asn Arg
                165                 170                 175

Cys Lys Leu Pro Gln Lys Pro Glu Asp Pro Glu Lys Phe Thr Lys Arg
            180                 185                 190

Arg Arg Lys Val Glu Ile Ala Ile Asp Arg Leu Gln Glu Gln Leu Glu
        195                 200                 205

Gly Arg Leu Pro Gln Gly Arg Asp Leu Thr Asn His Asn Trp Leu Glu
    210                 215                 220

Thr Leu Ser Ile Ala Cys Gln Thr Asp Pro Glu Asp Thr Ala Gln Ala
225                 230                 235                 240

Arg Ser Trp Gln Asp Lys Leu Leu Ile Gln Ser Gln Ser Ile Pro Phe
                245                 250                 255
```

```
Pro Ile Asn Tyr Glu Thr Asn Glu Asp Leu Thr Trp His Lys Asn Glu
            260                 265                 270

Lys Gly Arg Leu Cys Val Lys Phe Asn Gly Ile Ser Asp Leu Ser Phe
        275                 280                 285

Glu Ile Tyr Cys Asp Gln Arg Gln Leu Lys Trp Phe Gln Arg Phe Tyr
    290                 295                 300

Glu Asp Gln Gln Ala Lys Lys Gly Ser Lys Asn Gln His Ser Ser Ala
305                 310                 315                 320

Leu Phe Thr Leu Arg Ser Gly Arg Ile Leu Trp Gln Glu Gly Asn Glu
                325                 330                 335

Lys Gly Gln Pro Trp Asn Ile His Arg Leu Ile Leu Gln Cys Thr Leu
            340                 345                 350

Asp Thr Arg Leu Trp Thr Gln Glu Gly Thr Glu Glu Val Lys Gln Glu
        355                 360                 365

Lys Ala Glu Glu Ile Ala Lys Val Leu Thr Ser Met Asn Glu Lys Gly
    370                 375                 380

Asp Leu Thr Lys Asn Gln Gln Ala Phe Ile Lys Arg Lys Gln Ser Thr
385                 390                 395                 400

Leu Asp Lys Leu Glu Asn Pro Phe Pro Arg Pro Ser Gln Pro Leu Tyr
                405                 410                 415

Arg Gly Gln Ser Asn Ile Leu Val Gly Val Ser Met Gly Val Asp Lys
            420                 425                 430

Pro Ala Thr Val Ala Val Val Asp Gly Ile Thr Gln Lys Thr Leu Thr
        435                 440                 445

Ile Glu Tyr Ile Lys Gln Leu Leu Gly Asn Asn Tyr Pro Leu Ile Gln
```

```
    450                 455                 460

Arg Gln Arg Gln Gln Lys Gln His Gln Ser His Gln Arg Asn Val Ala
465                 470                 475                 480

Gln Arg Lys Glu Ala Phe Asn Gln Phe Gly Asp Ser Glu Leu Gly Glu
                485                 490                 495

Tyr Ile Asp Arg Leu Leu Thr Lys Ala Ile Val Thr Leu Ala Lys Lys
            500                 505                 510

Tyr Lys Ala Gly Ser Ile Val Val Pro Lys Leu Glu Asp Met Arg Glu
        515                 520                 525

Ile Val Gln Thr Glu Ile Gln Thr Lys Ala Glu Glu Arg Ile Pro Asn
    530                 535                 540

Cys Ile Glu Ala Gln Lys Asn Tyr Ala Lys Cys Tyr Arg Val Gln Val
545                 550                 555                 560

His Gln Trp Ser Tyr Ser Arg Leu Ile Asp Asn Ile Glu Ala Gln Ala
                565                 570                 575

Ser Lys Leu Gly Ile Val Leu Glu Ile Ser Gln Gln Pro Tyr Lys Gly
            580                 585                 590

Thr Pro His Asp Lys Ala Ile Ala Leu Ala Leu Asn Ala Tyr Gln Ser
        595                 600                 605

Arg Leu Ser Ala
    610
```

<210> 494
<211> 637
<212> PRT
<213> Leptolyngbya frigida

<400> 494

```
Met Ser Gln Lys Thr Ile Glu Cys Arg Leu Val Ala Thr Glu Asp Thr
1               5                  10                  15

Arg Arg Tyr Leu Trp His Leu Met Ala Glu Lys Tyr Thr Pro Leu Val
            20                  25                  30

Asn Thr Leu Leu Lys Gln Val Ala Gln Asp Asp His Phe Glu Glu Trp
        35                  40                  45

Cys His Ser Gly Asn Leu Ser Val Ala Ile Val Lys Gln Phe Cys Glu
    50                  55                  60

Lys Leu Lys Glu Asp Ser Gln Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Ser Ser Ala Ile Ala Leu Val His Arg Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Leu Arg Lys Arg Val Arg Asn Lys Ile Ala Gly Gln Thr Arg Trp Leu
            100                 105                 110

Ala Met Leu Lys Ser Asp Asp Glu Leu Thr Glu Ala Ser Gly Ser Asp
        115                 120                 125

Leu Asp Ala Leu Lys Val Gln Ala Glu Ala Ile Leu Ala Gln Ile Gln
    130                 135                 140

Ser Gln Thr Leu Leu Asn Gly Gln Ser Lys Pro Lys Lys Ser Arg Asn
145                 150                 155                 160

Gln Lys Gln Pro Thr Gln Thr Leu Glu Pro Lys Lys Asn Asn Ile Pro
                165                 170                 175

Asn Glu Leu Phe Lys Leu Tyr Asp Ser Val Asp Asp Val Leu Thr Arg
            180                 185                 190

Cys Ala Ile Ala Tyr Leu Leu Lys Asn Gly Ser Lys Ile Pro Asp Lys
        195                 200                 205
```

```
Pro Glu Asp Ala Lys Lys Phe Ala Lys Arg Arg Arg Lys Thr Glu Ile
    210                 215                 220

Arg Leu Glu Arg Leu Met His Thr Leu Gln Arg Thr Arg Leu Pro Lys
225                 230                 235                 240

Gly Arg Asp Leu Ser Trp His Asn Trp Leu Lys Ala Leu Glu Gln Ser
                245                 250                 255

Ala Lys Cys Val Pro Gln Asp Glu Thr Glu Ala Ala Asp Trp Gln Ala
            260                 265                 270

Ser Leu Leu Thr Glu Ala Ala Ile Leu Pro Phe Pro Val Asn Tyr Glu
        275                 280                 285

Thr Asn Glu Asp Leu Arg Trp Phe Leu Asn Glu Lys Gly Arg Leu Cys
    290                 295                 300

Val Ser Phe Asn Gly Leu Gly Glu His Thr Phe Glu Val Tyr Cys Asp
305                 310                 315                 320

Gln Arg Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Glu Ala
                325                 330                 335

Lys Lys Ala Ser Lys Gly Gln Leu Ser Ser Ser Leu Phe Thr Leu Arg
            340                 345                 350

Ser Gly Arg Leu Ala Trp Gln Ala Gly Lys His Gln Gly Asp Pro Trp
        355                 360                 365

Asn Val His Arg Leu Ser Leu Ala Cys Val Val Glu Thr Arg Leu Trp
    370                 375                 380

Thr Thr Glu Gly Thr Asp Gln Val Arg Gln Glu Lys Ala Ala Thr Tyr
385                 390                 395                 400
```

```
Thr Lys Val Ile Ala Gly Thr Lys Ala Lys Gly Lys Leu Asn Ala Lys
                405                 410                 415

Gln Glu Ala Phe Ile Gln Lys Arg Glu Lys Thr Leu Ala Leu Leu Asn
            420                 425                 430

His Ala Tyr Pro Arg Pro Ser His Pro Leu Tyr Gln Gly Gln Pro Ser
        435                 440                 445

Leu Leu Ala Gly Ile Ser Tyr Gly Leu Asp Lys Pro Ala Thr Leu Ala
    450                 455                 460

Ile Val Asn Ile Gln Thr Gly Lys Ala Ile Thr Tyr Arg Ser Leu Arg
465                 470                 475                 480

Gln Leu Leu Gly Glu Asn Tyr Arg Leu Leu Asn Arg Ser Arg Leu Arg
                485                 490                 495

Gln Gln Arg Asn Ala His Gln Arg His Asn Asn Gln Ser Lys Asn Ala
            500                 505                 510

Pro Asn Gln Phe Gly Glu Ser Asn Leu Gly Glu Tyr Ile Asp Arg Leu
        515                 520                 525

Ile Ala Gly Ala Ile Val Ala Ile Ala Gln Gln Tyr Gln Val Ser Ser
    530                 535                 540

Ile Val Leu Pro Asp Val Gly Asp Leu Arg Glu Ile Ile Gln Ser Glu
545                 550                 555                 560

Val Gln Ala Arg Ala Glu Gln Lys Ile Leu Gly Ser Val Glu Arg Gln
                565                 570                 575

Arg Gln Tyr Ala Leu Ser Tyr Arg Ser Ser Val His Arg Trp Ser Tyr
            580                 585                 590

Ala Gln Leu Ser Gln Ala Ile Gln Ser Gln Ala Ala Gln Ile Gly Ile
        595                 600                 605
```

Ala Val Glu Thr Ala Lys Gln Ser Phe Thr Gly Thr Pro Gln Glu Arg
    610   615   620

Ala Lys Gly Leu Ala Ile Ala Ala Tyr Gln Ala Arg Lys
625   630   635

<210> 495
<211> 612
<212> PRT
<213> Cyanothece sp. CCY0110

<400> 495

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Lys Glu Ala Thr
1   5   10   15

Arg Gln Thr Leu Trp Gln Leu Met Ala Glu Leu Asn Thr Pro Phe Ile
            20   25   30

Asn Glu Leu Leu Gln Gln Val Ala Gln Tyr Pro Asp Phe Glu Gln Trp
        35   40   45

Arg Gln Arg Gly Arg Leu Thr Ala Lys Val Ile Glu Gln Leu Gly Asn
    50   55   60

Glu Leu Lys Lys Asp Pro Arg Phe Leu Gly Gln Pro Ala Arg Phe Tyr
65   70   75   80

Thr Ser Gly Ile Ser Leu Val Glu Tyr Ile Phe Lys Ser Trp Leu Lys
                85   90   95

Leu Gln Gln Arg Leu Gln Arg Lys Leu Asp Gly Lys Arg Arg Trp Leu
            100   105   110

Glu Val Leu Lys Ser Asp Glu Gln Leu Ile Lys Asp Ser Gln Thr Asp
        115   120   125

Leu Glu Thr Ile Arg Gln Lys Ala Thr Glu Ile Leu Gln Ser Tyr Glu

```
    130                 135                 140

Gly Thr Glu Arg Leu Phe Asn Ser Leu Phe Gln Ala Tyr Arg Asp Glu
145                 150                 155                 160

Gln Asn Ile Leu Thr Gln Thr Ala Leu Asn Tyr Leu Leu Lys Asn Arg
                165                 170                 175

Cys Gln Leu Pro Lys Lys Pro Glu Asp Ala Lys Lys Phe Ala Lys Arg
            180                 185                 190

Arg Arg Lys Val Glu Ile Thr Ile Lys Arg Leu Gln Lys Gln Ile Asn
        195                 200                 205

Gly Arg Leu Pro Gln Gly Arg Asp Leu Thr Asn Asp Asn Trp Leu Glu
    210                 215                 220

Thr Leu Asn Leu Ala Cys Asp Thr Asp Pro Lys Asp Val Glu Gln Ser
225                 230                 235                 240

Arg Thr Trp Gln Asp Lys Leu Leu Lys Lys Ser Gln Ser Ile Pro Phe
                245                 250                 255

Pro Ile Asn Tyr Glu Thr Asn Glu Asp Leu Thr Trp Ser Lys Asn Glu
            260                 265                 270

Lys Gly Arg Phe Cys Val Gln Phe Asn Gly Ile Ser Asp Leu Lys Phe
        275                 280                 285

Glu Ile Tyr Cys Asp Gln Arg Gln Leu Lys Trp Ile Gln Arg Phe Tyr
    290                 295                 300

Glu Asp Gln Gln Val Lys Lys Asp Gly Lys Asp Gln His Ser Ser Gly
305                 310                 315                 320

Leu Phe Thr Leu Arg Ser Gly Arg Ile Leu Trp Gln Glu Gly Lys Gly
                325                 330                 335
```

```
Lys Gly Glu Leu Trp Asp Ile His Arg Leu Thr Leu Gln Cys Thr Leu
            340                 345                 350

Glu Thr Arg Cys Trp Thr His Glu Gly Thr Glu Gln Val Lys Gln Glu
        355                 360                 365

Lys Ala Asp Glu Ile Ala Gly Ile Leu Thr Arg Met Asn Glu Lys Gly
    370                 375                 380

Asp Leu Thr Lys Asn Gln Lys Ala Phe Val Arg Arg Lys Gln Ser Thr
385                 390                 395                 400

Leu Asn Arg Leu Glu Lys Pro Phe Pro Arg Pro Ser Gln Pro Leu Tyr
                405                 410                 415

Gln Gly Lys Ser Asn Ile Leu Val Gly Val Ser Met Glu Leu Lys Lys
            420                 425                 430

Pro Ala Thr Ile Ala Val Ile Asp Gly Val Thr Arg Lys Val Leu Thr
        435                 440                 445

Tyr Arg Asn Ile Lys Gln Leu Leu Gly Lys Asn Tyr Pro Leu Leu Asn
    450                 455                 460

Arg Gln Gln Arg Gln Lys Gln Arg Gln Ser His Gln Arg Asn Ile Ala
465                 470                 475                 480

Gln Arg Lys Glu Ala Phe Asn Gln Phe Gly Asp Ser Glu Leu Gly Gln
                485                 490                 495

His Ile Asp Arg Leu Leu Ala Lys Ala Ile Ile Ser Ile Ala Gln Lys
            500                 505                 510

Tyr Gln Ala Gly Ser Ile Val Val Pro Lys Leu Glu Asp Ile Arg Glu
        515                 520                 525

Ala Thr Gln Ser Glu Ile Gln Ala Lys Ala Glu Ala Lys Ile Pro Asn
```

```
    530                 535                 540

Cys Ile Glu Ala Gln Ala Glu Tyr Ala Lys Lys Tyr Arg Met Gln Val
545                 550                 555                 560

His Glu Trp Ser Tyr Gly Arg Leu Ile Asp Asn Ile Gln Ala Gln Ala
                565                 570                 575

Ser Lys Leu Gly Ile Phe Ile Glu Glu Ser Gln Gln Pro Leu Gln Gly
            580                 585                 590

Thr Pro Leu Gln Lys Ala Ala Glu Leu Ala Phe Lys Ala Tyr Arg Ser
        595                 600                 605

Arg Leu Ser Ala
    610
```

<210> 496
<211> 612
<212> PRT
<213> Cyanothece sp. PCC 8801

<400> 496

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Lys Glu Pro Ile
1               5                   10                  15

Arg His Thr Leu Trp Gln Leu Met Ala Asp Leu Asn Thr Pro Phe Ile
            20                  25                  30

Asn Glu Leu Leu Gln Lys Val Ala Gln Asn Pro Asp Phe Glu Gln Trp
        35                  40                  45

Lys Gln Lys Gly Lys Leu Gln Lys Ser Val Ile Lys Gln Leu Gly Asp
    50                  55                  60

Lys Leu Lys Lys Asp Pro Arg Tyr Leu Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80
```

```
Thr Ser Gly Ile Ser Leu Val Glu Tyr Ile Phe Lys Ser Trp Leu Lys
                85                  90                  95

Leu Gln Gln Arg Leu Gln Arg Lys Leu Asp Gly Lys Arg Arg Trp Leu
            100                 105                 110

Thr Val Leu Lys Ser Asp Glu Glu Leu Ile Gln Gln Ser Gln Gln Asn
        115                 120                 125

Leu Glu Ala Ile Arg His Lys Ala Ser Glu Ile Leu Gln Thr His Gln
    130                 135                 140

Lys Thr Glu Lys Leu Phe Asn His Leu Phe Gln Leu Tyr Gln Glu Glu
145                 150                 155                 160

Lys Asn Pro Phe Thr His Ile Ala Leu Cys Tyr Leu Leu Lys Asn Arg
                165                 170                 175

Cys Lys Leu Pro Gln Lys Pro Glu Asp Pro Glu Lys Phe Thr Lys Arg
            180                 185                 190

Arg Arg Lys Val Glu Ile Ala Ile Asp Arg Leu Gln Glu Gln Leu Glu
        195                 200                 205

Gly Arg Leu Pro Gln Gly Arg Asp Leu Thr Asn His Asn Trp Leu Glu
    210                 215                 220

Thr Leu Ser Ile Ala Cys Gln Thr Asp Pro Glu Asp Thr Ala Gln Ala
225                 230                 235                 240

Arg Ser Trp Gln Asp Lys Leu Leu Ile Gln Ser Gln Ser Ile Pro Phe
                245                 250                 255

Pro Ile Asn Tyr Glu Thr Asn Glu Asp Leu Thr Trp His Lys Asn Glu
            260                 265                 270

Lys Gly Arg Leu Cys Val Lys Phe Asn Gly Ile Ser Asp Leu Ser Phe
        275                 280                 285
```

```
Glu Ile Tyr Cys Asp Gln Arg Gln Leu Lys Trp Phe Gln Arg Phe Tyr
    290                 295                 300

Glu Asp Gln Gln Ala Lys Lys Gly Ser Lys Asn Gln His Ser Ser Ala
305                 310                 315                 320

Leu Phe Thr Leu Arg Ser Gly Arg Ile Leu Trp Gln Glu Gly Asn Glu
                325                 330                 335

Lys Gly Gln Pro Trp Asn Ile His Arg Leu Ile Leu Gln Cys Thr Leu
            340                 345                 350

Asp Thr Arg Leu Trp Thr Gln Glu Gly Thr Glu Glu Val Lys Gln Glu
        355                 360                 365

Lys Ala Glu Glu Ile Ala Lys Val Leu Thr Ser Met Asn Glu Lys Gly
    370                 375                 380

Asp Leu Thr Lys Asn Gln Gln Ala Phe Ile Lys Arg Lys Gln Ser Thr
385                 390                 395                 400

Leu Asp Lys Leu Glu Asn Pro Phe Pro Arg Pro Ser Gln Pro Leu Tyr
                405                 410                 415

Arg Gly Gln Ser Asn Ile Leu Val Gly Val Ser Met Gly Val Asp Lys
            420                 425                 430

Pro Ala Thr Val Ala Val Val Asp Gly Ile Thr Gln Lys Thr Leu Thr
        435                 440                 445

Ile Glu Tyr Ile Lys Gln Leu Leu Gly Asn Asn Tyr Pro Leu Ile Gln
    450                 455                 460

Arg Gln Arg Gln Gln Lys Gln His Gln Ser His Gln Arg Asn Val Ala
465                 470                 475                 480
```

```
Gln Arg Lys Glu Ala Phe Asn Gln Phe Gly Asp Ser Glu Leu Gly Glu
                485                 490                 495


Tyr Ile Asp Arg Leu Leu Thr Lys Ala Ile Val Thr Leu Ala Lys Lys
            500                 505                 510


Tyr Lys Ala Gly Ser Ile Val Val Pro Lys Leu Glu Asp Met Arg Glu
        515                 520                 525


Ile Val Gln Thr Glu Ile Gln Thr Lys Ala Glu Glu Arg Ile Pro Asn
    530                 535                 540


Cys Ile Glu Ala Gln Lys Asn Tyr Ala Lys Cys Tyr Arg Val Gln Val
545                 550                 555                 560


His Gln Trp Ser Tyr Ser Arg Leu Ile Asp Asn Ile Glu Ala Gln Ala
                565                 570                 575


Ser Lys Leu Gly Ile Val Leu Glu Ile Ser Gln Gln Pro Tyr Lys Gly
            580                 585                 590


Thr Pro His Asp Lys Ala Ile Ala Leu Ala Leu Asn Ala Tyr Gln Ser
        595                 600                 605


Arg Leu Ser Ala
    610


<210>  497
<211>  639
<212>  PRT
<213>  Calothrix sp. NIES-4101

<400>  497

Met Ser Gln Ile Thr Ile Met Cys Arg Leu Val Ala Asn Glu Ser Thr
1               5                   10                  15


Arg Gln Gln Leu Trp Gln Leu Met Ala Glu Leu Asn Thr Pro Leu Ile
            20                  25                  30
```

```
Asn Glu Leu Leu Val Leu Ile Ser Gln His Gln Asp Phe Glu Thr Trp
        35                  40                  45

Gln Gln Lys Gly Lys Ile Pro Ala Gly Thr Val Lys Gln Leu Cys Glu
    50                  55                  60

Ser Leu Lys Thr Asp Pro Gly Phe Ala Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Ala Ser Ala Ile Ala Thr Val Ser Tyr Val Tyr Lys Ala Trp Met Lys
                85                  90                  95

Val Gln Lys Arg Leu Lys Ser Gln Leu Glu Ser Lys Ala Arg Trp Leu
            100                 105                 110

Ser Met Leu Gln Ser Asp Glu Glu Leu Ile Ala Ile Ala Gly Val Asp
        115                 120                 125

Leu Asp Gly Leu Arg Asn Gln Ala Arg Leu Ile Leu Gln Gln Phe Ala
    130                 135                 140

Pro Glu Pro Ser Pro Gln Glu Asp Leu Gln Ala Asn Lys Lys Gln Pro
145                 150                 155                 160

Lys Thr Glu Lys Ser Leu Ser Gln Thr Leu Leu Asp Thr Tyr Glu Ser
                165                 170                 175

Ser Glu Asp Ile Leu Thr Arg Cys Ala Ile Ser Tyr Leu Leu Lys Asn
            180                 185                 190

Gly Cys Lys Val Tyr Glu Lys Pro Glu Asn Ser Gln Lys Phe Ser Lys
        195                 200                 205

His Lys Asp Lys Leu Lys Val Gln Ile Gln Arg Leu Ile Gln Lys Leu
    210                 215                 220

Glu Gly Arg Val Pro Gln Gly Arg Asn Leu Thr Asp Thr Glu Trp Leu
```

```
225                 230                 235                 240

Glu Thr Leu Ile Leu Ala Thr Glu Lys Ile Pro Gln Asp Glu Ala Glu
                245                 250                 255

Ala Lys Ser Trp Gln Asp Ser Leu Leu Lys Lys Ser Ser Ser Val Ile
            260                 265                 270

Phe Pro Val Ser Tyr Glu Ser Asn Glu Asp Met Thr Trp Phe Arg Asn
        275                 280                 285

Gln Lys Gly Arg Ile Cys Ile Lys Phe Asn Gly Ile Ser Glu His Thr
    290                 295                 300

Phe Glu Ile Tyr Cys Asp Ser Arg Gln Leu His Trp Phe Glu Arg Phe
305                 310                 315                 320

Leu Ser Asp Gln Glu Thr Lys Lys Asn Ser Lys Asn Gln His Ser Ser
                325                 330                 335

Ala Leu Phe Thr Leu Arg Ser Ala Arg Ile Gly Trp His Glu Gln Glu
            340                 345                 350

Ile Lys Asn Lys Gln Ile Cys Arg Arg Lys Pro Thr Val Asn Pro Trp
        355                 360                 365

Asp Ile Tyr His Leu Thr Leu Tyr Cys Thr Val Asp Thr Arg Leu Trp
    370                 375                 380

Thr Ala Glu Gly Thr Ala Val Val Ala Ala Glu Lys Ala Glu Glu Ile
385                 390                 395                 400

Ala Lys Ile Ile Thr Lys Thr Lys Glu Lys Asp Asp Leu Asn Glu Lys
                405                 410                 415

Gln Leu Ala His Ile Lys Arg Lys Asn Ser Thr Leu Glu Arg Ile Asn
            420                 425                 430
```

```
Asn Pro Tyr Pro Arg Pro Ser Lys Pro Leu Tyr Gln Ala Asn Pro His
        435                 440                 445

Ile Leu Val Gly Val Ser Leu Gly Leu Lys Lys Pro Ala Thr Ile Ala
    450                 455                 460

Val Val Asp Val Ile Ser Gln Lys Val Leu Thr Tyr Cys Ser Ile Lys
465                 470                 475                 480

Gln Leu Leu Gly Lys Asn Tyr Lys Leu Leu Asn Arg His Arg Gln Leu
                485                 490                 495

Lys His Asn Phe Ala His Lys Arg Lys Ile Ala Gln Thr Gln Ala Lys
            500                 505                 510

Gln Gln Gln Tyr Leu Asp Ser Glu Leu Gly Gln Tyr Ile Asp Arg Leu
        515                 520                 525

Leu Ala Lys Gln Ile Ile Ala Ile Ala Lys Gln Tyr Ser Ala Ser Ser
    530                 535                 540

Ile Val Leu Pro Gln Leu Asn Gly Met Arg Glu Gln Ile Asn Ser Glu
545                 550                 555                 560

Ile Gln Ala Lys Ala Lys Glu Lys Cys Pro Glu Ser Ile Glu Ala Gln
                565                 570                 575

Lys Lys Tyr Ala Lys Gln Tyr Arg Arg Ser Ile Asn Gln Trp Ser Tyr
            580                 585                 590

Gly Arg Leu Ile Glu Ser Ile Ile Ser Gln Gly Leu Gln Ala Gly Ile
        595                 600                 605

Ala Ile Glu Glu Ser Lys Gln Ala Val Gln Gly Ser Pro Gln Glu Lys
    610                 615                 620

Ala Lys Glu Leu Ala Phe Val Ala Tyr Asn Ser Arg Lys Lys Ser
```

625 630 635

<210> 498
<211> 645
<212> PRT
<213> Scytonema hofmannii

<400> 498

Met Ser Thr Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Ala Thr
1 5 10 15

Leu Arg Tyr Phe Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Glu Gln Leu Gly Gln His Pro Asp Phe Asp Thr Trp
35 40 45

Val Gln Ala Gly Lys Met Pro Glu Lys Thr Val Glu Asn Leu Cys Lys
50 55 60

Ser Leu Glu Asp Arg Glu Pro Phe Ala Asn Gln Pro Gly Arg Phe Arg
65 70 75 80

Thr Ser Ala Val Ala Leu Val Lys Tyr Ile Tyr Lys Ser Trp Phe Ala
85 90 95

Leu Gln Lys Arg Arg Ala Asp Arg Leu Glu Gly Lys Glu Arg Trp Leu
100 105 110

Lys Met Leu Lys Ser Asp Val Glu Leu Glu Arg Glu Ser Asn Cys Ser
115 120 125

Leu Asp Ile Ile Arg Ala Lys Ala Gly Glu Ile Leu Ala Lys Val Thr
130 135 140

Glu Gly Cys Ala Pro Ser Asn Gln Thr Ser Ser Lys Arg Lys Lys Lys
145 150 155 160

```
Lys Thr Lys Lys Ser Gln Ala Thr Lys Asp Leu Pro Thr Leu Phe Glu
                165                 170                 175

Ile Ile Leu Lys Ala Tyr Glu Gln Ala Glu Glu Ser Leu Thr Arg Ala
            180                 185                 190

Ala Leu Ala Tyr Leu Leu Lys Asn Asp Cys Glu Val Ser Glu Val Asp
        195                 200                 205

Glu Asp Ser Glu Lys Phe Lys Lys Arg Arg Arg Lys Lys Glu Ile Glu
    210                 215                 220

Ile Glu Arg Leu Arg Asn Gln Leu Lys Ser Arg Ile Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Asp Lys Trp Leu Lys Thr Leu Glu Glu Ala Thr Arg
                245                 250                 255

Asn Val Pro Glu Asn Glu Asp Glu Ala Lys Ala Trp Gln Ala Gln Leu
            260                 265                 270

Leu Arg Glu Ala Ser Ser Val Pro Phe Pro Val Ala Tyr Glu Thr Ser
        275                 280                 285

Glu Asp Met Thr Trp Phe Thr Asn Glu Gln Gly Arg Ile Phe Val Tyr
    290                 295                 300

Phe Asn Gly Ser Ala Lys His Lys Phe Gln Val Tyr Cys Asp Arg Arg
305                 310                 315                 320

Gln Leu His Trp Phe Gln Arg Phe Val Glu Asp Phe Gln Ile Lys Lys
                325                 330                 335

Asn Gly Asp Lys Lys Gly Ser Glu Lys Glu Tyr Pro Ala Gly Leu Leu
            340                 345                 350

Thr Leu Cys Ser Thr Arg Leu Arg Trp Lys Glu Ser Ala Glu Lys Gly
        355                 360                 365
```

```
Asp Pro Trp Asn Val His Arg Leu Ile Leu Ser Cys Thr Ile Asp Thr
    370                 375                 380

Arg Leu Trp Thr Leu Glu Gly Thr Glu Gln Val Arg Ala Glu Lys Ile
385                 390                 395                 400

Ala Gln Val Glu Lys Thr Ile Ser Lys Arg Glu Gln Glu Val Asn Leu
                405                 410                 415

Ser Lys Thr Gln Leu Glu Arg Leu Gln Ala Lys His Ser Glu Arg Glu
            420                 425                 430

Arg Leu Asn Asn Ile Phe Pro Asn Arg Pro Ser Lys Pro Ser Tyr Arg
        435                 440                 445

Gly Lys Ser His Ile Ala Ile Gly Val Ser Phe Ser Leu Glu Asn Pro
    450                 455                 460

Ala Thr Val Ala Val Val Asp Val Ala Thr Lys Lys Val Leu Thr Tyr
465                 470                 475                 480

Arg Ser Phe Lys Gln Leu Leu Gly Asp Asn Tyr Asn Leu Ala Asn Arg
                485                 490                 495

Leu Arg Gln Gln Lys Gln Arg Leu Ser His Glu Arg His Lys Ala Gln
            500                 505                 510

Lys Gln Gly Ala Pro Asn Ser Phe Gly Asp Ser Glu Leu Gly Gln Tyr
        515                 520                 525

Val Asp Arg Leu Leu Ala Lys Ser Ile Val Ala Ile Ala Lys Thr Tyr
    530                 535                 540

Gln Ala Ser Ser Ile Val Leu Pro Lys Leu Arg Tyr Met Arg Glu Ile
545                 550                 555                 560
```

```
Ile His Asn Glu Val Gln Ala Lys Ala Glu Lys Lys Ile Pro Gly Tyr
                565                 570                 575

Lys Glu Gly Gln Lys Gln Tyr Ala Lys Gln Tyr Arg Ile Ser Val His
            580                 585                 590

Gln Trp Ser Tyr Asn Arg Leu Ser Gln Ile Leu Glu Ser Gln Ala Thr
        595                 600                 605

Lys Ala Gly Ile Ser Ile Glu Arg Gly Ser Gln Val Ile Gln Gly Ser
    610                 615                 620

Ser Gln Glu Gln Ala Arg Asp Leu Ala Leu Phe Ala Tyr Asn Glu Arg
625                 630                 635                 640

Gln Leu Ser Leu Gly
                645
```

<210> 499
<211> 623
<212> PRT
<213> Cyanobacterium aponinum

<400> 499

```
Met Val Gln Val Thr Ile Gln Ser Arg Leu Ile Ala Ser Ala Asp Thr
1               5                   10                  15

Arg Gln Ser Leu Trp Leu Leu Met Ser Lys Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Ile Leu Thr Arg Ile Lys His His Pro Asp Phe Pro Gln Trp
        35                  40                  45

Arg Glu Lys Gly Arg Leu Pro Lys Asn Phe Ile Ala Gln Gln Ile Gln
    50                  55                  60

Glu Leu Lys Asn Asp Ser Arg Phe Gln Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80
```

```
Ala Ser Val Gly Lys Ile Ile Asp Tyr Ile Tyr Lys Ser Trp Phe Lys
                85                  90                  95

Val Gln Lys Ser Tyr Lys Ile Gln Leu Glu Gly Asn Ser Arg Trp Leu
            100                 105                 110

Glu Met Leu Lys Pro Asp Ser Leu Leu Ile Glu Ser Phe Asp Gly Ser
        115                 120                 125

Met Glu Ala Leu Gln Asn Gln Ala Gln Gln Ile Leu Asp Asn Ile Glu
    130                 135                 140

Thr Thr Ser Thr Gln Glu Gly Ile Val Asp Tyr Leu Phe Gln Lys Tyr
145                 150                 155                 160

Glu Lys Ile Glu Asn Cys Arg Met Lys Asp Ala Ile Val Tyr Leu Ile
                165                 170                 175

Lys Asn Gly Ser Arg Ile Pro Lys Asn Asn Ile Glu Thr Thr Lys Lys
            180                 185                 190

Tyr Lys Arg Ile Lys Arg Lys Leu Glu Ile Lys Ile Arg Lys Leu Lys
        195                 200                 205

Arg Gln Val Glu Met Ser Ile Pro Ser Gly Arg Asp Leu Glu Gly Glu
    210                 215                 220

Lys Trp Leu His Thr Leu Ile Leu Ala Ser Asn Thr Met Pro Val Asp
225                 230                 235                 240

Gln Ser Glu Ser Asp Ser Trp Phe Ser Ala Leu Lys Arg Asn Ser Pro
                245                 250                 255

Ser Ile Pro Tyr Pro Ile Val Tyr Glu Ser Asn Glu Asp Leu Thr Trp
            260                 265                 270

Cys Leu Asn Asn Gln Asn Arg Ile Cys Ile Lys Phe Ser Gly Leu Ser
```

```
        275                 280                 285

Asp His Leu Phe Gln Ile Tyr Cys Asp Ser Arg Gln Leu Ala Tyr Phe
    290                 295                 300

Arg Arg Phe Tyr Glu Asp Gln Glu Leu Lys Lys Ala Ser Lys Asp Gln
305                 310                 315                 320

Phe Ser Ser Ala Leu Phe Thr Leu Arg Ser Ala Met Ile Ile Trp Lys
                325                 330                 335

Glu Asp Asp Gly Lys Gly Glu Ser Trp Asp Lys His Lys Leu Tyr Leu
            340                 345                 350

His Cys Thr Phe Asp Thr Asp Tyr Trp Thr Val Glu Gly Thr Gln Val
        355                 360                 365

Ile Ala Gln Lys Lys Gln Glu Glu Val Leu Asn Leu Ile Asp Arg Met
    370                 375                 380

Lys Glu Lys Thr Asp Leu Thr Asp Thr Gln Lys Ala Phe Ile Gln Arg
385                 390                 395                 400

Lys Gln Thr Thr Leu Ala Arg Leu Asn Asn Ile Phe Pro Arg Pro Ser
                405                 410                 415

Lys Pro Ile Tyr Gln Gly Asn Pro Asn Leu Phe Leu Gly Val Ala Met
            420                 425                 430

Gly Leu Gln Glu Pro Val Thr Ile Ala Leu Val Asp Val Ser Thr Asn
        435                 440                 445

Lys Val Ile Leu Tyr Arg Asn Ile Lys Gln Leu Leu Gly Asp Asn Tyr
    450                 455                 460

His Leu Leu Arg Arg Arg Arg Asn Glu Lys Gln Lys Leu Asn His Gln
465                 470                 475                 480
```

```
Asn His Lys Ala Arg Lys Arg Ala Asn Phe Gln Gln Lys Gly Glu Ser
                485                 490                 495


Asn Leu Gly Glu Tyr Leu Asp Arg Leu Ile Ala Lys Ser Ile Leu Gln
            500                 505                 510


Ile Ala Lys Glu Tyr Gln Val Ser Thr Ile Ile Val Pro Arg Leu Asn
        515                 520                 525


Gln Met Arg Ser Ile Thr Glu Ala Glu Ile Gln Ala Arg Ala Glu Glu
    530                 535                 540


Arg Ile Pro Glu Tyr Lys Glu Gly Gln Arg Lys Tyr Ala Gln Asp Tyr
545                 550                 555                 560


Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg Leu Ile Asp Asn Ile
                565                 570                 575


Lys Ala Ile Ser Ser Lys Leu Gly Ile Val Val Glu Glu Gly Lys Gln
            580                 585                 590


Pro Lys Gln Gly Thr Phe Thr Asp Lys Ala Ser Gln Leu Ala Leu Ser
        595                 600                 605


Thr Gln Lys Asn Asn Arg Gln Asn Asn Pro Lys Lys Thr Asn Ser
    610                 615                 620


<210>  500
<211>  629
<212>  PRT
<213>  Alkalinema sp. CACIAM 70d

<400>  500

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Pro Pro Thr Ala
1               5                   10                  15


Arg Gln His Leu Trp Thr Leu Ala Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30
```

```
Asn Thr Leu Ile Gln Glu Val Ala Asn His Glu Glu Phe Glu Thr Trp
        35                  40                  45

Arg Leu Lys Gly Lys His Pro Thr Lys Ile Val Ser Glu Ile Cys Arg
    50                  55                  60

Arg Leu Arg Thr Glu Ala Pro Phe Ser Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Glu Lys Thr Val Asn Tyr Ile Phe Lys Ser Trp Phe Thr
                85                  90                  95

Leu Gln Ser Arg Leu Gln Arg Gln Leu Ser Arg Lys Gln Ile Trp Leu
            100                 105                 110

Ser Ile Leu Lys Ser Asp Pro Glu Leu Val Glu Leu Cys Gly His Pro
        115                 120                 125

Leu Glu Thr Ile Gln Asn Lys Ala Thr Gln Leu Leu Thr Gln Ile Glu
    130                 135                 140

Lys Thr Leu Ala Asp Ser Asn Pro Glu Asp Pro Gln Ser Pro Cys Thr
145                 150                 155                 160

Asn Asp Leu Ile Arg Ala Gln Leu Phe Lys Lys Tyr His Gly Ala Lys
                165                 170                 175

Thr Pro Leu Ile Arg Cys Ser Ile Ala Tyr Leu Ile Lys Asn Gly Gly
            180                 185                 190

Lys Leu Pro Lys Ser Pro Glu Ile Pro His Lys Phe Ala Gln Arg Arg
        195                 200                 205

Arg Lys Ala Glu Ile Gln Val Gln Arg Leu Gln Asp Gln Leu Glu Gly
    210                 215                 220
```

```
Arg Leu Pro Lys Gly Arg Asp Leu Thr Gly Gln Ala Trp Leu Ser Thr
225                 230                 235                 240

Leu Ile Thr Ala Thr Ser Thr Val Pro Lys Asp Asn His Glu Gln Lys
                245                 250                 255

Gln Trp Asn Asp Arg Leu Leu Ala Lys Pro Cys Thr Thr Pro Phe Pro
            260                 265                 270

Ile Leu Phe Glu Thr Asn Glu Asp Leu Asn Trp Ser Lys Asn His Thr
        275                 280                 285

Gly Arg Ile Cys Val Arg Phe Asn Gly Leu Ser Glu His Thr Phe Gln
    290                 295                 300

Val Tyr Cys Asp Gln Arg Gln Leu Pro Trp Phe Gln Arg Phe Leu Glu
305                 310                 315                 320

Asp Gln Gln Thr Lys His Thr Ser Lys Asn Gln His Ser Ser Ala Leu
                325                 330                 335

Phe Thr Leu Arg Ser Ala His Leu Ala Trp Gln Glu Thr His Ser Asn
            340                 345                 350

Gly Ala Gly Trp Asp Asn His Tyr Ile Thr Leu Tyr Cys Thr Val Asp
        355                 360                 365

Val Arg Leu Trp Thr Ala Glu Gly Thr Glu Glu Val His Gln Glu Lys
    370                 375                 380

Ala Val Asp Ile Ala Lys Gln Leu Thr Tyr Leu Asp Gln Lys Glu Asp
385                 390                 395                 400

Leu Ser Glu Thr Gln Ala Ala Phe Ala Gln Arg Leu Thr Ser Thr Leu
                405                 410                 415

Asp Arg Leu Asn Lys Pro Phe Pro Arg Pro His Arg His Arg Ala Gln
            420                 425                 430
```

```
Gln His Ser His Ile Ile Val Gly Leu Ser Val Asp Trp Glu Ala Pro
        435                 440                 445

Leu Thr Leu Ala Ile Trp Asn Ala Asn Thr Gln Glu Val Leu Val Tyr
    450                 455                 460

Arg Ser Leu Arg Gln Leu Leu Gly Lys Asp Tyr Pro Leu Phe Leu Gln
465                 470                 475                 480

His Arg Gln Glu Gln Gln Lys Gln Ser His Asn Arg His Lys Ala Gln
                485                 490                 495

Lys Arg Asn Lys Asn Cys Gln Phe Gly Thr Ser His Leu Gly Glu His
            500                 505                 510

Ile Asp Arg Leu Leu Ala Lys Ala Val Ile Thr Ile Ala Gln Gln Tyr
        515                 520                 525

Asn Ala Gly Ser Ile Ala Val Pro Asn Leu Asp Asn Ile Arg Glu Thr
    530                 535                 540

Leu Gln Ala Thr Ile Asp Ala Lys Ala Glu Gln Lys Ala Pro Gly Cys
545                 550                 555                 560

Ile Glu Ala Gln Lys Arg Tyr Thr Lys Gln Tyr Lys Ile Thr Ile His
                565                 570                 575

Arg Trp Ser Tyr Gly Arg Leu Ile Asp Gln Ile Ile Ser Lys Ala Lys
            580                 585                 590

Gln Val Gly Leu Gly Val Glu Glu Ala Lys Gln Pro Leu Ser Gly Asn
        595                 600                 605

Val Gln Glu Lys Ala Lys Leu Val Ala Ile Ser Ala Tyr Asn Ala Arg
    610                 615                 620
```

Leu Ile Val Ala Phe
625

<210> 501
<211> 636
<212> PRT
<213> Leptolyngbya boryana

<400> 501

Met Ser Val Ile Thr Ile Gln Cys Lys Leu Val Ala Thr Glu Glu Thr
1   5   10   15

Arg Arg Ala Leu Trp His Leu Met Ala Glu Lys His Thr Pro Leu Ile
            20   25   30

Asn Glu Leu Leu Lys His Ile Ala Gln Asp Ser Arg Phe Glu Glu Trp
        35   40   45

Ser Leu Thr Gly Lys Leu Pro Arg Leu Val Val Ser Glu Ala Cys Asn
    50   55   60

Gln Leu Lys Gln Asp Pro Gln Phe Ser Gly Gln Pro Gly Arg Phe Tyr
65   70   75   80

Ser Ser Ala Ile Ser Thr Val His Arg Ile Phe Leu Ser Trp Leu Ala
                85   90   95

Leu Gln Thr Arg Leu Arg Asn Gln Ile Ser Gly Gln Thr Arg Trp Leu
            100   105   110

Ala Met Leu Gln Ser Asp Asn Glu Leu Thr Ile Ala Ser Gln Thr Asp
        115   120   125

Ile Asn Thr Leu Arg Leu Lys Ala Ser Glu Leu Leu Thr His Leu Asn
    130   135   140

Glu Pro Ile Ser Glu Ser Asp Gln Pro Glu Val Lys Lys Thr Arg Ser
145   150   155   160

```
Lys Lys Lys Asn Gln Thr Ser Asn Gln Ala Gly Ala Asn Val Ser Arg
                165                 170                 175

Thr Leu Phe Lys Leu Tyr Asp Glu Thr Glu Asp Pro Leu Thr Arg Cys
            180                 185                 190

Ala Ile Ala Tyr Leu Leu Lys Asn Gly Cys Lys Leu Pro Asp Gln Asn
        195                 200                 205

Glu Asn Pro Glu Lys Phe Ile Lys Arg Arg Arg Lys Thr Glu Ile Arg
    210                 215                 220

Leu Glu Arg Leu Met Asn Thr Phe Gln Thr Thr Arg Ile Pro Arg Gly
225                 230                 235                 240

Arg His Leu Ser Trp His Ser Trp Ile Glu Ala Leu Glu Thr Ala Thr
                245                 250                 255

Ser His Ile Pro Glu Asn Glu Glu Glu Ala Ala Gly Trp Gln Ala Arg
            260                 265                 270

Leu Leu Thr Lys Pro Ala Ile Leu Pro Phe Pro Val Asn Tyr Glu Thr
        275                 280                 285

Asn Glu Asp Leu Arg Trp Ser Leu Asn Ser Gln Gly Arg Ile Cys Val
    290                 295                 300

Ser Phe Asn Gly Leu Ser Glu His Phe Phe Glu Val Tyr Cys Asp Gln
305                 310                 315                 320

Arg Asp Leu His Trp Phe Asn Arg Phe Leu Glu Asp Gln Glu Thr Lys
                325                 330                 335

Lys Ala Ser Lys Asn Gln His Ser Ser Ser Leu Phe Ser Leu Arg Ser
            340                 345                 350

Gly Gln Ile Ala Trp Gln Glu Gly Lys Gly Asp Ala Glu His Trp Val
```

```
        355                 360                 365

Val His Arg Leu Val Leu Ser Cys Ser Ile Glu Thr Asp Thr Trp Thr
    370                 375                 380

Gln Glu Gly Thr Glu Glu Ile Arg Gln Lys Lys Ala Ser Asp Cys Ala
385                 390                 395                 400

Lys Val Ile Ala Ser Thr Lys Ala Lys Glu Asn Arg Ser Gln Asn Gln
                405                 410                 415

Asp Ala Phe Ile Arg Arg Arg Glu Arg Met Leu Glu Leu Leu Glu Asn
            420                 425                 430

Gln Phe Pro Arg Pro Ser Tyr Pro Leu Tyr Gln Gly Gln Pro Ser Ile
        435                 440                 445

Leu Ala Gly Val Ser Tyr Gly Leu Asp Lys Pro Ala Thr Leu Ala Ile
    450                 455                 460

Val Asn Ile Gln Thr Gly Lys Ala Ile Thr Tyr Arg Ser Ile Arg Gln
465                 470                 475                 480

Ile Leu Gly Lys Asn Tyr Lys Leu Leu Asn Arg Tyr Arg Leu Asn Gln
                485                 490                 495

Gln Arg Asn Ala His Lys Arg His Asn Asn Gln Arg Lys Gly Gly Ser
            500                 505                 510

Ser Gln Leu Arg Glu Ser Asn Gln Gly Gln Tyr Leu Asp Arg Leu Ile
        515                 520                 525

Ala His Glu Ile Val Ala Ile Ala Gln Glu Tyr Gln Val Ser Ser Leu
    530                 535                 540

Ala Leu Pro Asp Leu Gly Asp Ile Arg Glu Ile Val Gln Ser Glu Val
545                 550                 555                 560
```

```
Gln Ala Arg Ala Glu Gln Lys Ile Leu Gly Ser Ile Glu Gln Gln Arg
                565                 570                 575


Lys Tyr Ala Arg Gln Tyr Arg Ala Ser Val His Arg Trp Arg Tyr Ala
            580                 585                 590


Gln Leu Thr Gln Phe Ile Gln Ser Gln Ala Ala Gln Val Gly Ile Ser
        595                 600                 605


Ile Glu Ile Thr Lys Gln Pro Leu Ser Gly Thr Pro Gln Glu Lys Ala
    610                 615                 620


Arg Asn Leu Ala Ile Ala Ala Tyr Gln Ser Arg Lys
625                 630                 635
```

<210> 502
<211> 642
<212> PRT
<213> Cyanobacterium sp. HL-69

<400> 502

```
Met Leu Leu Tyr Lys Tyr Val Leu Leu Asn Ile Ile Val Asp Ala Met
1               5                   10                  15


Ser Leu Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Ala Asp Thr Arg
            20                  25                  30


Gln Phe Leu Trp Met Leu Met Ser Gln Lys Asn Thr Pro Leu Ile Asn
        35                  40                  45


Glu Ile Phe Met Arg Ile Ala Glu His Pro Asp Phe Ser Val Trp Lys
    50                  55                  60


Glu Lys Gly Lys Leu Pro Lys Asn Phe Leu Ala Gln Gln Ile Ala Glu
65                  70                  75                  80


Leu Lys Glu Asp Lys Arg Phe Gln Gly Gln Pro Ser Arg Phe Tyr Ala
                85                  90                  95
```

```
Ser Val His Lys Met Ile Asp Tyr Val Tyr Glu Ser Trp Phe Thr Ile
            100                 105                 110

Gln Asp Lys Asn Lys Phe Arg Leu Gln Gly His Thr Arg Trp Leu Glu
        115                 120                 125

Met Leu Lys Pro Asp Thr Glu Ile Leu Gln Cys Phe Asp Gly Ser Trp
    130                 135                 140

Glu Lys Leu Gln Asn Gln Ala Lys Lys Ile Leu Asp Glu Ile Asp Ser
145                 150                 155                 160

Thr Leu Ser His Thr Arg Ile Val Asp Lys Leu Phe Lys Glu Tyr Glu
                165                 170                 175

Ala Thr Asn Asp Pro Arg Ile Gln Gly Ala Ile Val Tyr Leu Ile Lys
            180                 185                 190

Asn Gly Ala Ser Ile Pro Asp Asn Lys Val Glu Thr Glu Lys Lys Tyr
        195                 200                 205

Lys Lys Leu Lys Arg Lys Val Glu Ile Gln Val His Lys Leu Lys Lys
    210                 215                 220

Gln Ile Glu Ile Ser Ala Pro Thr Gly Arg Asp Leu Asn Gln Gln Lys
225                 230                 235                 240

Trp Leu Asp Thr Leu Ile Leu Ala Ser Leu Ala Ser Thr Thr Met Pro
                245                 250                 255

Leu Asn Gln Ala Gln Cys Asp Arg Trp Phe Ser Ala Leu Lys Lys Asn
            260                 265                 270

Ser Pro Ser Ile Pro Tyr Pro Val Ile Tyr Glu Thr Asn Glu Asp Leu
        275                 280                 285
```

```
Lys Trp Ser Leu Ser Asp Gln Asn Arg Leu His Val Arg Phe Asn Gly
    290                 295                 300

Leu Ser Asp His Thr Phe Lys Ile Tyr Cys Asp Ser Arg Gln Leu Pro
305                 310                 315                 320

Tyr Phe Gln Arg Phe Tyr Glu Asp Gln Glu Leu Lys Lys Ala Asn Lys
                325                 330                 335

Asn Gln Phe Ser Ser Ala Leu Phe Thr Leu Arg Ser Ala Met Ile Ile
            340                 345                 350

Trp Lys Glu Asp Asp Gly Lys Gly Glu Leu Trp Asp Lys His Lys Leu
        355                 360                 365

Tyr Leu His Cys Thr Leu Asp Thr Asp Tyr Trp Thr Val Glu Gly Thr
    370                 375                 380

Gln Val Val Ala Gln Arg Lys Gln Lys Glu Val Leu Asn Ile Ile Asp
385                 390                 395                 400

Gly Met Lys Glu Lys Asp Asp Leu Arg Asp Thr Gln Lys Lys Phe Ile
                405                 410                 415

Gln Arg Lys Glu Thr Thr Leu Ala Arg Leu Asn Asn Ile Phe Pro Arg
            420                 425                 430

Pro Gly Lys Pro Ile Tyr Gln Gly Asn Pro Asn Leu Phe Leu Gly Val
        435                 440                 445

Ala Met Gly Leu Gln Glu Ser Val Thr Leu Ala Leu Val Asn Val Gly
    450                 455                 460

Glu Gly Lys Ala Ile Leu Tyr Arg Asn Ile Lys Gln Leu Leu Gly Asp
465                 470                 475                 480

Asn Tyr His Leu Leu Arg Arg Arg Arg Asn Glu Lys Gln Lys Leu Asn
                485                 490                 495
```

```
His Gln Asn His Lys Ala Arg Lys Arg Ala Ser Phe Gln Gln Lys Gly
            500                 505                 510

Glu Ser Asn Leu Gly Glu Tyr Val Asp Arg Leu Ile Ala Lys Ser Ile
        515                 520                 525

Leu Lys Ile Ala Gln Glu Tyr Lys Val Ser Thr Ile Ile Ile Pro Leu
    530                 535                 540

Leu Ser Gln Met Arg Ser Ile Thr Glu Ala Glu Val Gln Ala Arg Ala
545                 550                 555                 560

Glu Glu Arg Ile Pro Glu Tyr Lys Glu Gly Gln Lys Lys Tyr Ala Lys
                565                 570                 575

Asp Tyr Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg Leu Ile Asp
            580                 585                 590

Asn Ile Lys Ala Asn Ser Ala Lys Val Gly Ile Val Val Arg Glu Gly
        595                 600                 605

Lys Gln Pro Lys Gln Gly Thr Phe Thr Asp Lys Ala Leu Gln Leu Ala
    610                 615                 620

Leu Ser Ile Gln Gln Asn Ile Thr Glu Gly Lys Ile Pro Arg Asn Thr
625                 630                 635                 640

Lys Phe
```

<210> 503
<211> 641
<212> PRT
<213> Nostoc sp. 'Peltigera membranacea cyanobiont' 232

<400> 503

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Asp Thr
```

```
1               5                   10                  15

Arg Arg His Leu Trp Gln Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Lys Gln Val Arg Ile His Pro Asp Met Glu Gln Trp
        35                  40                  45

Leu Lys Lys Gly Lys Leu Pro Asp Gly Val Ile Lys Pro Leu Cys Asp
    50                  55                  60

Ser Leu Ser Thr Gln Glu Cys Phe Val Asn Gln Pro Lys Arg Phe Tyr
65                  70                  75                  80

Lys Ser Ala Ile Glu Val Val Glu Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Leu Gln Lys Glu Arg Gln Gln Lys Ile Asp Lys Lys Glu His Trp Leu
            100                 105                 110

Asn Met Leu Lys Ser Asp Ile Glu Leu Glu Gln Glu Ser Asn Phe Ser
        115                 120                 125

Leu Asn Ile Ile Arg Ala Lys Ala Ile Lys Val Leu Ala His Tyr Ile
    130                 135                 140

Ala Lys Val Glu Glu Asn His Lys Gln Asp Ile Thr Asn Lys Asn Val
145                 150                 155                 160

Asn Lys Arg Lys Lys Ser Lys Ser Lys Asn Asn Asn Tyr Thr Leu Phe
                165                 170                 175

Asp Ile Leu Phe Lys Ala Tyr Asp Gln Ala Lys Val Ser Leu Asn Arg
            180                 185                 190

Cys Ala Ile Ala Tyr Leu Leu Lys Asn Asn Cys Gln Val Ser Glu Glu
        195                 200                 205
```

```
Glu Glu Asp Pro Asn Arg Tyr Ala Leu Arg Arg Ser Lys Lys Leu Lys
    210                 215                 220

Glu Ile Glu Arg Leu Lys Glu Gln Leu Lys Ser Arg Ile Pro Ser Gly
225                 230                 235                 240

Arg Asp Leu Thr Gly Gln Glu Trp Leu Gln Ser Leu Leu Val Ala Thr
                245                 250                 255

Thr Asn Val Pro Glu Ser Glu Asn Gln Phe Lys Ile Trp Gln Lys His
            260                 265                 270

Leu Leu Gln Asn Ser Ser Ser Ile Pro Phe Pro Val Gln Phe Thr Ser
        275                 280                 285

Asn Glu Asp Leu Ile Trp Ser Lys Asn Glu Lys Gly Arg Ile Cys Val
    290                 295                 300

Ser Phe Ser Gly Glu Glu Phe Asn Asn His Ile Phe Glu Ile Tyr Cys
305                 310                 315                 320

Asp Lys Lys Gln Ile Tyr Trp Phe Gln Arg Phe Leu Glu Asp Gln Ser
                325                 330                 335

Ile Lys Arg Asn Asn Lys Lys Gln Tyr Ser Ser Ser Leu Phe Thr Leu
            340                 345                 350

Arg Ser Gly Arg Leu Ala Trp Gln Asp Asn Lys Gly Asn Asp Leu Pro
        355                 360                 365

Trp Lys Ile His Arg Leu Thr Leu Tyr Cys Ser Val Asp Thr Arg Leu
    370                 375                 380

Trp Thr Ile Glu Gly Thr Gln Glu Phe Arg Arg Glu Lys Val Asp Glu
385                 390                 395                 400

Ile Thr Glu Lys Leu Ala Asp Met Glu Lys Lys Glu Asn Leu Asn Lys
```

```
                405                 410                 415

Asn Gln Gln Ile Tyr Val Lys Arg Leu Asn Ser Thr Leu Thr Lys Ile
            420                 425                 430

Asp Thr Ala Tyr Pro Arg Pro Asn Gln Asn Leu Tyr Gln Gly Lys Thr
        435                 440                 445

Ser Ile Leu Ile Gly Val Ser Leu Gly Leu Glu Lys Pro Ala Thr Ile
    450                 455                 460

Ala Ile Val Asp Cys Pro Thr Asn Lys Val Leu Ala Tyr Arg Ser Val
465                 470                 475                 480

Lys Gln Leu Leu Gly Asp Asn Tyr Asn Leu Leu Asn Arg Gln Arg Gln
                485                 490                 495

Gln Gln Gln Arg Asn Ser His Glu Arg His Lys Ala Gln Lys Ser Asn
            500                 505                 510

Thr Gln Ile Lys Leu Ser Glu Leu Glu Leu Gly Lys His Ile Asp Asn
        515                 520                 525

Leu Leu Ala Gln Ala Ile Ile Thr Leu Ala Lys Ser Tyr Gln Ala Gly
    530                 535                 540

Ser Ile Val Leu Pro Thr Met Lys Asn Val Arg Glu Ser Ile Gln Ser
545                 550                 555                 560

Glu Ile Glu Ala Arg Ala Val Lys Arg Cys Pro Asn Tyr Lys Glu Gly
                565                 570                 575

Gln Gln Gln Tyr Ala Lys Gln Tyr Arg Gln Ser Ile His Arg Trp Ser
            580                 585                 590

Tyr Asn Arg Leu Ile Gly Cys Ile Lys Ser Gln Ala Ala Lys Ala Asn
        595                 600                 605
```

```
Ile Ser Ile Glu Gln Gly Pro Gln Pro Ile Arg Asp Ser Pro Gln Glu
    610                 615                 620

Lys Ala Arg Asp Leu Ala Ile Ala Ala Tyr His Phe Arg Gln Asn Lys
625                 630                 635                 640

Ser
```

<210> 504
<211> 690
<212> PRT
<213> Scytonema sp. HK-05

<400> 504

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asn Thr
1               5                   10                  15

Leu Arg Gln Leu Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Glu Gln Val Gly Gln His Pro Asn Phe Glu Lys Trp
        35                  40                  45

Leu Lys Lys Gly Glu Val Pro Glu Glu Ala Ile Asp Thr Ile Lys Lys
    50                  55                  60

Ser Leu Ile Thr Gln Glu Pro Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Val Thr Leu Val Lys Glu Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Gln Glu Arg Gln Arg Lys Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Lys Met Leu Lys Ser Asp Ile Glu Leu Gln Gln Glu Ser Gln Cys Asn
        115                 120                 125
```

```
Leu Asp Ile Ile Arg Asn Lys Ala Asn Glu Ile Leu Thr Ser Phe Val
    130                 135                 140

Ala Asn Phe Thr Glu Asn Arg Asn Gln Gln Phe Lys Lys Lys Gly Asn
145                 150                 155                 160

Lys Thr Lys Lys Asn Lys Lys Glu Glu Glu Glu Ser Thr Leu Phe Asn
                165                 170                 175

Ala Leu Phe Lys Ile Tyr Asp Lys Thr Lys Asp Cys Leu Ser Gln Cys
            180                 185                 190

Ala Leu Ala Tyr Leu Leu Lys Asn Asn Cys Gln Val Ser Glu Ile Asp
        195                 200                 205

Glu Asp Pro Glu Glu Tyr Val Lys Arg Arg Arg Arg Lys Glu Ile Glu
    210                 215                 220

Ile Glu Arg Leu Arg Lys Gln Leu Lys Ser Arg Lys Pro Lys Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Glu Lys Trp Leu Thr Ala Leu Lys Glu Ala Thr Asn
                245                 250                 255

Gln Val Pro Val Asp Gln Leu Glu Ala Lys Ser Trp Gln Ala Ser Leu
            260                 265                 270

Leu Lys Val Thr Ser Asp Ile Pro Tyr Pro Val Asp Tyr Glu Ser Asn
        275                 280                 285

Thr Asp Leu Asp Trp Leu Ile His Ser Asn Asp Asp Asp Ile Lys Lys
    290                 295                 300

Lys Val Ile Leu Val Trp Gln Ile Tyr Phe Leu Lys Gln Leu Ile Lys
305                 310                 315                 320
```

```
Ser Gly Ser Tyr Ser Phe Ile Lys Tyr Leu Tyr Phe Gln Arg Gly Cys
                325                 330                 335

Leu Pro Lys Arg Asp Val Asn Trp Leu Asn Leu Lys Asn Lys Ala Gly
            340                 345                 350

Arg Ile Phe Val Lys Phe Asn Gly Leu Arg Lys Asn Ile Ile Asn Pro
        355                 360                 365

Glu Phe Tyr Ile Cys Cys Asp Ser Arg Gln Arg His Tyr Phe Gln Arg
    370                 375                 380

Leu Cys Gln Asp Trp Gln Val Trp His Asp Asn Glu Glu Thr Tyr Ser
385                 390                 395                 400

Ser Ser Leu Phe Phe Leu Arg Ser Ala Arg Leu Leu Trp Gln Lys Arg
                405                 410                 415

Lys Gly Thr Gly Ala Pro Trp Lys Val Asn Arg Leu Ile Leu Gln Cys
            420                 425                 430

Ser Ile Glu Thr Arg Leu Trp Thr Glu Glu Glu Thr Glu Leu Val Arg
        435                 440                 445

Ile Glu Lys Ile Asn Gln Ala Glu Thr Glu Ile Arg Glu Ser Glu Gln
    450                 455                 460

Lys Gly Lys Pro Lys Gln Lys Val Leu Ser His Arg Gln Lys Leu Asn
465                 470                 475                 480

Asn Leu Phe Pro Asn Arg Pro Ser Lys Pro Ile Tyr Lys Gly Lys Pro
                485                 490                 495

Asn Ile Ile Val Gly Val Ser Phe Gly Leu Asp Lys Pro Ala Thr Val
            500                 505                 510

Ala Val Val Asp Val Ala Asn Lys Lys Val Leu Ala Tyr Arg Ser Thr
        515                 520                 525
```

```
Lys Gln Leu Leu Gly Lys Asn Tyr Asn Leu Leu Asn Arg Gln Arg Gln
    530                 535                 540

Gln Gln Gln Arg Leu Ser His Glu Arg His Lys Ala Gln Lys Arg Asn
545                 550                 555                 560

Ala Pro Asn Ser Phe Gly Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg
                565                 570                 575

Leu Leu Ala Asp Ala Ile Ile Ala Ile Ala Lys Thr Tyr Gln Ala Gly
            580                 585                 590

Ser Ile Val Ile Pro Lys Leu Arg Asp Met Arg Glu Gln Ile Thr Ser
        595                 600                 605

Glu Ile Gln Ser Arg Ala Glu Lys Lys Cys Pro Gly Tyr Lys Glu Ala
    610                 615                 620

Gln Gln Lys Tyr Ala Lys Glu Tyr Arg Leu Ser Val His Arg Trp Ser
625                 630                 635                 640

Tyr Gly Arg Leu Ile Glu Ser Ile Lys Ser Gln Ala Ala Lys Val Gly
                645                 650                 655

Ile Ser Thr Glu Ile Gly Thr Gln Pro Ile Arg Gly Ser Pro Glu Glu
            660                 665                 670

Lys Ala Arg Asp Leu Ala Val Phe Ala Tyr Gln Glu Arg Gln Ala Ala
        675                 680                 685

Leu Val
    690
```

<210> 505
<211> 643
<212> PRT
<213> Trichormus variabilis

<400> 505

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Ile Ala Ser Glu Ala Thr
1               5                  10                  15


Arg Ser Tyr Leu Trp Gln Leu Met Ala Gln Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Ile Glu Gln Leu Gly Ile His Pro Glu Ile Glu Gln Trp
        35                  40                  45


Leu Lys Lys Gly Lys Leu Pro Asp Gly Val Val Lys Pro Leu Cys Asp
    50                  55                  60


Ser Leu Ile Thr Gln Glu Ser Phe Ala Asn Gln Pro Lys Arg Phe Asn
65                  70                  75                  80


Lys Ser Ala Ile Glu Val Val Glu Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95


Leu Gln Lys Glu Arg Gln Gln Thr Ile Asp Arg Lys Glu His Trp Leu
            100                 105                 110


Lys Met Leu Lys Ser Asp Val Glu Leu Glu Gln Glu Ser Lys Cys Thr
        115                 120                 125


Leu Asp Ala Ile Arg Ser Gln Ala Thr Lys Ile Leu Pro Lys Tyr Leu
    130                 135                 140


Ala Gln Ser Glu Gln Asn Asn Asn Gln Thr Gln Ser Gln Asn Lys Lys
145                 150                 155                 160


Lys Ser Lys Lys Ser Lys Thr Lys Asn Glu Asn Ser Thr Leu Phe Asp
                165                 170                 175


Ile Leu Phe Lys Ala Tyr Asp Lys Ala Lys Asn Pro Leu Asn Arg Cys
            180                 185                 190
```

```
Thr Leu Ala Tyr Leu Leu Lys Asn Asn Cys Gln Val Ser Gln Lys Asp
        195                 200                 205

Glu Asp Pro Asn Gln Tyr Ala Leu Arg Arg Ser Lys Lys Glu Lys Glu
    210                 215                 220

Ile Glu Arg Leu Lys Lys Gln Leu Gln Ser Arg Lys Pro Asn Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Arg Glu Trp Gln Gln Thr Leu Ile Met Ala Thr Ser
                245                 250                 255

Ser Val Pro Glu Ser Asn Asp Glu Ala Asn Ile Trp Gln Lys Arg Leu
            260                 265                 270

Leu Lys Lys Asp Ile Ser Leu Pro Phe Pro Ile Arg Phe Arg Thr Asn
        275                 280                 285

Glu Asp Leu Ile Trp Ser Lys Asn Glu Glu Gly Arg Ile Cys Val Ser
    290                 295                 300

Phe Ser Gly Glu Gly Leu Asn Asp His Ile Phe Glu Ile Tyr Cys Gly
305                 310                 315                 320

Asn Arg Gln Ile His Trp Phe Gln Arg Phe Leu Glu Asp Gln Asn Ile
                325                 330                 335

Lys Asn Asp Asn Asn Asp Gln His Ser Ser Ala Leu Phe Thr Leu Arg
            340                 345                 350

Ser Ala Ile Leu Ala Trp Gln Glu Asn Lys Gln His Lys Glu Asn Ser
        355                 360                 365

Leu Pro Trp Asn Thr Arg Arg Leu Thr Leu Tyr Cys Thr Leu Asp Thr
    370                 375                 380

Arg Leu Trp Thr Thr Asp Gly Thr Glu Lys Val Lys Gln Glu Lys Val
```

```
385                 390                 395                 400

Asp Glu Phe Thr Gln Gln Leu Ala Asn Met Glu Gln Lys Glu Asn Leu
                405                 410                 415

Asn Gln Asn Gln Gln Asn Tyr Val Lys Arg Leu Gln Ser Thr Leu Asn
            420                 425                 430

Lys Leu Asn Asn Ala Tyr Pro Arg His Asn His Asp Leu Tyr Gln Gly
        435                 440                 445

Lys Pro Ser Ile Leu Val Gly Val Ser Leu Gly Leu Glu Lys Pro Ala
    450                 455                 460

Thr Leu Ala Ile Val Asp Ser Ser Thr Asn Ile Val Leu Ala Tyr Arg
465                 470                 475                 480

Ser Ile Lys Gln Leu Leu Gly Asp Asn Tyr Lys Leu Leu Asn Arg Gln
                485                 490                 495

Arg Gln Gln Gln Gln Arg Asn Ser His Glu Arg His Lys Ala Gln Lys
            500                 505                 510

Ser Asn Met Pro Asn Lys Leu Ser Glu Ser Asp Leu Gly Lys Tyr Ile
        515                 520                 525

Asp Asn Leu Leu Ala Gln Ala Ile Ile Ala Leu Ala Lys Asn Tyr Gln
    530                 535                 540

Ala Gly Ser Ile Val Leu Pro Thr Met Lys Asn Val Arg Glu Ser Ile
545                 550                 555                 560

Gln Ser Glu Ile Glu Ala Arg Ala Val Lys Arg Cys Pro Asn Tyr Lys
                565                 570                 575

Glu Gly Gln Gln Gln Tyr Ala Lys Gln Tyr Arg Gln Ser Ile His Arg
            580                 585                 590
```

```
Trp Ser Tyr Asn Arg Leu Met Gln Phe Ile Gln Ser Gln Ala Val Lys
        595                 600                 605


Ala Asn Ile Ser Ile Glu Gln Gly Pro Gln Pro Ile Arg Gly Ser Ser
    610                 615                 620


Gln Glu Lys Ala Arg Asp Leu Ala Ile Ala Ala Tyr Tyr Leu Arg Gln
625                 630                 635                 640


Asn Lys Ser
```

<210> 506
<211> 626
<212> PRT
<213> Cyanobacterium sp. IPPAS B-1200

<400> 506

```
Met Ser Leu Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Ala Asp Thr
1               5                   10                  15


Arg Gln Phe Leu Trp Met Leu Met Ser Gln Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Ile Phe Met Arg Ile Ala Glu His Pro Asp Phe Ser Val Trp
        35                  40                  45


Lys Glu Lys Gly Lys Leu Pro Lys Asn Phe Leu Ala Gln Gln Ile Ala
    50                  55                  60


Glu Leu Lys Glu Asp Lys Arg Phe Gln Gly Gln Pro Cys Arg Phe Tyr
65                  70                  75                  80


Ala Ser Val His Lys Met Ile Glu Tyr Val Tyr Glu Ser Trp Phe Thr
                85                  90                  95


Ile Gln Asp Lys Asn Lys Phe Arg Leu Gln Gly His Thr Arg Trp Leu
            100                 105                 110
```

```
Glu Met Leu Lys Pro Asp Thr Glu Ile Leu Gln Cys Phe Asp Gly Ser
        115                 120                 125

Leu Glu Lys Leu Gln Asn Gln Ala Arg Lys Ile Leu Asp Glu Ile Asp
    130                 135                 140

Ser Thr Leu Pro His Lys Arg Ile Ile Asp Gln Leu Phe Lys Glu Tyr
145                 150                 155                 160

Glu Arg Ile Asn Asp Pro Arg Ile Gln Gly Ala Ile Val Tyr Leu Ile
                165                 170                 175

Lys Asn Gly Ala Ser Ile Pro Asp Asn Lys Val Glu Thr Glu Lys Lys
            180                 185                 190

Tyr Lys Lys Leu Lys Arg Lys Val Glu Ile Gln Val Asn Lys Leu Lys
        195                 200                 205

Glu Gln Ile Glu Ile Ser Val Pro Thr Gly Arg Glu Leu Asn Asp Gln
    210                 215                 220

Lys Trp Leu Asp Thr Leu Ile Leu Ala Ser Thr Thr Met Pro Leu Asn
225                 230                 235                 240

Gln Ala Gln Cys Asp His Trp Phe Ser Val Leu Gln Gln Asn Ser Pro
                245                 250                 255

Cys Val Pro Tyr Pro Ile Ile Tyr Gln Thr Asn Glu Asp Leu Arg Trp
            260                 265                 270

Ser Ile Asn Asp Lys Asn Arg Leu Cys Val Gln Phe Ser Gly Leu Gly
        275                 280                 285

Gly His Leu Phe Thr Ile Tyr Cys Asp Ser Arg Gln Leu Ser Tyr Phe
    290                 295                 300
```

```
Arg Arg Phe Tyr Glu Asp Gln Gly Leu Lys Lys Ser His Lys Asp Lys
305                 310                 315                 320

Phe Ser Ser Ala Leu Phe Thr Leu Arg Ser Ile Leu Leu Leu Trp Lys
                325                 330                 335

Glu Asp Lys Thr Asn Lys Thr Lys Gly Glu Pro Trp Gln Ile Asn Arg
            340                 345                 350

Leu Tyr Leu His Cys Thr Leu Glu Thr Asp Cys Trp Thr Val Glu Gly
        355                 360                 365

Thr Gln Val Val Ala Gln Arg Lys Gln Lys Glu Val Leu Asn Ile Ile
    370                 375                 380

Asp Gly Met Lys Glu Lys Asp Asp Leu Arg Asp Thr Gln Lys Lys Phe
385                 390                 395                 400

Ile Gln Ser Lys Gln Thr Ser Leu Ala Arg Leu Asn Asn Ile Phe Pro
                405                 410                 415

Arg Pro Ser Lys Pro Ile Tyr Gln Ala Asn Pro Asp Leu Tyr Leu Gly
            420                 425                 430

Val Ala Met Gly Leu Gln Glu Pro Val Thr Ile Ala Leu Val Asp Val
        435                 440                 445

Ser Gln Glu Lys Val Ile Leu Tyr Arg Asn Ile Lys Gln Leu Leu Gly
    450                 455                 460

Asp Asn Tyr His Leu Leu Arg Lys Arg Arg Asn Glu Lys Gln Lys Leu
465                 470                 475                 480

Ser His Gln Asn His Lys Ala Lys Lys Arg Ala Asn Phe Gln Gln Lys
                485                 490                 495

Gly Glu Ser Asn Leu Gly Glu Tyr Val Asp Arg Leu Ile Ala Lys Ser
            500                 505                 510
```

```
Ile Leu Lys Ile Ala Gln Glu Tyr Lys Val Ser Thr Ile Ile Val Pro
        515                 520                 525

Arg Leu Lys Gln Met Arg Ser Ile Thr Glu Ala Glu Val Gln Ala Arg
    530                 535                 540

Ala Glu Glu Lys Ile Pro Glu Tyr Lys Glu Gly Gln Arg Lys Tyr Ala
545                 550                 555                 560

Lys Asp Tyr Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg Leu Ile
                565                 570                 575

Asp Asn Ile Lys Gly Asn Ser Ser Lys Leu Gly Ile Val Val Glu Glu
            580                 585                 590

Gly Thr Gln Pro Lys Gln Gly Thr Phe Thr Asp Lys Ala Leu Gln Leu
        595                 600                 605

Ala Leu Ser Ser Ser Lys Thr Asn His Lys Ala Asn Pro Thr Lys Ile
    610                 615                 620

Asn Ser
625
```

<210> 507
<211> 674
<212> PRT
<213> Calothrix sp. NIES-2100

<400> 507

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Ile Ala His Val Ala Thr
1               5                   10                  15

Leu Arg Tyr Leu Trp Lys Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Glu Gln Val Ala Glu His Pro Asn Phe Glu Ala Trp
```

```
        35                  40                  45

Leu Lys Lys Gly Glu Val Ser Lys Thr Ala Ile Lys Thr Ile Cys Asn
    50                  55                  60

Ser Leu Lys Thr Gln Glu Arg Phe Asn Asn Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Val Thr Leu Val His Glu Val Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Gln Arg Arg Gln Arg Gln Ile Asn Gly Lys Glu Arg Trp Leu
            100                 105                 110

Asn Met Leu Lys Ser Asp Ile Glu Leu Gln Gln Glu Ser Gln Cys Asp
        115                 120                 125

Leu Asn Val Ile Arg Ala Lys Ala Thr Glu Ile Leu Asn Lys Phe Asn
    130                 135                 140

Ala Lys Phe Ser Gln Lys Lys Lys Tyr Lys Ser Lys Lys Lys Ala Asn
145                 150                 155                 160

Asn Thr Lys Asn Lys Asn Lys Glu Phe Leu Asn Asn Thr Leu Phe Ser
                165                 170                 175

Ala Leu Phe Asp Met Tyr Asp Lys Thr Glu Asp Cys Leu Ser Lys Cys
            180                 185                 190

Ala Leu Ala Tyr Leu Leu Lys Asn Asn Cys Glu Val Asn Glu Leu Asp
        195                 200                 205

Glu Asp Gln Glu Lys Tyr Ala Lys Asn Lys Arg Gln Lys Glu Ile Glu
    210                 215                 220

Ile Glu Arg Leu Lys Lys Gln Ile Ile Ser Arg Lys Pro Lys Gly Arg
225                 230                 235                 240
```

```
Asp Ile Thr Ala Glu Lys Trp Leu Ser Thr Leu Glu Lys Ala Thr Asn
                245                 250                 255

Gln Val Ser Gln Asn Glu Asp Glu Ala Lys Ser Trp Gln Ala Ser Leu
            260                 265                 270

Leu Arg Arg Asp Ser Cys Met Pro Tyr Pro Ile Asp Tyr Asp Ser Asp
        275                 280                 285

Asp Leu Glu Trp Arg Val Asn Ser Leu Ala Glu Lys Asn Asn Ile Leu
    290                 295                 300

Glu Gln Ser Lys Tyr Asp Val Asp Asn Glu Ala Tyr Lys Asp Val Asn
305                 310                 315                 320

Trp Ser Asp Ile Lys Asn Lys Glu Gly Tyr Ile Leu Val Lys Phe Asn
                325                 330                 335

Gly Leu Lys Glu Ile Ile Lys His Pro Glu Phe Tyr Val Gly Cys Asp
            340                 345                 350

Ser Arg Gln Leu Asp Tyr Phe Gln Arg Phe Cys Gln Asp Trp Lys Ile
        355                 360                 365

Trp Asn Glu Asn Gln Glu Thr Tyr Ser Ser Gly Leu Phe Leu Leu Arg
    370                 375                 380

Ser Ala Arg Leu Leu Trp Gln Glu Arg Lys Gly Lys Gly Asp Pro Trp
385                 390                 395                 400

Thr Val His Arg Leu Ile Leu Gln Cys Ser Ile Glu Thr Arg Leu Trp
                405                 410                 415

Thr Gln Glu Glu Thr Glu Leu Val Arg Leu Glu Lys Ile Asp Gln Ala
            420                 425                 430

Asp Lys Thr Ile Ser Asn Met Glu Lys Lys Asp Ser Leu Asn Lys Asn
```

```
        435                 440                 445

Gln Val Ala Tyr Leu Lys Lys Thr Leu Thr Thr Arg Arg Lys Leu Asn
    450                 455                 460

Asn Pro Phe Pro Gly Arg Pro Ser Gln Ala Leu Tyr Gln Gly Lys Ser
465                 470                 475                 480

Ser Ile Leu Val Gly Val Ser Leu Gly Leu Asp Lys Pro Ala Thr Val
                485                 490                 495

Ala Val Val Asp Ala Ala Ser Lys Lys Val Leu Thr Tyr Arg Ser Val
            500                 505                 510

Lys Gln Leu Leu Gly Gln Lys Tyr Asn Leu Leu Asn Arg Gln Arg Gln
        515                 520                 525

Gln Gln Gln Arg Leu Ser His Glu Arg His Lys Ala Gln Lys Gln Asn
    530                 535                 540

Ala Pro Asn Ser Ala Ser Glu Ser Glu Leu Gly Gln Tyr Ile Asp Arg
545                 550                 555                 560

Leu Leu Ala Asp Ala Ile Val Ala Ile Ala Lys Thr Tyr Ser Ala Ser
                565                 570                 575

Ser Ile Val Leu Pro Lys Leu Gln Asp Leu His Glu Ile Ile Glu Ser
            580                 585                 590

Glu Ile Gln Val Lys Ala Glu Lys Lys Val Pro Gly Tyr Lys Glu Gly
        595                 600                 605

Gln Lys Asn Tyr Ala Lys Gln Tyr Arg Val Asn Ile His Arg Trp Ser
    610                 615                 620

Tyr Gly Arg Leu Phe Lys Ile Ile Gln Ser Gln Ala Ala Lys Ala Ser
625                 630                 635                 640
```

```
Ile Ser Ile Glu Ile Thr Ser Ser Val Ile Arg Ser Ser Pro Gln Glu
                645                 650                 655


Lys Ala Arg Asp Leu Ala Leu Leu Ala Tyr Gln Glu Arg Gln Ala Lys
            660                 665                 670


Leu Thr
```

<210> 508
<211> 608
<212> PRT
<213> Geminocystis sp. NIES-3708

<400> 508

```
Met Ala Val Ile Thr Ile His Cys Arg Leu Ile Ser Ser Lys Ser Asn
1               5                   10                  15


Arg His Gln Leu Trp Asn Leu Met Val Gln Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Leu Glu Leu Ser Gln His Glu Asp Leu Glu Gln Trp
        35                  40                  45


Cys Glu Leu Gly Lys Leu Pro Ser Gly Leu Ile Ser Lys Leu Cys Asp
    50                  55                  60


Gln Leu Lys Gln Arg Ala Glu Phe Glu Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80


Ala Ser Ala Ile Asn Leu Val Asp Tyr Ile Tyr Lys Ser Tyr Leu Arg
                85                  90                  95


Thr Gln Arg Arg Leu Arg Phe Arg Leu Gln Gly Gln Gln Arg Trp Phe
            100                 105                 110


Glu Met Phe Lys Ser Asp Thr Glu Phe Lys Asn Glu Thr Asn Phe Ser
        115                 120                 125
```

```
Leu Thr Asp Ile Arg Val Lys Ala Arg Glu Leu Leu Asp Lys Asp Leu
    130                 135                 140

Lys Asp Ser Ser Pro Asp Asp Tyr Phe Lys Thr Tyr Glu Ser Thr Ser
145                 150                 155                 160

Asp Leu Leu Thr Arg Ser Ala Ile Ser Tyr Leu Leu Lys Asn Gly Arg
                165                 170                 175

Lys Leu Pro Glu Lys Pro Glu Asp Tyr Gln Lys Phe Gln Lys Arg Arg
            180                 185                 190

Arg Lys Leu Gln Ile Lys Ile Glu Lys Leu Gln Lys Lys Ile Asp Ser
        195                 200                 205

Ser Pro Pro Met Gly Arg Asn Leu Thr Asn Asp Ser Trp Leu Gly Met
    210                 215                 220

Leu Asn Leu Val Ser Asn Thr Ile Pro Gln Thr Asp Glu Glu Ala Lys
225                 230                 235                 240

Gln Trp Gln Asp Gln Leu Leu Arg Gln Ser Lys Ser Val Pro Tyr Pro
                245                 250                 255

Val Met Phe Asn Thr Asn Glu Asp Leu Arg Trp Ser Lys Asn Lys Lys
            260                 265                 270

Gly Arg Leu Cys Val Thr Phe Asn Gly Leu Gly Lys Leu Val Phe Glu
        275                 280                 285

Ile Tyr Cys Asp Gln Gln Gln Leu Lys Trp Phe Glu Arg Phe Tyr Glu
    290                 295                 300

Asp Gln Glu Val Lys Arg Lys Gly Lys Asn Gln His Ser Ser Ala Leu
305                 310                 315                 320
```

```
Phe Thr Leu Arg Ser Gly Met Leu Leu Trp Gln Glu His Glu Gly Lys
                325                 330                 335

Gln Glu Ala Trp Gln Asn Asn His Leu Thr Leu Tyr Cys Ser Leu Asp
            340                 345                 350

Thr Cys Phe Glu Thr Ala Glu Gly Thr Glu Leu Val Arg Gln Lys Lys
        355                 360                 365

Val Lys Glu Val Val Asn Leu Ile Asp Ala Met Asn Asn Lys Ser Glu
    370                 375                 380

Arg Thr Lys Thr Gln Asp Ala Phe Ile Lys Arg Lys Gln Ser Thr Leu
385                 390                 395                 400

Ala Arg Leu Asp Asn Ser Phe Pro Arg Pro Ser Lys Pro Leu Tyr Gln
                405                 410                 415

Gly Asn Gln Asn Ile Val Val Ala Val Ser Met Ser Leu Glu Tyr Pro
            420                 425                 430

Ala Thr Ile Ala Met Phe Asn Met Ser Ser Gln Glu Val Leu Thr Tyr
        435                 440                 445

Arg Ser Thr Lys Gln Leu Leu Asp Asn Asn Tyr His Leu Leu Asn Arg
    450                 455                 460

Gln Arg Asn Gln Lys Gln Arg Leu Ser His Gln Arg His Lys Thr Gln
465                 470                 475                 480

Arg Gln Asn Ser Ser Asp Phe Phe Thr Gln Gln Glu Ser Glu Leu Gly
                485                 490                 495

Gln Tyr Leu Asp Arg Leu Leu Ala Gln Ser Ile Val Ser Ile Ala Lys
            500                 505                 510

Gln Tyr Gln Ala Ser Thr Ile Leu Leu Pro Asn Leu Lys Asn Ile Arg
        515                 520                 525
```

Asp Ser Ile Gln Ala Glu Ile Glu Ala Lys Ala Glu Ala Lys Ile Pro
530 535 540

Asn Cys Lys Glu Ala Gln Lys Lys Tyr Leu Lys Asn Tyr Arg Ile Asn
545 550 555 560

Ile His His Trp Ser Tyr Gly Arg Leu Ile Asp Ser Ile Gln Leu Gln
565 570 575

Ala Ser Lys Leu Asp Ile Leu Ile Gln Glu Val Lys Gln Pro Ile Arg
580 585 590

Gly Ser Pro Gln Glu Lys Ala Lys Gln Met Ala Ile Leu Thr Leu Glu
595 600 605

<210> 509
<211> 643
<212> PRT
<213> Leptolyngbya ohadii

<400> 509

Met Ser Ile Ile Thr Ile His Cys Arg Leu Thr Ala Pro Glu Ser Val
1 5 10 15

Arg Arg His Leu Trp Leu Leu Met Ser Gly Arg Asn Thr Pro Leu Ile
20 25 30

Asn Asp Leu Leu Lys Arg Val Ser Gln His Pro Asp Phe Glu Thr Trp
35 40 45

Gln Tyr Trp Gly Thr Val Pro Lys Val Ala Ile Lys Glu Leu Cys Glu
50 55 60

Pro Leu Lys Glu Leu Tyr Pro Gly Gln Pro Ala Arg Phe Tyr Ala Ser
65 70 75 80

Ala Ile Leu Met Val Thr Tyr Ile Tyr Glu Ser Trp Leu Ser Leu Gln

```
                85                  90                  95

Gln Thr Arg Arg His Arg Leu Asn Gly Lys Gln Arg Trp Leu Glu Val
            100                 105                 110

Val Lys Ser Asp Ala Glu Leu Leu Glu Met Ser Ser Ser Thr Leu Glu
        115                 120                 125

Thr Ile Arg His Arg Ala Gln Glu Ile Leu Ser Arg Cys Asn Val Glu
    130                 135                 140

Ser Thr Pro Gln Ser Glu Ser Ser Thr Lys Lys Arg Ser Lys Gln Gln
145                 150                 155                 160

Gly Gln Ser Ser Ala Ser Ser Ser Lys Ser Leu Met Thr Arg Leu Phe
                165                 170                 175

Glu Thr Tyr Asn Ser Ala Asp Asp Ile Leu Ser Arg Cys Ala Ile Ala
            180                 185                 190

His Leu Met Lys Asn Asp Cys Lys Val Ser Ala Thr Glu Glu Asp Pro
        195                 200                 205

Lys Glu Phe Ala His Arg Ile Leu Arg Lys Gln Lys Asp Ile Glu Gln
    210                 215                 220

Leu Glu Ala Gln Leu Gln Ala Arg Leu Pro Lys Gly Arg Asp Leu Thr
225                 230                 235                 240

Gly Glu Glu Phe Leu Lys Thr Leu Thr Ile Ala Thr Gln Gln Ile Ser
                245                 250                 255

Ala Ser Val Ala Glu Ala Arg Asp Trp Gln Gly Lys Leu Leu Thr Arg
            260                 265                 270

Pro Lys Ser Leu Pro Tyr Pro Ile Ile Tyr Gly Ser Ser Thr Asp Val
        275                 280                 285
```

```
Arg Trp Gly Lys Thr Ala Lys Gly Arg Ile Thr Val Ser Phe Asn Gly
    290                 295                 300

Ile Asp Lys Tyr Leu Lys Glu Ala Asp Ser Glu Ile Gln Glu Trp Phe
305                 310                 315                 320

Lys Thr Gln Lys Glu Tyr Pro Phe Arg Leu Tyr Cys Asp Gln Arg Gln
                325                 330                 335

Leu Pro Phe Phe Gln Arg Phe Leu Glu Asp Trp Gln Ala Tyr Gln Ala
            340                 345                 350

Asn Lys Asp Thr Tyr Pro Ala Gly Leu Leu Thr Leu Ser Ser Ala Thr
        355                 360                 365

Leu Gly Trp Arg Glu Gly Glu Gly Lys Gly Glu Pro Trp Gln Val Asn
    370                 375                 380

His Leu Val Leu Tyr Cys Ser Phe Asp Thr Arg Leu Met Thr Ala Glu
385                 390                 395                 400

Gly Thr Leu Ala Val Gln Gln Glu Lys Ala Ser Lys Ala Leu Lys Asn
                405                 410                 415

Leu Ala Arg Glu Asn Ser Asp Pro Arg Asn Leu Ser Thr Leu Asn Arg
            420                 425                 430

Leu Gln Asn Leu Pro Glu Arg Pro Ser Arg Lys Pro Tyr Gln Gly Asn
        435                 440                 445

Pro Glu Ile Leu Val Gly Leu Ser Val Gly Leu Thr His Pro Val Thr
    450                 455                 460

Val Ala Val Val Asn Gly Arg Thr Gly Asp Ala Leu Thr Tyr Arg Thr
465                 470                 475                 480

Pro Arg Thr Leu Leu Gly Asp Arg Tyr Pro Leu Leu Asn Arg Gln Arg
```

```
                485                 490                 495

Gln Arg Gln Lys Gln Asn Ala Leu Gln Arg His Lys Asn Gln Lys Arg
            500                 505                 510

Gly Val Ala Tyr Gln Pro Ser Glu Ser Glu Leu Gly Gln Tyr Val Asp
        515                 520                 525

Arg Leu Leu Ala Lys Ser Ile Ile Gln Leu Ala Gln Gln Tyr Gln Ala
    530                 535                 540

Gly Ser Ile Val Ile Pro Asn Leu Lys His Leu Arg Glu Leu Leu Ser
545                 550                 555                 560

Ser Glu Ile Thr Ala Lys Ala Glu Gln Lys Cys Ser Gly Ser Val Glu
                565                 570                 575

Ala Gln Asp Lys Tyr Ala Lys Glu Phe Arg Gln Arg Ile His Arg Trp
            580                 585                 590

Ser Tyr Asn Arg Leu Leu Glu Ala Ile Cys Ser Lys Ala Asn Gln Val
        595                 600                 605

Gly Ile Thr Ile Glu Thr Gly Phe Gln Pro Ser Lys Gly Thr Phe Gln
    610                 615                 620

Glu Gln Ala Lys Asp Leu Ala Ile Ala Thr Tyr His Ser Arg Ala Ile
625                 630                 635                 640

Asn Lys Lys
```

<210> 510
<211> 641
<212> PRT
<213> Lyngbya confervoides

<400> 510

```
Met Ser Lys Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ala Thr
1               5                  10                  15

Arg Gln Tyr Leu Trp His Leu Met Ala Asp Ile Tyr Thr Pro Phe Val
            20                  25                  30

Asn Glu Ile Leu Arg Gln Ile Arg Glu Asp Asp Asn Phe Glu Gln Trp
        35                  40                  45

Arg Gln Ser Gly Lys Ile Pro Ala Ser Val Phe Glu Asp Tyr Arg Lys
    50                  55                  60

Thr Leu Lys Thr Glu Ser Arg Phe Gln Gly Met Pro Gly Arg Trp Tyr
65                  70                  75                  80

Tyr Ala Gly Arg Glu Glu Val Lys Arg Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95

Leu Arg Arg Arg Leu Arg Asn Gln Leu Ala Gly Gln Asn Arg Trp Leu
            100                 105                 110

Glu Val Leu Gln Ser Asp Glu Thr Leu Met Glu Val Ser Gly Leu Asp
        115                 120                 125

Leu Ser Ala Leu Gln Ala Glu Ala Ser Gln Leu Leu Asn Ile Leu Gly
    130                 135                 140

Ser Lys Asn Lys Thr Ser Lys Asn Arg Ser Lys Lys Ala Lys Gly Lys
145                 150                 155                 160

Pro Lys Gly Lys Ser Ala Lys Asp Pro Thr Leu Tyr Gln Ala Leu Trp
                165                 170                 175

Glu Leu Tyr Arg Glu Thr Glu Asp Ile Ala Lys Lys Cys Val Ile Ala
            180                 185                 190

Tyr Leu Leu Lys His Lys Cys Gln Val Pro Asp Lys Pro Glu Asp Pro
        195                 200                 205
```

```
Lys Lys Phe Arg His Arg Arg Arg Glu Ala Glu Ile Arg Ala Glu Arg
    210                 215                 220

Leu Asn Glu Gln Leu Ile Lys Thr Arg Leu Pro Lys Gly Arg Asp Leu
225                 230                 235                 240

Thr Asn Glu Gln Trp Leu Gln Val Leu Glu Ile Ala Thr Arg Gln Val
                245                 250                 255

Pro Lys Asp Glu Asp Glu Ala Ala Ile Trp Gln Ser Arg Leu Leu Thr
            260                 265                 270

Asp Ala Ala Lys Phe Pro Phe Pro Val Ala Tyr Glu Thr Asn Glu Asp
        275                 280                 285

Leu Lys Trp Phe Leu Asn Gly Lys Gly Arg Leu Cys Val Ser Phe Asn
    290                 295                 300

Gly Leu Ser Glu His Thr Phe Glu Val Tyr Cys Gly Gln Arg Gln Leu
305                 310                 315                 320

Tyr Trp Phe Asn Arg Phe Leu Glu Asp Gln Gln Ile Lys Lys Glu Asn
                325                 330                 335

Gln Gly Glu Arg Ser Ala Gly Leu Phe Thr Leu Arg Ser Gly Arg Leu
            340                 345                 350

Val Trp Lys Pro Tyr Ser Ser Asp Ala Ser Arg Ser Asp Pro Trp Met
        355                 360                 365

Ala Asn Gln Leu Thr Leu Gln Cys Ser Val Asp Thr Arg Leu Trp Thr
    370                 375                 380

Ala Glu Gly Thr Glu Gln Val Arg Gln Glu Lys Ala Thr Ser Ile Ala
385                 390                 395                 400
```

```
Lys Val Ile Ala Gly Thr Lys Ala Lys Gly Asn Leu Asn Gln Lys Gln
                405                 410                 415

Gln Asp Phe Ile Thr Lys Arg Glu Lys Thr Leu Glu Leu Leu His Asn
            420                 425                 430

Pro Phe Pro Arg Pro Ser Lys Pro Leu Tyr Gln Gly Lys Pro Ser Ile
        435                 440                 445

Ile Ala Ala Val Ser Phe Gly Leu Glu Lys Pro Ala Thr Leu Ala Ile
    450                 455                 460

Val Asp Ile Val Thr Asp Lys Ala Ile Thr Tyr Arg Ser Ile Arg Gln
465                 470                 475                 480

Leu Leu Gly Gln Asn Tyr Lys Leu Phe Thr Lys His Arg Leu Lys Gln
                485                 490                 495

Gln Gln Cys Ala His Gln Arg His Gln Asn Gln Val Glu Ser Ala Glu
            500                 505                 510

Asn Arg Ile Ser Glu Gly Gly Leu Gly Glu His Leu Asp Ser Leu Ile
        515                 520                 525

Ala Lys Ala Ile Leu Glu Thr Ala Ala Glu Tyr Gly Ala Ser Ser Ile
    530                 535                 540

Val Leu Pro Glu Leu Gly Asn Ile Arg Glu Ile Ile His Ala Glu Ile
545                 550                 555                 560

Gln Ala Lys Ala Glu Arg Lys Ile Pro Gly Leu Lys Glu Lys Gln Asp
                565                 570                 575

Glu Tyr Ala Ala Lys Phe Arg Ala Ser Val His Arg Trp Ser Tyr Gly
            580                 585                 590

Arg Leu Ala Gln Lys Val Thr Thr Lys Ala Ser Leu His Gly Leu Glu
        595                 600                 605
```

Thr Glu Ser Thr Arg Gln Ser Leu Gln Gly Thr Pro Gln Glu Lys Ala
610 615 620

Arg Asn Leu Ala Ile Ser Ala Tyr Glu Ser Arg Lys Val Ala Gln Arg
625 630 635 640

Ala

<210> 511
<211> 648
<212> PRT
<213> Nodosilinea nodulosa

<400> 511

Met Ala Gln Ile Thr Ile Gln Cys Ser Leu Val Ala Ser Glu Ala Thr
1 5 10 15

Arg Gln Tyr Leu Trp His Leu Met Ala Asp Ile Tyr Thr Pro Phe Ile
20 25 30

Asn Glu Met Leu Val Arg Ile Gly Gln His Pro Asn Phe Glu Glu Trp
35 40 45

Asn Gln Lys Gly Lys Ile Pro Ala Asp Val Phe Glu Asp Leu Arg Lys
50 55 60

Ala Leu Lys Glu Asp Pro Ala Phe Arg Gly Ile Pro Gly Arg Trp Tyr
65 70 75 80

His Ala Gly Arg Asp Leu Val Lys Arg Ile Tyr Lys Ser Trp Leu Thr
85 90 95

Lys Arg Arg Arg Leu Tyr Ser Gln Leu Ala Gly Gln Thr His Trp Leu
100 105 110

Thr Ile Leu Gln Ser Asp Asp Glu Leu Ile Ala Ala Cys Asn Gln Asp

```
        115                 120                 125

Leu Gly Val Ile Arg Ala Glu Ala Ala Ala Leu Leu Val Lys Ala Glu
    130                 135                 140

Gly Ala Ala Pro Pro Ser Pro Ser Ala Lys Lys Ser Lys Lys Ser Pro
145                 150                 155                 160

Cys Pro Gln Lys Lys Ala Gln Lys Glu Lys Ser Ala Gln Pro Ser Lys
                165                 170                 175

Ser Leu Tyr Pro Trp Leu Phe Glu Ala Tyr Lys Thr Ala Glu Thr Asp
            180                 185                 190

Leu Ser Lys Cys Ala Ile Ala Tyr Leu Leu Lys His Asn Cys Gln Ile
        195                 200                 205

Pro Thr Lys Ala Glu Asp Ala Lys Lys Phe Gln Lys Arg Arg Arg Lys
    210                 215                 220

Ala Glu Ile Arg Val Glu Arg Ile Ile Glu Gln Leu Ala Arg Thr Arg
225                 230                 235                 240

Leu Pro Lys Gly Arg Asp Leu Thr Asp Glu Lys Trp Leu Asp Thr Leu
                245                 250                 255

Lys Met Ala Val Gln Gln Val Pro Lys Asp Glu Ala Glu Ala Ala Ala
            260                 265                 270

Trp Gln Ala Asp Leu Leu Thr Asp Ser Ser Pro Leu Pro Phe Pro Ile
        275                 280                 285

Ala Tyr Glu Thr Asn Glu Asp Leu Lys Trp Ser Gln Asn Ala Lys Gly
    290                 295                 300

Arg Leu Cys Val Ser Phe Asn Gly Leu Ala Glu His Ser Phe Glu Ile
305                 310                 315                 320
```

```
His Cys Asp Ile Arg Gln Leu His Trp Phe Gln Arg Phe Leu Asp Asp
                325                 330                 335

Gln Thr Ile Lys Lys Gln Gly Arg Lys Ser His Ser Ala Gly Ala Leu
            340                 345                 350

Thr Leu Arg Ser Gly Arg Ile Ser Trp Arg Leu Asp Ala Gly Lys Gly
        355                 360                 365

Asn Pro Trp Asp Arg Asn Arg Leu Val Leu Phe Cys Ser Val Asp Thr
    370                 375                 380

Leu Leu Trp Thr Lys Glu Gly Thr Glu Lys Ala Ser Gln Glu Lys Ala
385                 390                 395                 400

Ser Lys Ile Ala Gln Met Ile Ser Gly Thr Lys Ala Lys Gly Asn Leu
                405                 410                 415

Thr Asn Glu Gln Glu Asp Ser Val Arg Lys Lys Glu Lys Thr Leu Ala
            420                 425                 430

Leu Leu Gln Asn Pro Phe Pro Arg Pro Ser Arg Pro Leu Tyr Glu Gly
        435                 440                 445

Ser Pro Thr Val Leu Ala Gly Val Ser Phe Gly Leu Asp Lys Pro Ala
    450                 455                 460

Thr Leu Ala Ile Val Asp Ile Thr Thr Gly Gln Ala Ile Ala Tyr Arg
465                 470                 475                 480

Ser Ile Arg Gln Leu Leu Gly Asp Asp His Lys Leu Leu Asn Arg Gln
                485                 490                 495

Arg Gln Arg Gln Arg Lys Lys Ala Gln Leu Arg Arg Ser Lys Gln Leu
            500                 505                 510

Lys Phe Ala Pro Asn Arg Ile Ser Lys Glu Gly Leu Gly Asp Gln Ile
```

```
        515                 520                 525

Asp Ser Leu Ile Ala Lys Ala Ile Val Gln Ile Ala Gln Gln Tyr Asn
    530                 535                 540

Ala Ser Ser Ile Val Leu Gly Asp Leu Ala Asn Ile Arg Glu Ile Ile
545                 550                 555                 560

Glu Ser Glu Val Lys Ala Lys Ala Glu Gln Lys Thr Thr Leu Lys Glu
                565                 570                 575

Ile Gln Ala Lys Tyr Ala Leu Asp Tyr Arg Thr Ser Ile His Arg Trp
            580                 585                 590

Ser Tyr Asn Arg Leu Ala Gln Lys Ile Glu Ser Lys Ala Leu Gln Ala
        595                 600                 605

Gly Leu Ser Val Glu Thr Ile Lys Gln Pro Leu Thr Gly Ser Pro Gln
    610                 615                 620

Asp Lys Ala Arg Glu Val Ala Ile Ala Gly Phe Gln Ala Arg Asn Val
625                 630                 635                 640

Arg Lys Ile Leu Asp Thr Gly Ser
                645
```

<210> 512
<211> 612
<212> PRT
<213> Cyanobacterium aponinum

<400> 512

```
Met Ser Ile Val Thr Ile His Cys Arg Leu Ile Ala Pro Glu Ser Cys
1               5                   10                  15

Arg Ser Lys Ile Trp Asp Leu Met Ala Leu Lys Asn Thr Pro Met Ile
            20                  25                  30
```

```
Asn Glu Ile Leu Lys Arg Leu Ser Asn His Glu Glu Leu Glu Ser Trp
        35                  40                  45

Tyr Gln Thr Gly Arg Leu Pro Asn Gly Leu Val Thr Lys Ile Cys Asp
    50                  55                  60

Gln Leu Lys Asn Gln Pro Pro Phe Asp Asn Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80

Leu Ser Val Thr Asn Leu Val Glu Tyr Ile Tyr Lys Ser Tyr Leu Arg
                85                  90                  95

Thr Gln Lys Gln Leu Arg Phe Arg Leu Gln Arg Gln Gln Arg Trp Tyr
            100                 105                 110

Gln Met Leu Lys Ser Asp Ser Glu Leu Lys Gln Glu Ala Gln Cys Ser
        115                 120                 125

Leu Thr Asp Ile Arg Asn Lys Ala Gln Ser Leu Leu Ala Lys Tyr Thr
    130                 135                 140

Asn Ala Glu Ser Leu Ser Gln Ser Leu Phe Asp Ala Tyr Asn Leu Ala
145                 150                 155                 160

Glu Asp Lys Ile Thr Lys Val Ala Ile Ser Tyr Leu Leu Lys Asn Gly
                165                 170                 175

Cys Lys Ile Pro Gln Lys Val Glu Asn Ile Glu Arg Phe Val Lys Arg
            180                 185                 190

Arg Arg Lys Val Lys Ile Lys Ile Glu Arg Leu Glu Lys Arg Ile Ala
        195                 200                 205

Glu Ser Ser Pro Pro Met Gly Arg Asp Leu Ser Asp Glu Lys Trp Ile
    210                 215                 220

Asn Ile Leu Asn Ile Val Cys Gln Ser Ala Pro Gln Thr Asp Glu Gln
225                 230                 235                 240
```

```
Gly Lys Gln Trp Gln Asp Gln Leu Leu Lys Gln Ser Lys Ser Val Pro
                245                 250                 255

Tyr Pro Leu Ile Phe Asn Thr Asn Glu Asp Leu Ile Trp Ser Lys Asn
            260                 265                 270

Glu Lys Gly Arg Leu Cys Val Thr Phe Asn Gly Leu Thr Lys Lys Gly
        275                 280                 285

Phe Val Phe Glu Val Cys Cys Asp Gln Arg Gln Leu Lys Trp Phe Glu
    290                 295                 300

Arg Phe Tyr Gln Asp Gln Gln Val Lys Arg Gln Ser Lys Asn Gln His
305                 310                 315                 320

Ser Ser Ala Leu Phe Ser Leu Arg Ser Gly Met Leu Leu Trp Arg Glu
                325                 330                 335

Gly Glu Gly Lys Gln Lys Pro Trp Thr Lys Asn His Leu Ala Leu Phe
            340                 345                 350

Cys Ser Leu Glu Thr Gln Phe Glu Thr Ile Glu Gly Thr Glu Leu Ile
        355                 360                 365

Lys Gln Gln Lys Val Glu Glu Val Leu Lys Thr Ile Glu Asn Ile Lys
    370                 375                 380

Asn Lys Gly Glu Leu Thr Lys Thr Gln Glu Asn Phe Leu Gln Arg Lys
385                 390                 395                 400

Gln Ser Thr Leu Ala Arg Leu Asp Asn Pro Phe Pro Arg Pro Ser Lys
                405                 410                 415

Pro Leu Tyr Gln Gly Asn Pro Thr Ile Val Ile Gly Val Ser Met Gly
            420                 425                 430
```

```
Ile Glu Lys Pro Ala Thr Ile Ala Val Val Asn Gln Ser Thr Gly Glu
        435                 440                 445

Val Ile Ala Tyr Arg Ser Leu Lys Gln Leu Leu Gly Asp Asp Tyr Lys
    450                 455                 460

Leu Leu Asn Leu Gln Arg Leu His Lys Gln Lys Gln Ser His Lys Arg
465                 470                 475                 480

His Lys Ser Gln Arg Asp Ser Ser Ser Arg Lys Cys Asn Lys Ser Gln
                485                 490                 495

Ser Glu Leu Gly Gln Tyr Ile Asp Arg Leu Leu Ala Lys Glu Ile Val
            500                 505                 510

Ala Ile Ala Arg Thr Tyr Lys Val Gly Arg Ile Val Val Pro Ser Leu
        515                 520                 525

Asn Asn Ile Arg Glu Ser Ile Gln Ala Glu Leu Thr Ala Lys Ala Glu
    530                 535                 540

Ala Lys Ile Gln Gly Ser Leu Glu Ala Gln Lys Arg Tyr Leu Lys Asn
545                 550                 555                 560

Tyr Arg Ile Asn Val His Gln Trp Ser Tyr Gly Arg Leu Ile Glu Asn
                565                 570                 575

Ile Thr Leu Gln Ala Ser Lys Leu Asn Ile Ile Val Thr Glu Ala Lys
            580                 585                 590

Gln Ser Ile Arg Gly Ser Pro Gln Glu Lys Ala Lys His Leu Ala Leu
        595                 600                 605

Ser Ser Lys Asp
    610
```

<210> 513
<211> 729

<212> PRT
<213> Fremyella diplosiphon NIES-3275

<400> 513

Met Leu Asn Ile Tyr Ala Ile Ile Lys His Met Cys Phe Ile Asp Glu
1 5 10 15

Arg Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ser
20 25 30

Thr Arg Gln Gln Leu Trp Lys Leu Met Ala Glu Lys Asn Thr Ser Leu
35 40 45

Ile Asn Glu Leu Leu Val Gln Val Ala Gln Asn Pro Glu Phe Glu Thr
50 55 60

Trp Arg Gln Lys Gly Lys His Pro Ser Ser Ile Val Lys Glu Leu Cys
65 70 75 80

Gln Pro Leu Lys Thr Asp Pro Arg Phe Ile Gly Gln Pro Ala Arg Phe
85 90 95

Tyr Thr Ser Ala Ile Ala Thr Val Asn Tyr Ile Tyr Lys Ser Trp Phe
100 105 110

Ala Leu Ile Lys Arg Ser His Phe Gln Leu Glu Gly Lys Ile Arg Trp
115 120 125

Trp Glu Met Leu Lys Ser Asp Thr Glu Leu Val Glu Leu Ser Gly Met
130 135 140

Thr Ile Glu Ser Leu Arg Ser Lys Ala Ala Glu Ile Leu Ala Gln Phe
145 150 155 160

Thr Leu Lys Ser Asp Thr Val Glu Ala Lys Pro Ala Thr Glu Asn Lys
165 170 175

Arg Lys Lys Thr Lys Lys Ser Lys Ala Ser Asp Ser Asp Arg Ser Met

```
            180                 185                 190

Ser Lys Thr Leu Phe Glu Ala Tyr His Asp Thr Lys Asp Ile Leu Thr
        195                 200                 205

Ser Cys Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Ile Asn Asp
    210                 215                 220

Lys Glu Glu Asp Thr Gln Lys Phe Ala Lys Arg Arg Arg Lys Leu Glu
225                 230                 235                 240

Ile Gln Ile Glu Arg Leu Arg Glu Gln Leu Glu Ala Arg Ile Pro Lys
                245                 250                 255

Gly Arg Asp Leu Thr Asp Ala Lys Trp Leu Glu Thr Leu Leu Leu Ala
            260                 265                 270

Thr Arg Asn Val Pro Lys Ser Glu Leu Glu Ala Lys Ser Trp Gln Asp
        275                 280                 285

Asp Leu Leu Lys Lys Ser Ser Lys Leu Pro Phe Pro Val Gly Tyr Glu
    290                 295                 300

Ser Asn Glu Asp Met Thr Trp Phe Trp Gln Phe Ser Leu Tyr Asn Ile
305                 310                 315                 320

Ala Ile Asn Leu Arg Phe Phe Trp Leu Trp Ile Tyr Ile Asp Tyr Leu
                325                 330                 335

Ile Ala Ile Val Phe Leu Arg Asp Val Leu Gln Ile Glu Lys Gln Trp
            340                 345                 350

Leu His Asn Leu Glu Ile Asn Asn Thr Ser Leu Leu Ile Lys Leu Trp
        355                 360                 365

Asn Leu Ala Leu Glu Leu Asn Cys Leu Ala Ser Ile Leu Phe Leu His
    370                 375                 380
```

```
Glu Ser Leu His Lys Tyr Lys Arg Arg Leu Cys Val Gln Phe Asn Gly
385                 390                 395                 400

Leu Ser Lys His Thr Phe Lys Val Tyr Cys Asp Phe Arg Asp Leu His
                405                 410                 415

Trp Phe Gln Arg Phe Phe Glu Asp Gln Arg Ile Lys Lys Asn Ser Lys
            420                 425                 430

Asn Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser Gly Cys Ile Cys
        435                 440                 445

Trp Gln Glu His Glu Gly Lys Gly Lys Glu Trp Ile Val Asn Arg Leu
    450                 455                 460

Ile Leu Tyr Cys Cys Val Asp Thr Arg Leu Trp Thr Ala Glu Gly Thr
465                 470                 475                 480

Asn Gln Val Arg Glu Glu Lys Ala Glu Glu Ile Ala Lys Ala Ile Thr
                485                 490                 495

Arg Thr Ile Ala Arg Gly Glu Leu Asn Glu Lys Gln Leu Ala Phe Ile
            500                 505                 510

Arg Arg Lys Asn Ser Thr Leu Ala Arg Ile Asn Asn Pro Phe Pro Arg
        515                 520                 525

Pro Ser Gln Leu Leu Tyr Lys Gly Gln Ser His Ile Leu Val Gly Val
    530                 535                 540

Ser Leu Gly Leu Glu Lys Leu Ala Thr Val Ala Val Val Asp Gly Ser
545                 550                 555                 560

Thr Gly Lys Val Leu Thr Tyr Arg Ser Ile Lys Gln Leu Leu Gly Asp
                565                 570                 575

Asn Tyr Lys Leu Leu Asn Arg Gln Arg Gln Gln Lys His Thr Leu Ser
```

```
            580                 585                 590

His Gln Arg Gln Ile Ala Gln Ile Leu Ala Ala Pro Asn Gln Leu Gly
        595                 600                 605

Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala Lys Glu Ile
    610                 615                 620

Val Ala Ile Ala Gln Thr Tyr Lys Ala Gly Ser Ile Val Leu Pro Lys
625                 630                 635                 640

Leu Gly Asp Met Arg Glu Gln Val Gln Ser Glu Ile Gln Ala Lys Ala
                645                 650                 655

Glu Gln Lys Ser Asp Leu Ile Glu Val Gln Gln Lys Tyr Ala Lys Glu
            660                 665                 670

Tyr Arg Val Ser Val His Gln Trp Ser Tyr Gly Arg Leu Ile Ala Asn
        675                 680                 685

Ile Gln Thr Gln Ala Ala Lys Val Gly Ile Val Ile Glu Glu Ala Lys
    690                 695                 700

Gln Pro Val Arg Val Ser Pro Gln Glu Lys Ala Lys Glu Leu Ala Ile
705                 710                 715                 720

Ala Ala Tyr Asn Tyr Arg Gln Lys Thr
                725
```

<210> 514
<211> 646
<212> PRT
<213> Geminocystis sp. NIES-3709

<400> 514

```
Met Leu Val Lys Asn Cys Leu Ser Ile Ile Ile Ile Val Gln Leu Glu
1               5                   10                  15
```

```
Asp Asn Ile Phe Ser Ile Asn Phe Ile Lys Thr Leu Thr Ile Arg Lys
            20                  25                  30

Thr Ile Cys Tyr Phe Lys Val Met Thr Ile Lys Thr Ile Cys Cys Gln
        35                  40                  45

Leu Ile Ala Pro Glu Gln Thr Arg Gln Arg Leu Trp Gln Tyr Met Ala
    50                  55                  60

Glu Gln Tyr Thr Pro Leu Met Thr Glu Leu Ile Arg Gln Val Gly Glu
65                  70                  75                  80

His Pro Asp Leu Ser Gln Trp Gln Asp Lys Gly Lys Met Pro Ser Asn
                85                  90                  95

Ile Val Lys Asp Leu Cys Ala Thr Leu Lys Gln Ile Arg Pro Phe Thr
            100                 105                 110

Gly Leu Pro Ser Asn Phe Tyr Gln Ser Ala Ile Asn Gln Val Asn Tyr
        115                 120                 125

Ile Phe Ala Ser Trp Leu Ala Ser Gln His Lys Leu Lys Leu Arg Leu
    130                 135                 140

Asn Gly Lys Arg Tyr Tyr Phe Ser Met Leu Tyr Ser Asp Gln Asp Leu
145                 150                 155                 160

Val Lys Asn Ser Gly His Thr Leu Thr Glu Ile Arg Ser Gln Ala Gln
                165                 170                 175

Ile Ile Leu Asn Gln Ile Ser Asn Lys Lys Thr Glu Glu Lys His Lys
            180                 185                 190

Tyr Leu Phe Gln His His Arg Glu Ser Ser Asn Ile Leu Gly Lys Thr
        195                 200                 205

Ala Ile Thr Tyr Leu Ile Lys His Asn Gln Lys Ile Pro Thr Glu Pro
    210                 215                 220
```

```
Glu His Arg Asp Lys Phe Glu Lys Leu Tyr Arg Lys Thr Gln Ile Gln
225                 230                 235                 240

Ile Glu Lys Leu Glu Lys Gln Ile Glu Ala Arg Leu Pro Lys Gly Arg
                245                 250                 255

Asn Leu Ser Glu Gln Gln Trp Leu Asn Thr Leu Ile Thr Ala Ser Gln
            260                 265                 270

Asn Val Pro Lys Asp Glu Asn Glu Ala Lys Leu Trp Gln Lys Tyr Ile
        275                 280                 285

Leu Thr Asp Ser Asn Ser Leu Pro Tyr Pro Val Ser Tyr Glu Thr Asn
    290                 295                 300

Glu Asn Leu Val Trp Ser Leu Asp Glu Gln Gly Arg Leu Asn Leu Arg
305                 310                 315                 320

Phe Asn Gly Leu Gly Lys Leu Thr Phe Lys Val Tyr Cys Asp Asn Arg
                325                 330                 335

Gln Leu His Tyr Phe Gln Gln Phe Leu Gln Asp Gln Thr Ile Lys Lys
            340                 345                 350

Ser Gly Lys Asn Lys His Ser Ser Gly Leu Phe Leu Leu Arg Ser Ala
        355                 360                 365

Met Leu Val Trp Lys Pro Asn Glu Ser Lys Gly Lys Ser Trp Asn Lys
    370                 375                 380

Asn Thr Leu His Leu His Cys Ala Ile Asp Thr Arg Leu Leu Thr Leu
385                 390                 395                 400

Glu Gly Thr Gln Glu Val Arg Glu Glu Lys Leu Thr Gln Val Thr Asn
                405                 410                 415
```

```
Ile Ile Gln Ser Met Glu Lys Lys Pro Ser Leu Asn Asp Asn Gln Lys
            420                 425                 430

Gln Cys Leu Lys Arg Lys Lys Thr Ser Gln Lys Asn Leu His Glu Ser
        435                 440                 445

Phe Leu Arg Pro Ser Arg Ala Lys Tyr Gln Gly Asn Pro Asn Ile Ile
    450                 455                 460

Val Gly Val Ala Leu Gly Leu Lys His Pro Val Thr Val Ser Ile Val
465                 470                 475                 480

Asp Met Ala Thr Gln Lys Val Ile Ala Tyr Arg Ser Thr Lys Gln Leu
                485                 490                 495

Leu Gly Lys Asn Tyr Lys Leu Leu Asn Arg Tyr Lys Val Gln Lys Gln
            500                 505                 510

Arg Gln Ala His Gln Arg His Val Asn Gln Arg Gln Ser Ser Ser Val
        515                 520                 525

Ser Phe Gly Asp Ser Asn Gln Gly Lys Tyr Leu Asn Asp Leu Leu Val
    530                 535                 540

Gly Ala Val Met Asp Leu Ala Thr Gln Tyr Gln Ala Gly Asn Ile Val
545                 550                 555                 560

Leu Pro Lys Leu Asp His Ile Arg Glu Ile Val Glu Ser Glu Ile Lys
                565                 570                 575

Val Lys Ala Glu Lys Lys Ile Pro Leu Ser Val Asp Leu Gln Lys Lys
            580                 585                 590

Tyr Ala Lys Thr Tyr Arg Met Ser Val His Gln Trp Gly Tyr Gly Leu
        595                 600                 605

Phe Ile Asp Gly Leu Gln Asn Gln Ala Lys Arg Leu Ser Ile Ser Ile
    610                 615                 620
```

```
Glu Glu Arg Lys Gln Pro Ile Arg Gly Ser Pro Gln Glu Gln Ser Arg
625                 630                 635                 640


Asp Leu Val Leu Gly Lys
                645
```

<210> 515
<211> 719
<212> PRT
<213> Tolypothrix sp. PCC 7601

<400> 515

```
Met Cys Phe Ile Asp Glu Arg Met Ser Gln Ile Thr Ile Gln Cys Arg
1               5                   10                  15


Leu Val Ala Ser Glu Ser Thr Arg Gln Gln Leu Trp Lys Leu Met Ala
            20                  25                  30


Glu Lys Asn Thr Ser Leu Ile Asn Glu Leu Leu Val Gln Val Ala Gln
        35                  40                  45


Asn Pro Glu Phe Glu Thr Trp Arg Gln Lys Gly Lys His Pro Ser Ser
    50                  55                  60


Ile Val Lys Glu Leu Cys Gln Pro Leu Lys Thr Asp Pro Arg Phe Ile
65                  70                  75                  80


Gly Gln Pro Ala Arg Phe Tyr Thr Ser Ala Ile Ala Thr Val Asn Tyr
                85                  90                  95


Ile Tyr Lys Ser Trp Phe Ala Leu Ile Lys Arg Ser His Phe Gln Leu
            100                 105                 110


Glu Gly Lys Ile Arg Trp Trp Glu Met Leu Lys Ser Asp Thr Glu Leu
        115                 120                 125


Val Glu Leu Ser Gly Met Thr Ile Glu Ser Leu Arg Ser Lys Ala Ala
```

```
    130                 135                 140

Glu Ile Leu Ala Gln Phe Thr Leu Lys Ser Asp Thr Val Glu Ala Lys
145                 150                 155                 160

Pro Ala Thr Glu Asn Lys Arg Lys Lys Thr Lys Lys Ser Lys Ala Ser
                165                 170                 175

Asp Ser Asp Arg Ser Met Ser Lys Thr Leu Phe Glu Ala Tyr His Asp
            180                 185                 190

Thr Lys Asp Ile Leu Thr Ser Cys Ala Ile Ser Tyr Leu Leu Lys Asn
        195                 200                 205

Gly Cys Lys Ile Asn Asp Lys Glu Glu Asp Thr Gln Lys Phe Ala Lys
    210                 215                 220

Arg Arg Arg Lys Leu Glu Ile Gln Ile Glu Arg Leu Arg Glu Gln Leu
225                 230                 235                 240

Glu Ala Arg Ile Pro Lys Gly Arg Asp Leu Thr Asp Ala Lys Trp Leu
                245                 250                 255

Glu Thr Leu Leu Leu Ala Thr Arg Asn Val Pro Lys Ser Glu Leu Glu
            260                 265                 270

Ala Lys Ser Trp Gln Asp Asp Leu Leu Lys Lys Ser Ser Lys Leu Pro
        275                 280                 285

Phe Pro Val Gly Tyr Glu Ser Asn Glu Asp Met Thr Trp Phe Trp Gln
    290                 295                 300

Phe Ser Leu Tyr Asn Ile Ala Ile Asn Leu Arg Phe Phe Trp Leu Trp
305                 310                 315                 320

Ile Tyr Ile Asp Tyr Leu Ile Ala Ile Val Phe Leu Arg Asp Val Leu
                325                 330                 335
```

```
Gln Ile Glu Lys Gln Trp Leu His Asn Leu Glu Ile Asn Asn Thr Ser
            340                 345                 350

Leu Leu Ile Lys Leu Trp Asn Leu Ala Leu Glu Leu Asn Cys Leu Ala
        355                 360                 365

Ser Ile Leu Phe Leu His Glu Ser Leu His Lys Tyr Lys Arg Arg Leu
    370                 375                 380

Cys Val Gln Phe Asn Gly Leu Ser Lys His Thr Phe Lys Val Tyr Cys
385                 390                 395                 400

Asp Phe Arg Asp Leu His Trp Phe Gln Arg Phe Phe Glu Asp Gln Arg
                405                 410                 415

Ile Lys Lys Asn Ser Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu
            420                 425                 430

Arg Ser Gly Cys Ile Cys Trp Gln Glu His Glu Gly Lys Gly Lys Glu
        435                 440                 445

Trp Ile Val Asn Arg Leu Ile Leu Tyr Cys Cys Val Asp Thr Arg Leu
    450                 455                 460

Trp Thr Ala Glu Gly Thr Asn Gln Val Arg Glu Glu Lys Ala Glu Glu
465                 470                 475                 480

Ile Ala Lys Ala Ile Thr Arg Thr Ile Ala Arg Gly Glu Leu Asn Glu
                485                 490                 495

Lys Gln Leu Ala Phe Ile Arg Arg Lys Asn Ser Thr Leu Ala Arg Ile
            500                 505                 510

Asn Asn Pro Phe Pro Arg Pro Ser Gln Leu Leu Tyr Lys Gly Gln Ser
        515                 520                 525

His Ile Leu Val Gly Val Ser Leu Gly Leu Glu Lys Leu Ala Thr Val
```

```
    530                 535                 540

Ala Val Val Asp Gly Ser Thr Gly Lys Val Leu Thr Tyr Arg Ser Ile
545                 550                 555                 560

Lys Gln Leu Leu Gly Asp Asn Tyr Lys Leu Leu Asn Arg Gln Arg Gln
                565                 570                 575

Gln Lys His Thr Leu Ser His Gln Arg Gln Ile Ala Gln Ile Leu Ala
            580                 585                 590

Ala Pro Asn Gln Leu Gly Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg
        595                 600                 605

Leu Leu Ala Lys Glu Ile Val Ala Ile Ala Gln Thr Tyr Lys Ala Gly
    610                 615                 620

Ser Ile Val Leu Pro Lys Leu Gly Asp Met Arg Glu Gln Val Gln Ser
625                 630                 635                 640

Glu Ile Gln Ala Lys Ala Glu Gln Lys Ser Asp Leu Ile Glu Val Gln
                645                 650                 655

Gln Lys Tyr Ala Lys Glu Tyr Arg Val Ser Val His Gln Trp Ser Tyr
            660                 665                 670

Gly Arg Leu Ile Ala Asn Ile Gln Thr Gln Ala Ala Lys Val Gly Ile
        675                 680                 685

Val Ile Glu Glu Ala Lys Gln Pro Val Arg Val Ser Pro Gln Glu Lys
    690                 695                 700

Ala Lys Glu Leu Ala Ile Ala Ala Tyr Asn Tyr Arg Gln Lys Thr
705                 710                 715

<210>  516
<211>  682
<212>  PRT
```

<213> Cyanothece sp. PCC 8801

<400> 516

```
Met Thr Leu Lys Thr Leu Glu Cys Arg Leu Tyr Ala Pro Ser Asp Thr
1               5                  10                  15


Leu Arg Tyr Leu Trp Leu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Ile Ile Asn His Leu Ser Glu His Pro Asp Phe Asp Gln Trp
        35                  40                  45


Phe Lys Ala Lys Gln Ile Pro Lys Ser Ala Ile Ser Asp Ile Cys Asn
    50                  55                  60


Asp Leu Lys Ser Gln Glu Asn Tyr Gln Asn Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Ser Ser Ala Ile Ser Leu Thr His Tyr Met Phe Lys Ser Trp Phe Ala
                85                  90                  95


Val His Lys Gln Leu Gln Arg Arg Ile Glu Gly Lys Arg Arg Trp Leu
            100                 105                 110


Asn Leu Leu Lys Ser Asp Gln Glu Leu Glu Gln Asn Cys Gly Gln Ser
        115                 120                 125


Leu Glu Ile Ile Ile Gln Lys Ala Glu Glu Ile Leu Lys Leu Met Asp
    130                 135                 140


Ser Glu Lys Ser Gln Ser Ser Ser Lys Pro Lys Lys Pro Lys Lys Pro
145                 150                 155                 160


Lys Lys Lys Lys Lys Ser Ser Ser Glu Glu Thr Ile Thr Leu Phe Asp
                165                 170                 175


Arg Leu Phe Lys Ala Tyr Asn Gln Gly Asn Asp Ser Leu Glu Ser Tyr
            180                 185                 190
```

```
Ala Leu Ala Tyr Leu Leu Lys Asn Asn Gly Gln Ile Pro Glu Asp Asp
        195                 200                 205

Glu Asp Leu Asp Lys Phe Ala Leu Arg Lys Arg Lys Lys Glu Ile Glu
    210                 215                 220

Ile Glu Arg Leu Gln Gln Gln Leu Glu Asn Arg Ile Pro Leu Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Glu Leu Trp Gln Glu Met Leu Thr Ile Val Asn Glu
                245                 250                 255

Ser Ile Pro Gln Asp Glu Asn Glu Ala Ser Ala Trp Gln Ala Lys Leu
            260                 265                 270

Leu Lys Lys Ser His Asn Ile Pro Tyr Pro Val Ala Tyr Glu Thr Asn
        275                 280                 285

Thr Asp Leu Lys Trp Ser Lys Asp Ser Arg Gly His Leu Leu Val Thr
    290                 295                 300

Phe Asn Gly Leu Val Glu Ser Leu Lys Lys Leu Asn Leu Asn Pro Glu
305                 310                 315                 320

Phe Glu Ile Arg Cys Asp Arg Arg His Leu Pro Trp Phe Gln Arg Phe
                325                 330                 335

Cys Lys Asp Gln Glu Ile Lys Ala Asn Asn Asp Gln His Ser Ser Ala
            340                 345                 350

Leu Phe Val Leu Arg Ser Ala Arg Leu Ile Trp Arg Glu Gly Gln Gly
        355                 360                 365

Lys Glu Asp Pro Trp Lys Ile His Gln Leu Tyr Leu Gln Cys Ser Val
    370                 375                 380
```

```
Glu Thr Gln Leu Trp Thr Glu Ala Gly Thr Lys Gln Val Gln Ser Glu
385                 390                 395                 400

Lys Met Val Glu Phe Gln Leu Asn Gln Leu Arg Met Lys Pro Glu Leu
                405                 410                 415

Thr Phe Pro Ile Phe Phe Arg Ser Gln Ser Leu Pro Thr Tyr Phe Asn
            420                 425                 430

Leu Trp Lys Val Ile Thr Ser Tyr Arg Ile Leu Lys Phe Leu Glu Lys
        435                 440                 445

Gly Asp Phe Thr Lys Ala Gln Lys Asn Phe Gln Asp Ala Ile Lys Arg
    450                 455                 460

Thr Glu Ser Cys Leu Glu Asn Leu Gln Ser Ser Tyr Leu Thr Ser Gln
465                 470                 475                 480

Lys Ser Leu Tyr Gln Gly Asn Pro Glu Ile Ile Met Gly Val Ala Met
                485                 490                 495

Gly Leu Ser Gln Pro Ala Thr Ile Ala Val Val Asn Val Val Thr Gln
            500                 505                 510

Glu Val Leu Thr Tyr Arg Ser Leu Lys Gln Leu Leu Gly Lys Asn Tyr
        515                 520                 525

Asn Leu Leu Asn Arg Gln Arg Gln Gln Lys Gln Lys Leu Ser His Gln
    530                 535                 540

Arg His Lys Ala Gln Lys Lys Asp Ala Phe Asn Gln Tyr Gly Glu Ser
545                 550                 555                 560

Glu Leu Gly Gln Tyr Val Asp Arg Leu Ile Ala Lys Ala Ile Val Gln
                565                 570                 575

Val Ala Lys Glu Tyr Gln Ala Asp Ser Ile Ala Val Pro Lys Ile Arg
            580                 585                 590
```

```
Gln Met Arg Glu Ile Ile Gln Ser Glu Val Gln Ala Arg Ala Glu Arg
        595                 600                 605

Lys Ile Gln Gly Tyr Lys Glu Gly Gln Lys Lys Tyr Ala Gln Gln Tyr
    610                 615                 620

Arg Glu Asn Val His Gln Trp Ser Tyr Gly Arg Leu Ile Glu Ser Ile
625                 630                 635                 640

His Gln Ala Ser Ala Lys Phe Gly Ile Arg Val Glu Ile Ala Ser Gln
                645                 650                 655

Ser Tyr Gln Gly Ser Phe Gln Glu Gln Ala Gln Asn Leu Ala Ile Ala
            660                 665                 670

Ala Tyr Thr Asn Arg Leu Glu Ala Val Gly
        675                 680
```

<210> 517
<211> 637
<212> PRT
<213> Microcoleus sp. PCC 7113

<400> 517

```
Met Ser Ile Ile Thr Val Gln Cys Gln Leu Lys Ala Thr Lys Asp Ser
1               5                   10                  15

Leu Arg His Leu Trp Ser Leu Met Val Glu Lys Asn Thr Leu Leu Val
            20                  25                  30

Asn Glu Leu Leu Lys Gln Ile Asn Thr His Pro Asp Leu Glu Asn Trp
        35                  40                  45

Leu Lys Val Gly Asn Ile Lys Ala Glu Val Ile Glu Gly Leu Cys Asp
    50                  55                  60

Asn Leu Arg Thr Glu Ser Arg Phe Gln Asp Met Pro Gly Arg Phe Ala
```

```
65                  70                  75                  80

Asn Ala Ala Glu Lys Leu Val Lys Asp Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Glu Glu Arg Arg Phe Arg Leu Trp Arg Lys Gln Arg Trp Phe
            100                 105                 110

Ser Leu Leu Arg Ser Asp Leu Glu Leu Glu Gln Glu Ser Gly Leu Ser
        115                 120                 125

Leu Glu Lys Leu Arg Thr Glu Ala Thr Lys Ile Leu Ile Lys Ala Gln
    130                 135                 140

Leu Glu Cys Ser Arg Glu Ala Glu Pro Asp Gln Ala Thr Thr Asp Asn
145                 150                 155                 160

Ser Ser Ala Leu Trp Asp Asn Leu Phe Thr Ala Tyr Asp Lys Phe Lys
                165                 170                 175

Ser Pro Arg Leu Arg Cys Val Ile Ala Tyr Leu Leu Lys Asn Gly Cys
            180                 185                 190

Gln Val Asn Lys Val Glu Glu Asp Pro Glu Ala Tyr Gln Arg Arg Arg
        195                 200                 205

Arg Lys Lys Glu Ile Gln Ile Glu Arg Leu Lys Glu Gln Leu Lys Ser
    210                 215                 220

Arg Leu Pro Lys Gly Arg Asn Leu Ser Glu Gln Glu Trp Leu Glu Ala
225                 230                 235                 240

Leu Glu Gln Ala Gln Gly Leu Ile Ile Asp Asp Glu His Leu Arg Gln
                245                 250                 255

Val Gln Ala Ser Leu Thr Arg Lys Gln Ser Pro Val Pro Phe Ser Ile
            260                 265                 270
```

```
Ser Tyr Glu Thr Ser Thr Asp Leu Arg Trp Ser Ser Asn Glu Gln Gly
        275                 280                 285

Arg Ile Cys Val Ser Phe Asn Gly Lys Gly Ile Ser Lys His Thr Phe
    290                 295                 300

Glu Val Phe Cys Asp Gln Arg Gln Leu His Trp Phe Glu Arg Phe Tyr
305                 310                 315                 320

Glu Asp Tyr Lys Ile Phe Thr Gln Asn Lys Asp Gln Val Pro Ala Gly
                325                 330                 335

Leu Leu Thr Leu Arg Ser Ala Arg Leu Val Trp Gln Glu Gly Glu Gly
            340                 345                 350

Glu Gly Glu Pro Trp Gln Val His Arg Leu Leu Leu His Cys Ser Val
        355                 360                 365

Glu Thr Arg Leu Trp Thr Ala Gln Gly Thr Glu Glu Val Arg Ala Glu
    370                 375                 380

Lys Ile Ala Gln Thr Gln Ala Ala Ile Asp Arg Gln Lys Ala Lys Gly
385                 390                 395                 400

Thr Gln Ser Lys Lys Leu Asn Thr Ser Leu Glu Arg Leu Lys Thr Phe
                405                 410                 415

Gln Gly Phe Ser Arg Pro Ser Arg Ala Ser Tyr Lys Gly Asn Cys Ser
            420                 425                 430

Ile Val Ile Gly Val Ser Phe Gly Arg Ala Lys Pro Ala Thr Val Ala
        435                 440                 445

Val Val Asn Val Glu Thr Gly Glu Val Leu Ala Tyr Arg Asp Val Lys
    450                 455                 460

Gln Leu Leu Asn Lys Pro Ile Lys Glu Gly Lys Thr Lys Lys Lys Lys
```

```
465                 470                 475                 480

Thr Gln Tyr Glu Tyr Leu Lys Arg Arg Gln Glu Gln Gln Arg Leu Asn
                485                 490                 495

Ser His Gln Arg His Asn Ala Gln Lys Asn Gly Ala Pro Cys Asn Phe
            500                 505                 510

Gly Glu Ser Lys Gln Gly Glu Tyr Val Asp Arg Leu Leu Ala Lys Ala
        515                 520                 525

Ile Val Glu Val Ala Ser Gln Tyr Arg Ala Ser Ser Ile Val Leu Pro
    530                 535                 540

Asp Leu Arg Asn Ile Glu Glu Ala Ala Glu Ser Glu Val Arg Ala Arg
545                 550                 555                 560

Ala Glu Gln Lys Phe Pro Gly Asn Gln Lys Leu Gln Asp Ser Tyr Ala
                565                 570                 575

Lys Asp Tyr Arg Ala Ser Ile His Cys Trp Ser Tyr Ser Arg Leu Ala
            580                 585                 590

Gln Cys Ile Glu Leu Lys Ala Gly Lys Ala Gly Ile Ala Thr Glu Lys
        595                 600                 605

Val His Gln Pro His Gly Asp Thr Pro Gln Glu Lys Ala Arg Asp Leu
    610                 615                 620

Val Leu Ala Ala Tyr Ala Asn Arg Lys Val Ser Val Ser
625                 630                 635
```

<210> 518
<211> 643
<212> PRT
<213> Cyanothece sp. PCC 7425

<400> 518

```
Met Ser Met Tyr Thr Ile His Cys His Leu Thr Ala Ser Glu Pro Val
1               5                   10                  15

Arg Arg His Leu Trp Tyr Leu Met Ala Gly Ser Asn Thr Pro Leu Val
            20                  25                  30

Asn Asn Leu Leu Lys Leu Val Ser Gln His Pro Asp Phe Glu Thr Trp
        35                  40                  45

Gln Arg Lys Gly Asp Ile Ser Lys Ser Ser Val Glu Ala Leu Cys Glu
    50                  55                  60

Pro Leu Lys Glu Thr Tyr Pro Gly Gln Pro Gly Arg Phe Tyr Ser Ser
65                  70                  75                  80

Ala Ile Leu Arg Val Thr Tyr Thr Tyr Lys Ser Trp Leu Ala Leu Gln
                85                  90                  95

Lys Asn Arg Arg Tyr Arg Leu Glu Gly Lys Gln Arg Trp Leu His Val
            100                 105                 110

Val Glu Ser Asp Ser Glu Leu Leu His Arg Ser Gly Ser Ser Ile Glu
        115                 120                 125

Thr Leu Lys Tyr Arg Ala Gln Asp Ile Leu Val Gln Leu Asn Val Glu
    130                 135                 140

Gln Gln Thr Gln Lys Thr Ser Val Thr Asp Ile Ser Thr Ile Thr Pro
145                 150                 155                 160

Glu Glu Thr Pro Ser Ser Lys Asn Glu Ser Leu Phe Pro Ser Leu Phe
                165                 170                 175

Arg Ala Tyr Asp Ser Glu Asp Asp Ile Leu Ser Arg Cys Ala Ile Ala
            180                 185                 190

Tyr Leu Ile Lys Asn Gly Gly Lys Ile Pro Glu Thr Glu Glu Asp Gln
        195                 200                 205
```

```
Glu Lys Phe Thr Gln Arg Val Asn Ser Lys Arg Glu Glu Ile Glu Gln
    210                 215                 220

Leu Glu Ile Glu Leu Ser Ala Arg Tyr Pro Lys Gly Arg Asp Leu Thr
225                 230                 235                 240

Gly Glu Glu Phe Leu Glu Thr Leu Ala Ile Ala Thr Gln Gln Leu Ser
                245                 250                 255

Glu Thr Val Ala Gln Ala Arg Glu Trp Asn Asp Lys Ile Leu Thr Gln
            260                 265                 270

Pro Lys Phe Met Pro Tyr Pro Ile Ile Tyr Gly Ser Ser Thr Asp Val
        275                 280                 285

Arg Trp Arg Lys Thr Ser Lys Ser Arg Ile Thr Val Ser Phe Asn Gly
    290                 295                 300

Ile Asp Lys Tyr Leu Lys Ala Ala Asp Pro Glu Ile Lys Ala Trp Phe
305                 310                 315                 320

Lys Asp His Gln Glu Tyr Pro Phe Arg Leu His Cys Asp Glu Arg Gln
                325                 330                 335

Leu Pro Phe Phe Gln Arg Phe Leu Glu Asp Trp Gln Phe Tyr Gln Ala
            340                 345                 350

Asn Lys Glu Thr Tyr Pro Ala Gly Leu Leu Thr Leu Ser Ser Thr Leu
        355                 360                 365

Leu Gly Trp Arg Glu Gly Glu Gly Lys Gly Asp Pro Trp Asn Val Asn
    370                 375                 380

Arg Leu Ala Leu Tyr Cys Thr Phe Asp Thr Arg Leu Met Thr Ala Glu
385                 390                 395                 400
```

```
Gly Thr Leu Asp Val Gln Lys Glu Lys Ser Glu Lys Ala Leu Lys Asn
                405                 410                 415

Leu Ala Lys Ala Lys Pro Asp Pro Arg Asn His Ser Thr Leu Asp Arg
            420                 425                 430

Leu Lys Asn Leu Pro Val Arg Pro Ser Arg Thr Pro Tyr Gln Gly Asn
        435                 440                 445

Pro Glu Ile Leu Val Gly Leu Arg Val Gly Leu Thr Asn Pro Ile Thr
    450                 455                 460

Ala Ala Val Val Asn Gly Arg Thr Gly Glu Val Leu Thr Tyr Arg Thr
465                 470                 475                 480

Pro Ser Thr Leu Leu Gly Asp Arg Tyr Asp Leu Phe Asn Arg His Arg
                485                 490                 495

His Gln Gln Glu Gln Asn Ala Leu Glu Arg His Lys Tyr Gln Lys Arg
            500                 505                 510

Gly Val Thr Tyr Gln Pro Ser Glu Ser Glu Leu Gly Lys Tyr Val Asp
        515                 520                 525

Arg Leu Leu Ala Lys Ala Ile Ile Glu Leu Ala Gln Thr Tyr Lys Ala
    530                 535                 540

Gly Ser Ile Val Ile Pro Cys Leu Thr His Leu Arg Glu Ile Leu Ala
545                 550                 555                 560

Ser Glu Ile Ala Ala Arg Ala Glu Glu Lys Cys Pro Gly Ser Val Glu
                565                 570                 575

Ala Gln Asp Asn Tyr Ala Lys Glu Tyr Arg Arg Lys Ile His Asn Trp
            580                 585                 590

Ser Tyr Asn Arg Leu Ile Ser Ala Ile Cys Ser Lys Ala Glu Gln Leu
        595                 600                 605
```

```
Gly Ile Ile Val Glu Ser Gly Phe Gln Pro Tyr Glu Gly Asp Ser Tyr
    610                 615                 620

Gln Gln Ala Lys Asp Leu Ala Ile Ala Val Tyr His Ser Arg Gln Leu
625                 630                 635                 640

Ala Leu Lys
```

<210> 519
<211> 671
<212> PRT
<213> Scytonema sp. NIES-4073

<400> 519

```
Met Ser Arg Asn Ser Lys Lys Asp Phe Lys Ser Pro Ile Leu Arg Thr
1               5                   10                  15

Ile Arg Cys His Leu Tyr Ala Ser Glu Asp Val Leu Arg Lys Val Trp
            20                  25                  30

Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Lys
        35                  40                  45

Ser Val Ser Glu Gln Pro Glu Phe Glu Ala Asn Lys Glu Asn Gly Lys
    50                  55                  60

Ile Thr Lys Lys Glu Ile Thr Glu Leu Arg Lys Ser Leu Thr Gln Asp
65                  70                  75                  80

Ser Asp Leu Asp Lys Gln Ser Gly Arg Leu Arg Ser Ser Ala Asp Thr
                85                  90                  95

Phe Val Thr Glu Val Tyr Ser Ser Trp Leu Thr Leu Tyr Gln Lys Arg
            100                 105                 110

Lys Ser Gln Lys Glu Arg Lys Glu Tyr Phe Leu Asn Asn Ile Leu Lys
```

```
        115                 120                 125

Ser Asp Phe Glu Leu Val Glu Glu Ser Asn Cys Asp Leu Gln Thr Ile
    130                 135                 140

Arg Phe Lys Ala Gln Glu Ile Leu Ser Gln Pro Glu Lys Leu Leu Gln
145                 150                 155                 160

Gln Ile Ile Ile Glu Asn Gly Asn Lys Ala Glu Ile Asn Ser Ser Arg
                165                 170                 175

Lys Lys Gly Ile Lys Asn Ser Asn Asn Gln Asn Ser Asn Thr Lys Glu
            180                 185                 190

Asn Ala Asn Glu Gly Asn Ser Lys Thr Leu Thr Asp Ile Leu Tyr Glu
        195                 200                 205

Ile His Lys Lys Thr Arg Asp Ile Val Thr Gln Cys Ala Val Ala Tyr
    210                 215                 220

Leu Ile Lys Asn Tyr Asn Gln Val Ser Glu Leu Glu Glu Asp Ile Gln
225                 230                 235                 240

Lys Leu Lys Lys Arg Arg Ser Gln Lys Glu Ile Glu Ile Lys Arg Leu
                245                 250                 255

Glu Lys Gln Ile Lys Asn Asn Gln Leu Pro Asn Gly Arg Asp Ile Ser
            260                 265                 270

Gly Lys Thr Tyr Ile Gln Ala Leu Asp Asn Leu Ile Asn Gln Val Pro
        275                 280                 285

Asn Asp Asn Glu Glu Tyr Ala Asn Trp Leu Ala Cys Leu Ser Lys Lys
    290                 295                 300

Ile Ser Ala Leu Pro Tyr Pro Ile Asp Tyr Leu Tyr Gly Asp Leu Ser
305                 310                 315                 320
```

```
Trp Tyr Lys Asn Glu Glu Glu Lys Ile Phe Val Tyr Phe Asn Gly Trp
                325                 330                 335

Ala Asp Tyr His Phe Gln Ile His Cys Asn Lys Arg Gln Arg His Phe
            340                 345                 350

Phe Glu Arg Phe Leu Glu Asp His Glu Ala Phe Lys Lys Asn Glu Lys
        355                 360                 365

Ser Glu Glu Lys Leu Ser Gly Gly Leu Ile Thr Leu Arg Ser Ala Gln
    370                 375                 380

Leu Leu Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp Lys Val His
385                 390                 395                 400

Lys Leu Ala Leu His Cys Thr Tyr Asp Ala Arg Leu Trp Thr Ala Glu
                405                 410                 415

Gly Thr Glu Glu Val Arg Glu Glu Lys Thr Asp Lys Thr Gln Lys Gln
            420                 425                 430

Val Ile Lys Gly Glu Glu Asn Glu Asn Leu Asp Lys Lys Glu Gln Thr
        435                 440                 445

Gln Leu Lys Lys Asn Lys Ser Ser Leu Ser Arg Leu Asn Asn Ser Phe
    450                 455                 460

Thr Arg Pro Ser Lys Leu Val Tyr Arg Gly Gln Pro His Ile Ile Val
465                 470                 475                 480

Gly Val Ser Phe His Pro Val Glu Leu Ala Thr Val Thr Val Val Asp
                485                 490                 495

Val Asn Thr Lys Lys Val Leu Thr Asn Lys Thr Val Lys Gln Leu Leu
            500                 505                 510

Gly Asp Asp Phe Asp Leu Leu Ser Arg Arg Arg Arg Gln Gln Val His
```

```
        515                 520                 525

Leu Arg Lys Glu Arg Glu Lys Ala Gln Lys Lys Asp Ser Pro Cys Asn
    530                 535                 540

Ile Gly Glu Ser Lys Leu Gly Glu Tyr Val Asp Lys Leu Leu Ala Lys
545                 550                 555                 560

Arg Ile Val Glu Val Ala Lys Tyr Tyr Gln Ala Ser Cys Ile Val Leu
                565                 570                 575

Pro Thr Leu Lys Asp Thr Arg Glu Ile Arg Thr Ser Val Ile Gln Ala
            580                 585                 590

Lys Ala Glu Thr Lys Phe Pro Gly Asp Val Asn Ala Gln Lys Leu Tyr
        595                 600                 605

Val Lys Glu Tyr Asn Arg Gln Ile His Asn Trp Ser Tyr Thr Arg Leu
    610                 615                 620

Gln Glu Ser Ile Lys Leu Lys Ala Ala Glu Ser Lys Ile Ser Ile Glu
625                 630                 635                 640

Cys Gly Ile Gln Pro His Tyr Asp Thr Leu Gln Glu Gln Ala Arg Asp
                645                 650                 655

Leu Ala Leu Ser Ala Tyr Gln Cys Arg Ile Asn Thr Ile Gly Arg
            660                 665                 670
```

<210> 520
<211> 679
<212> PRT
<213> Nostoc sp. KVJ20

<400> 520

```
Met Ser Ser Asp Arg Lys Lys Lys Ser Thr Ile Pro Val His Arg Thr
1               5                   10                  15
```

```
Ile Arg Cys His Leu Asp Ala Ser Glu Asp Ile Leu Arg Lys Val Trp
            20                  25                  30

Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Leu Lys Leu Leu Lys
        35                  40                  45

Ser Val Ser Glu Gln Pro Glu Phe Glu Ala Asn Lys Glu Lys Gly Glu
    50                  55                  60

Ile Thr Lys Lys Glu Ile Val Lys Leu Arg Lys Asn Val Thr Lys Asn
65                  70                  75                  80

Pro Glu Leu Glu Glu Gln Ser Gly Arg Leu Arg Ser Ser Ala Glu Ser
                85                  90                  95

Phe Val Lys Glu Val Tyr Ser Ser Trp Leu Thr Leu Tyr Gln Lys Arg
            100                 105                 110

Lys Arg Gln Lys Glu Gly Lys Glu Tyr Phe Leu Lys Asn Ile Leu Lys
        115                 120                 125

Ser Asp Val Glu Leu Ile Asp Glu Ser Asn Cys Asp Leu Glu Thr Ile
    130                 135                 140

Arg Ser Lys Ala Gln Glu Val Leu Ser Gln Pro Glu Glu Phe Ile Lys
145                 150                 155                 160

Gln Leu Thr Ile Asn Asp Glu Asp Val Lys Pro Thr Lys Ser Ala Arg
                165                 170                 175

Lys Arg Val Asn Lys Asn Ile Asn Asn Lys Ser Thr Asp Ala Glu Gln
            180                 185                 190

Arg Lys Asp Ser Ser Ser Thr Asn Asn Val Asp Lys Asn Lys Leu Glu
        195                 200                 205

Thr Leu Thr Asn Ile Leu Tyr Glu Ile His Lys Gln Thr Gln Asp Ile
    210                 215                 220
```

```
Leu Thr Arg Cys Thr Val Ala Tyr Leu Ile Lys Asn His Asn Lys Ile
225                 230                 235                 240

Ser Asn Leu Glu Glu Asp Ile Gln Lys Leu Lys Lys Arg Arg Asn Glu
                245                 250                 255

Lys Ile Val Gln Ile Lys Arg Leu Glu Asn Gln Ile Gln Asp Asn Arg
            260                 265                 270

Leu Pro Ser Gly Arg Asp Ile Thr Gly Glu Arg Tyr Ser Glu Ala Phe
        275                 280                 285

Gly Asn Leu Ile Asn Gln Val Pro Lys Asn Asn Gln Glu Trp Glu Asp
    290                 295                 300

Trp Ile Ala Asn Leu Ser Lys Lys Ile Ser His Leu Pro Tyr Pro Ile
305                 310                 315                 320

Asp Tyr Leu Tyr Gly Asp Leu Ser Trp Tyr Lys Asn Asp Val Gly Asn
                325                 330                 335

Ile Phe Val Tyr Phe Asn Gly Trp Ser Glu Tyr His Phe Lys Ile Cys
            340                 345                 350

Cys Asn Lys Arg Gln Arg His Phe Phe Glu Arg Phe Leu Glu Asp Tyr
        355                 360                 365

Lys Ala Phe Lys Val Ser Gln Lys Gly Glu Glu Lys Leu Ser Gly Ser
    370                 375                 380

Leu Ile Thr Leu Arg Ser Ala Gln Leu Leu Trp Gln Gln Gly Glu Gly
385                 390                 395                 400

Lys Gly Glu Pro Trp Lys Val His Lys Leu Ala Leu His Cys Thr Tyr
                405                 410                 415
```

```
Asp Ser Arg Leu Trp Thr Ala Glu Gly Thr Glu Glu Val Arg Lys Glu
            420                 425                 430

Lys Thr Asp Lys Ala Gln Lys Arg Val Ser Lys Ala Glu Glu Asn Glu
        435                 440                 445

Lys Leu Asp Asp Ile Gln Gln Thr Gln Leu Asn Lys Asp Lys Ser Ser
    450                 455                 460

Leu Ser Arg Leu Lys Asn Ser Phe Asn Arg Pro Gly Lys Leu Ile Tyr
465                 470                 475                 480

Gln Ser Gln Ser Asn Ile Ile Val Gly Ile Ser Phe His Pro Ile Glu
                485                 490                 495

Leu Ala Thr Val Ala Ile Val Asp Ile Asn Thr Lys Lys Val Leu Ala
            500                 505                 510

Cys Asn Thr Val Lys Gln Leu Leu Gly Asn Ala Phe His Leu Leu Ser
        515                 520                 525

Arg Arg Arg Arg Gln Gln Val His Leu Ser Lys Glu Arg Lys Lys Ala
    530                 535                 540

Gln Lys Lys Asp Ser Pro Cys Asn Ile Gly Glu Ser Lys Leu Gly Glu
545                 550                 555                 560

Tyr Ile Asp Lys Leu Leu Ala Lys Arg Ile Val Glu Ile Ala Lys Phe
                565                 570                 575

Tyr Gln Ala Gly Cys Ile Ile Leu Pro Arg Leu Lys Asp Met Lys Glu
            580                 585                 590

Ile Arg Thr Ser Ala Ile Gln Ala Lys Ala Glu Ala Lys Ile Pro Gly
        595                 600                 605

Asp Val Asn Ala Gln Lys Leu Tyr Val Lys Glu Tyr Asn Arg Gln Ile
    610                 615                 620
```

```
His Asn Trp Ser Tyr Asn Arg Leu Gln Glu Ser Ile Lys Ser Lys Ala
625                 630                 635                 640


Ala Glu Phe Lys Ile Ser Ile Glu Phe Gly Ile Gln Pro His Tyr Gly
                645                 650                 655


Thr Leu Glu Glu Gln Ala Lys Asp Leu Ala Phe Tyr Ala Tyr Gln Ser
            660                 665                 670


Arg Asn His Thr Leu Gly Arg
        675


<210>  521
<211>  641
<212>  PRT
<213>  Cyanothece sp. PCC 7425

<400>  521

Met Tyr Thr Ile His Cys His Leu Thr Ala Ser Glu Pro Val Arg Arg
1               5                   10                  15


His Leu Trp Tyr Leu Met Ala Gly Ser Asn Thr Pro Leu Val Asn Asn
            20                  25                  30


Leu Leu Lys Leu Val Ser Gln His Pro Asp Phe Glu Thr Trp Gln Arg
        35                  40                  45


Lys Gly Asp Ile Ser Lys Ser Ser Val Glu Ala Leu Cys Glu Pro Leu
    50                  55                  60


Lys Glu Thr Tyr Pro Gly Gln Pro Gly Arg Phe Tyr Ser Ser Ala Ile
65                  70                  75                  80


Leu Arg Val Thr Tyr Thr Tyr Lys Ser Trp Leu Ala Leu Gln Lys Asn
                85                  90                  95


Arg Arg Tyr Arg Leu Glu Gly Lys Gln Arg Trp Leu His Val Val Glu
```

```
            100                 105                 110

Ser Asp Ser Glu Leu Leu His Arg Ser Gly Ser Ser Ile Glu Thr Leu
        115                 120                 125

Lys Tyr Arg Ala Gln Asp Ile Leu Val Gln Leu Asn Val Glu Gln Gln
    130                 135                 140

Thr Gln Lys Thr Ser Val Thr Asp Ile Ser Thr Ile Thr Pro Glu Glu
145                 150                 155                 160

Thr Pro Ser Ser Lys Asn Glu Ser Leu Phe Pro Ser Leu Phe Arg Ala
                165                 170                 175

Tyr Asp Ser Glu Asp Asp Ile Leu Ser Arg Cys Ala Ile Ala Tyr Leu
            180                 185                 190

Ile Lys Asn Gly Gly Lys Ile Pro Glu Thr Glu Glu Asp Gln Glu Lys
        195                 200                 205

Phe Thr Gln Arg Val Asn Ser Lys Arg Glu Glu Ile Glu Gln Leu Glu
    210                 215                 220

Ile Glu Leu Ser Ala Arg Tyr Pro Lys Gly Arg Asp Leu Thr Gly Glu
225                 230                 235                 240

Glu Phe Leu Glu Thr Leu Ala Ile Ala Thr Gln Gln Leu Ser Glu Thr
                245                 250                 255

Val Ala Gln Ala Arg Glu Trp Asn Asp Lys Ile Leu Thr Gln Pro Lys
            260                 265                 270

Phe Met Pro Tyr Pro Ile Ile Tyr Gly Ser Ser Thr Asp Val Arg Trp
        275                 280                 285

Arg Lys Thr Ser Lys Ser Arg Ile Thr Val Ser Phe Asn Gly Ile Asp
    290                 295                 300
```

```
Lys Tyr Leu Lys Ala Ala Asp Pro Glu Ile Lys Ala Trp Phe Lys Asp
305                 310                 315                 320

His Gln Glu Tyr Pro Phe Arg Leu His Cys Asp Glu Arg Gln Leu Pro
                325                 330                 335

Phe Phe Gln Arg Phe Leu Glu Asp Trp Gln Phe Tyr Gln Ala Asn Lys
            340                 345                 350

Glu Thr Tyr Pro Ala Gly Leu Leu Thr Leu Ser Ser Thr Leu Leu Gly
        355                 360                 365

Trp Arg Glu Gly Glu Gly Lys Gly Asp Pro Trp Asn Val Asn Arg Leu
    370                 375                 380

Ala Leu Tyr Cys Thr Phe Asp Thr Arg Leu Met Thr Ala Glu Gly Thr
385                 390                 395                 400

Leu Asp Val Gln Lys Glu Lys Ser Glu Lys Ala Leu Lys Asn Leu Ala
                405                 410                 415

Lys Ala Lys Pro Asp Pro Arg Asn His Ser Thr Leu Asp Arg Leu Lys
            420                 425                 430

Asn Leu Pro Val Arg Pro Ser Arg Thr Pro Tyr Gln Gly Asn Pro Glu
        435                 440                 445

Ile Leu Val Gly Leu Arg Val Gly Leu Thr Asn Pro Ile Thr Ala Ala
    450                 455                 460

Val Val Asn Gly Arg Thr Gly Glu Val Leu Thr Tyr Arg Thr Pro Ser
465                 470                 475                 480

Thr Leu Leu Gly Asp Arg Tyr Asp Leu Phe Asn Arg His Arg His Gln
                485                 490                 495

Gln Glu Gln Asn Ala Leu Glu Arg His Lys Tyr Gln Lys Arg Gly Val
```

```
            500                 505                 510

Thr Tyr Gln Pro Ser Glu Ser Glu Leu Gly Lys Tyr Val Asp Arg Leu
        515                 520                 525

Leu Ala Lys Ala Ile Ile Glu Leu Ala Gln Thr Tyr Lys Ala Gly Ser
    530                 535                 540

Ile Val Ile Pro Cys Leu Thr His Leu Arg Glu Ile Leu Ala Ser Glu
545                 550                 555                 560

Ile Ala Ala Arg Ala Glu Glu Lys Cys Pro Gly Ser Val Glu Ala Gln
                565                 570                 575

Asp Asn Tyr Ala Lys Glu Tyr Arg Arg Lys Ile His Asn Trp Ser Tyr
            580                 585                 590

Asn Arg Leu Ile Ser Ala Ile Cys Ser Lys Ala Glu Gln Leu Gly Ile
        595                 600                 605

Ile Val Glu Ser Gly Phe Gln Pro Tyr Glu Gly Asp Ser Tyr Gln Gln
    610                 615                 620

Ala Lys Asp Leu Ala Ile Ala Val Tyr His Ser Arg Gln Leu Ala Leu
625                 630                 635                 640

Lys
```

<210> 522
<211> 678
<212> PRT
<213> Nostocales

<400> 522

```
Met Ser Arg Asp Arg Gln Lys Lys Ser Thr Ser Pro Ile His Arg Thr
1               5                   10                  15
```

```
Ile Arg Cys His Leu His Ala Ser Glu Asp Val Leu Arg Lys Val Trp
            20                  25                  30

Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Lys
        35                  40                  45

Ser Val Ser Glu Gln Pro Glu Phe Glu Thr Asn Gln Glu Lys Gly Thr
    50                  55                  60

Ile Ser Lys Lys Glu Ile Thr Lys Leu Arg Lys Ala Leu Thr Asn Asp
65                  70                  75                  80

Ser Asp Leu Gln Gln Gln Ser Gly Arg Leu Gly Ser Ser Ala Asp Ser
                85                  90                  95

Leu Val Thr Glu Val Tyr Thr Ser Trp Leu Thr Leu Ser Gln Lys Ile
            100                 105                 110

Lys Lys Gln Lys Glu Gly Lys Glu Tyr Phe Leu Asn Asn Ile Leu Lys
        115                 120                 125

Ser Asp Val Glu Leu Val Gln Glu Ser Asn Cys Asp Leu Gln Thr Ile
    130                 135                 140

Arg Cys Lys Ala Gln Asp Ile Leu Ser Gln Pro Lys Glu Phe Leu Glu
145                 150                 155                 160

Gln Ile Thr Asn His Asp Ala Val Leu Asn Gln Thr Lys Ser Ala Arg
                165                 170                 175

Lys Lys Val Gln Asn Ser Ser Asn Glu Ile Asn Ala Ser Lys Gln Arg
            180                 185                 190

Glu Asn Ser Asp Tyr Gln Glu Asn Val Asp Lys Asn Ile Pro Glu Thr
        195                 200                 205

Leu Thr Glu Ile Leu Tyr Lys Ile His Lys Ile Thr Gln Asp Ile Leu
    210                 215                 220
```

```
Thr Gln Cys Ala Val Ala Tyr Leu Ile Lys Asn His Asn Gln Val Ser
225                 230                 235                 240

Asp Leu Glu Glu Asp Ile Lys Lys Leu Lys Lys Arg Arg Thr Glu Lys
                245                 250                 255

Gln Val Gln Ile Lys Arg Leu Glu Glu Gln Ile Gln Lys Asn Lys Leu
            260                 265                 270

Pro Asn Gly Arg Asp Ile Thr Gly Glu Arg Tyr Asn His Ala Phe Asp
        275                 280                 285

Asn Leu Ile Asn Gln Val Pro Gln Asn Asn Glu Glu Phe Ala Glu Trp
    290                 295                 300

Ile Ala Ser Leu Leu Asn Lys Val Ser Asp Leu Pro Tyr Pro Ile Asp
305                 310                 315                 320

Tyr Leu Tyr Ser Asp Leu Thr Trp Tyr Lys Asn Glu Gln Arg Lys Ile
                325                 330                 335

Cys Val Tyr Phe Asn Gly Trp Ala Lys Phe His Phe Gln Ile Cys Cys
            340                 345                 350

Asn Lys Arg Gln Leu His Phe Phe Lys Arg Phe Leu Glu Asp Tyr Lys
        355                 360                 365

Ala Leu Lys Glu Ser Glu Lys Gly Glu Ile Lys Leu Ser Gly Ser Leu
    370                 375                 380

Val Thr Leu Arg Ser Val Gln Leu Leu Trp Gln Gln Gly Glu Gly Ala
385                 390                 395                 400

Gly Glu Pro Trp Lys Val Asn Lys Leu Ala Leu His Cys Thr Tyr Asp
                405                 410                 415
```

```
Ala Arg Leu Leu Thr Ala Glu Gly Thr Glu Glu Val Arg Gln Glu Lys
            420                 425                 430

Thr Asp Thr Thr Gln Lys Gln Val Thr Lys Ala Glu Gly Asn Glu Asn
        435                 440                 445

Ile Asp Ser Asp Glu Gln Lys Asn Leu Asn Arg Asn Ile Ser Ser Leu
    450                 455                 460

Ser Arg Leu Asn Asn Ser Phe Ala Arg Pro Ser Lys Pro Ile Tyr Arg
465                 470                 475                 480

Gly Gln Ser Asn Ile Ile Val Gly Val Ser Phe His Pro Val Glu Leu
                485                 490                 495

Ala Thr Leu Val Val Val Asp Ile Ile Thr Lys Glu Lys Ile Ile Cys
            500                 505                 510

Lys Thr Val Lys Gln Leu Leu Gly Asp Ala Phe Ser Leu Leu Ser Arg
        515                 520                 525

Arg Arg Arg Gln Gln Val His Phe Arg Lys Glu Arg Glu Lys Ala Gln
    530                 535                 540

Lys Lys Asp Ser Pro Cys Asn Met Gly Glu Ser Gln Leu Gly Glu Tyr
545                 550                 555                 560

Val Asp Lys Leu Leu Ala Lys Arg Ile Val Glu Val Thr Lys Glu Tyr
                565                 570                 575

Lys Ala Ser Cys Ile Val Leu Pro Arg Leu Lys Asp Thr Arg Glu Ile
            580                 585                 590

Arg Thr Ser Val Ile Gln Ala Lys Ala Glu Ala Lys Phe Pro Gly Asp
        595                 600                 605

Val Asn Ala Gln Lys Ile Tyr Val Lys Glu Tyr Asn Arg Gln Ile His
    610                 615                 620
```

```
Asn Trp Ser Tyr Gly Arg Leu Gln Glu Ser Ile Lys Ser Lys Ala Ala
625                 630                 635                 640


Glu Phe Lys Ile Ser Ile Glu Phe Gly Met Gln Pro Ser Tyr Asp Asn
                645                 650                 655


Leu Gln Glu Gln Ala Ile Asn Leu Ala Leu Ser Ala Tyr Gln Cys Arg
            660                 665                 670


Ile Asn Thr Ile Gly Arg
        675


<210>  523
<211>  665
<212>  PRT
<213>  Nostoc sp. NIES-4103

<400>  523

Met Ser Ser Thr Ser Gly Lys Asn Leu Thr Asn Pro Ile Phe Arg Thr
1               5                   10                  15


Ile Ser Cys Asp Leu Ser Ala Lys Glu Asp Val Leu Arg Lys Val Trp
            20                  25                  30


Glu Glu Met Ser Gln Lys Asn Ala Pro Leu Ile Val Gln Leu Leu Lys
        35                  40                  45


Ser Val Ser Glu Gln Pro Glu Phe Glu Ala Asn Lys Glu Asn Gly Thr
    50                  55                  60


Ile Thr Lys Arg Glu Ile Thr Lys Leu Arg Arg Asp Ile Thr Glu Asn
65                  70                  75                  80


Ser Asp Leu Lys Glu Gln Ser Gly Arg Leu Arg Ser Ser Ala Asp Ser
                85                  90                  95


Leu Val Thr Glu Ala Tyr Ser Ser Trp Leu Arg Leu Tyr Gln Val Arg
```

```
            100                 105                 110

Lys Asn Gln Lys Glu Gly Lys Glu Tyr Phe Leu Lys Asn Ile Leu Lys
        115                 120                 125

Ser Asp Val Glu Leu Val Glu Gln Ser Asn Cys Asp Leu Gln Thr Ile
    130                 135                 140

Arg Cys Lys Ala Lys Glu Ile Leu Ser Gln Val Glu Glu Phe Ile Glu
145                 150                 155                 160

Gln Ile Lys Asn Lys Pro Lys Ile Asn Gln Thr Lys Leu Ala Lys Lys
                165                 170                 175

Lys Asn Asn Lys Ser Asn Lys Ser Asn Lys Ala Ile Asp Lys Ile Leu
            180                 185                 190

Asn Arg Phe Phe Ile Gly Asn Leu Asp Lys Thr Leu Thr Asn Thr Leu
        195                 200                 205

Tyr Glu Ile His Arg Lys Ser Pro Asp Ser Leu Thr Gln Cys Ala Val
    210                 215                 220

Ala Tyr Leu Ile Lys Asn Asp Asn Lys Val Ser Glu Ala Glu Glu Asn
225                 230                 235                 240

Phe Thr Gln Leu Asn Lys Arg Arg Ala Ala Lys Glu Ile Glu Ile Lys
                245                 250                 255

Arg Leu Glu Thr Gln Ile Gln Asn Thr Arg Leu Pro Ile His Tyr Gly
            260                 265                 270

Arg Asp Ile Thr Gly Glu Lys Tyr Ser Gln Ala Phe Glu Lys Leu Val
        275                 280                 285

Asn Gln Val Pro Gln Asp Asn Glu Glu Phe Ala Glu Trp Ile Ala Ile
    290                 295                 300
```

```
Leu Leu Lys Lys Val Ser Ser Leu Pro Tyr Pro Ile Leu Tyr Cys Ser
305                 310                 315                 320

Gly Asp Leu Ser Trp Tyr Lys Asp Glu Lys Gly Asn Ile Phe Val Tyr
                325                 330                 335

Phe Asn Gly Trp Ala Glu Tyr His Phe Gln Ile Cys Cys Asp Lys Arg
            340                 345                 350

Gln Leu Arg Phe Phe Glu Arg Phe Leu Lys Asp Tyr Lys Ala Leu Lys
        355                 360                 365

Pro Ser Lys Lys Glu Glu Glu Lys Val Ser Gly Ser Leu Val Thr Leu
    370                 375                 380

Arg Ser Ala His Leu Leu Trp Arg Gln Gly Lys Gly Lys Gly Glu Pro
385                 390                 395                 400

Trp Lys Val Asn Lys Leu Ala Leu His Cys Thr Tyr Asp Ala Arg Leu
                405                 410                 415

Trp Thr Ala Glu Gly Thr Glu Glu Val Arg Gln Glu Lys Thr Asp Lys
            420                 425                 430

Ala Gln Ala Lys Val Asn Lys Ala Glu Ser Asn Glu Asn Leu Asn Ser
        435                 440                 445

Glu Gln Gln Lys Glu Leu Thr Lys Asn Lys Ser Ser Leu Ser Arg Leu
    450                 455                 460

Lys Asn Ser Phe Ala Arg Pro Ser Lys Pro Leu Tyr Arg Gly Gln Ser
465                 470                 475                 480

Asn Ile Ile Val Gly Ile Ser Phe His Pro Val Glu Leu Ala Thr Leu
                485                 490                 495

Val Val Val Asp Ile Asn Thr Lys Glu Ile Leu Ile Cys Lys Thr Val
```

```
            500                 505                 510

Lys Glu Leu Leu Gly Asp Ala Phe Pro Leu Leu Ser Arg Arg Arg Arg
        515                 520                 525

Gln Gln Val His Phe Arg Lys Glu Arg Glu Lys Ala Gln Lys Lys Asp
    530                 535                 540

Ser Pro Cys His Leu Gly Glu Ser Lys Leu Gly Glu Tyr Val Asp Arg
545                 550                 555                 560

Leu Leu Ala Lys Arg Ile Val Glu Val Ala Lys Glu Tyr Gln Ala Ser
                565                 570                 575

Cys Ile Val Leu Pro Gly Leu Lys Gly Ile Arg Glu Ile Arg Thr Ser
            580                 585                 590

Ala Ile Gln Ala Lys Ala Glu Thr Lys Phe Pro Gly Asp Ile Asn Val
        595                 600                 605

Gln Glu Leu Tyr Val Lys Glu Tyr Asn Arg Gln Ile His Asn Trp Ser
    610                 615                 620

Tyr Ser Arg Leu Gln Glu Ser Ile Lys Ser Arg Ala Ala Glu Leu Lys
625                 630                 635                 640

Ile Thr Ile Lys Phe Gly Lys Gln Pro Ser His Ser Thr Leu Gln Glu
                645                 650                 655

Gln Ala Ile Asn Leu Ala Leu Ser Ala
            660                 665


<210>  524
<211>  584
<212>  PRT
<213>  Geminocystis sp. NIES-3709

<400>  524
```

```
Met Ala Glu Gln Tyr Thr Pro Leu Met Thr Glu Leu Ile Arg Gln Val
1               5                  10                  15

Gly Glu His Pro Asp Leu Ser Gln Trp Gln Asp Lys Gly Lys Met Pro
            20                  25                  30

Ser Asn Ile Val Lys Asp Leu Cys Ala Thr Leu Lys Gln Ile Arg Pro
        35                  40                  45

Phe Thr Gly Leu Pro Ser Asn Phe Tyr Gln Ser Ala Ile Asn Gln Val
    50                  55                  60

Asn Tyr Ile Phe Ala Ser Trp Leu Ala Ser Gln His Lys Leu Lys Leu
65                  70                  75                  80

Arg Leu Asn Gly Lys Arg Tyr Tyr Phe Ser Met Leu Tyr Ser Asp Gln
                85                  90                  95

Asp Leu Val Lys Asn Ser Gly His Thr Leu Thr Glu Ile Arg Ser Gln
            100                 105                 110

Ala Gln Ile Ile Leu Asn Gln Ile Ser Asn Lys Lys Thr Glu Glu Lys
        115                 120                 125

His Lys Tyr Leu Phe Gln His His Arg Glu Ser Ser Asn Ile Leu Gly
    130                 135                 140

Lys Thr Ala Ile Thr Tyr Leu Ile Lys His Asn Gln Lys Ile Pro Thr
145                 150                 155                 160

Glu Pro Glu His Arg Asp Lys Phe Glu Lys Leu Tyr Arg Lys Thr Gln
                165                 170                 175

Ile Gln Ile Glu Lys Leu Glu Lys Gln Ile Glu Ala Arg Leu Pro Lys
            180                 185                 190

Gly Arg Asn Leu Ser Glu Gln Gln Trp Leu Asn Thr Leu Ile Thr Ala
        195                 200                 205
```

```
Ser Gln Asn Val Pro Lys Asp Glu Asn Glu Ala Lys Leu Trp Gln Lys
    210                 215                 220

Tyr Ile Leu Thr Asp Ser Asn Ser Leu Pro Tyr Pro Val Ser Tyr Glu
225                 230                 235                 240

Thr Asn Glu Asn Leu Val Trp Ser Leu Asp Glu Gln Gly Arg Leu Asn
                245                 250                 255

Leu Arg Phe Asn Gly Leu Gly Lys Leu Thr Phe Lys Val Tyr Cys Asp
            260                 265                 270

Asn Arg Gln Leu His Tyr Phe Gln Gln Phe Leu Gln Asp Gln Thr Ile
        275                 280                 285

Lys Lys Ser Gly Lys Asn Lys His Ser Ser Gly Leu Phe Leu Leu Arg
    290                 295                 300

Ser Ala Met Leu Val Trp Lys Pro Asn Glu Ser Lys Gly Lys Ser Trp
305                 310                 315                 320

Asn Lys Asn Thr Leu His Leu His Cys Ala Ile Asp Thr Arg Leu Leu
                325                 330                 335

Thr Leu Glu Gly Thr Gln Glu Val Arg Glu Glu Lys Leu Thr Gln Val
            340                 345                 350

Thr Asn Ile Ile Gln Ser Met Glu Lys Lys Pro Ser Leu Asn Asp Asn
        355                 360                 365

Gln Lys Gln Cys Leu Lys Arg Lys Lys Thr Ser Gln Lys Asn Leu His
    370                 375                 380

Glu Ser Phe Leu Arg Pro Ser Arg Ala Lys Tyr Gln Gly Asn Pro Asn
385                 390                 395                 400
```

```
Ile Ile Val Gly Val Ala Leu Gly Leu Lys His Pro Val Thr Val Ser
                405                 410                 415

Ile Val Asp Met Ala Thr Gln Lys Val Ile Ala Tyr Arg Ser Thr Lys
            420                 425                 430

Gln Leu Leu Gly Lys Asn Tyr Lys Leu Leu Asn Arg Tyr Lys Val Gln
        435                 440                 445

Lys Gln Arg Gln Ala His Gln Arg His Val Asn Gln Arg Gln Ser Ser
    450                 455                 460

Ser Val Ser Phe Gly Asp Ser Asn Gln Gly Lys Tyr Leu Asn Asp Leu
465                 470                 475                 480

Leu Val Gly Ala Val Met Asp Leu Ala Thr Gln Tyr Gln Ala Gly Asn
                485                 490                 495

Ile Val Leu Pro Lys Leu Asp His Ile Arg Glu Ile Val Glu Ser Glu
            500                 505                 510

Ile Lys Val Lys Ala Glu Lys Lys Ile Pro Leu Ser Val Asp Leu Gln
        515                 520                 525

Lys Lys Tyr Ala Lys Thr Tyr Arg Met Ser Val His Gln Trp Gly Tyr
    530                 535                 540

Gly Leu Phe Ile Asp Gly Leu Gln Asn Gln Ala Lys Arg Leu Ser Ile
545                 550                 555                 560

Ser Ile Glu Glu Arg Lys Gln Pro Ile Arg Gly Ser Pro Gln Glu Gln
                565                 570                 575

Ser Arg Asp Leu Val Leu Gly Lys
            580
```

<210> 525
<211> 617

<212> PRT
<213> unclassified Cyanobacteria (miscellaneous)

<400> 525

```
Met Ser Leu Lys Thr Ile Arg Cys Arg Leu Val Ala Pro Glu Glu Ser
1               5                   10                  15


Arg Lys Ala Ile Trp Thr Leu Met Ala Glu Arg Asn Thr Pro Leu Val
            20                  25                  30


Asn Glu Val Leu Arg Arg Val Pro Glu Gln Thr Asp Phe Ala Lys Trp
        35                  40                  45


Gln Lys Ser Gly Arg Leu Pro Asp Arg Ser Val Ala Gln Ile Val Glu
    50                  55                  60


Ser Leu Lys Thr Asp Pro Arg Phe Ile Asp Gln Pro Ala Trp Tyr Tyr
65                  70                  75                  80


Ile Ser Ala Lys Lys Gln Val Ala Tyr Thr Phe Arg Ser Trp Leu Lys
                85                  90                  95


Leu Gln His Arg Lys Gln Trp Lys Leu Glu Gly Lys Arg Arg Trp Leu
            100                 105                 110


Ser Ile Leu Gln Pro Asp Ser Glu Leu Ala Lys Gln Ala Asn Tyr Thr
        115                 120                 125


Leu Ala Glu Leu Arg Gln Ala Ala Thr Arg Ile Leu Asn Gln Ile Asp
    130                 135                 140


Ala Leu Glu Pro Phe Lys Tyr Leu Leu Cys Asp Tyr Gly Arg Ser Lys
145                 150                 155                 160


Ser Ala Lys Arg Arg Ser Thr Leu Ala Tyr Leu Leu Lys Arg Asn Ala
                165                 170                 175


Gln Leu Val Pro Glu Val Glu Asn Leu Asp Lys Leu Arg Lys Arg His
```

```
            180                 185                 190

His Lys Thr Glu Ile Ala Ile Gln Arg Leu Glu Ile Gln Leu Gln Ala
        195                 200                 205

Ser Leu Pro Lys Gly Arg Asp Leu Met Glu Ser Ala His Ile Glu Ala
    210                 215                 220

Leu Val Gln Ser Ile Gln Ser Pro Pro Leu Glu Asp Lys Asp Phe Val
225                 230                 235                 240

Thr Trp Gln Gln Asn Leu Thr Arg Lys Pro Ala Lys Leu Pro Phe Pro
                245                 250                 255

Val Ile Tyr Glu Thr Val Glu Ser Leu Thr Trp Ala His Asp Asp Lys
            260                 265                 270

Gly Tyr Leu Leu Val Arg Phe Gln Gly Lys Gly Thr Gly Glu His Val
        275                 280                 285

Phe Arg Val Tyr Cys Asp Lys Thr His Gln His Trp Phe Glu Arg Phe
    290                 295                 300

Leu Asp Asp Gln Glu Thr Lys Arg Thr Ser Gly Asp Lys His Ser Ala
305                 310                 315                 320

Gly Leu Phe Thr Leu Arg Ser Ala Lys Leu Ser Trp Val Val Ser Lys
                325                 330                 335

Thr His Leu His Glu Ala Glu Pro Trp Asn Arg Tyr His Leu Cys Leu
            340                 345                 350

Leu Cys Thr Val Asp Thr Arg Leu Trp Thr Met Glu Gly Thr Gln Leu
        355                 360                 365

Val Lys Ala Gln Lys Ala Ala Gly Thr Ala Ala Lys Leu Gln Ser Arg
    370                 375                 380
```

```
Arg Ala Lys Glu Gly Leu Ser Lys Asn Gln Gln Ala Asp Ile Arg Arg
385                 390                 395                 400

Leu Glu Ser Thr Leu Glu Arg Leu Glu Val Pro Tyr Ser Arg Pro Ser
                405                 410                 415

Arg Met Leu Tyr Gln Gly Thr Asp Asn Ile Leu Val Gly Ile Ser Met
            420                 425                 430

Gly Leu Asp Gln Pro Ala Thr Val Ala Val Val Asn Val Ser Thr Gln
        435                 440                 445

Glu Met Leu Ala Tyr Arg Ser Thr Lys Gln Leu Leu Gly Asp Lys Tyr
    450                 455                 460

Lys Leu Leu Asn Arg Ala Arg Thr Glu Arg Ala Arg Ile Ala His Gln
465                 470                 475                 480

Gly His Arg Gln Arg Leu Lys Gly Gly Lys Arg Ile Asn Ser Glu Ser
                485                 490                 495

Gln Leu Gly Val Tyr Ile Asp Arg Leu Leu Ala Lys Ala Ile Val Glu
            500                 505                 510

Val Ala Gln Gln Tyr Gln Ala Ala Ser Ile Val Leu Pro Asp Leu Lys
        515                 520                 525

Asp Ile Arg Glu Ile Val Glu Ala Glu Val Gly Gln Arg Ala Ala Val
    530                 535                 540

Arg Val Pro Asp Phe Ile Asp Gly Gln Arg Arg Tyr Ala Lys Ala Tyr
545                 550                 555                 560

Arg Ala Gln Val His Gln Trp Ser Tyr Arg Arg Leu Gln Ala Ala Ile
                565                 570                 575

Thr Ser Lys Ala Glu Gln Ser Gly Leu Val Val Glu Thr Val Arg Gln
```

```
            580                 585                 590

Gln Cys Ile Ala Ser Asp Gln Glu Lys Ala Lys Ala Leu Ala Leu Lys
        595                 600                 605

Ala Tyr Thr Asn Arg Val Asn Val Val
    610                 615
```

<210> 526
<211> 665
<212> PRT
<213> Nostoc cycadae WK-1

<400> 526

```
Met Ser Ala Ile Tyr Arg Thr Ile Arg Cys Tyr Leu Tyr Ala Ser Glu
1               5                   10                  15

Asp Ile Leu Arg Lys Val Trp Glu Glu Met Thr Gln Lys Asn Thr Pro
            20                  25                  30

Leu Ile Val Gln Leu Leu Lys Leu Val Ser Glu Gln Pro Glu Phe Glu
        35                  40                  45

Ala Asn Lys Glu Asn Gly Thr Ile Thr Lys Lys Glu Ile Thr Glu Leu
    50                  55                  60

Arg Lys Pro Leu Thr Asp Asp Ser Asp Phe Gln Glu Gln Ser Gly Arg
65                  70                  75                  80

Leu Cys Ser Ser Ala Asp Ser Leu Val Lys Glu Val Tyr Ser Ser Trp
                85                  90                  95

Leu Lys Leu Tyr Gln Gln Arg Lys Lys Gln Lys Glu Gly Lys Glu Tyr
            100                 105                 110

Phe Leu Asn Asn Ile Leu Lys Ser Asp Ala Glu Leu Val Gln Glu Ser
        115                 120                 125
```

```
Gln Cys Asn Leu Gln Thr Ile Arg Glu Lys Ala Gln Glu Ile Leu Asn
    130                 135                 140

Asn Pro Glu Lys Phe Ser Glu Gln Val Thr Asn Asn Gln Asn Val Lys
145                 150                 155                 160

Gln Lys Lys Ser Leu Arg Lys Lys Ser Asn Asn Asp Asn Lys Glu Ile
                165                 170                 175

Lys Gln Ser Lys Asn Gln Ala Tyr Lys Glu Asn Glu Asp Glu Ser Ser
            180                 185                 190

Pro Asn Thr Leu Thr Asp Ile Leu Tyr Lys Ile His Arg Glu Ala Gln
        195                 200                 205

Asp Ile Leu Thr Arg Cys Ala Val Ser Tyr Leu Ile Lys Asn Asn Asn
    210                 215                 220

Lys Val Ser Asp Ile Glu Glu Asp Ile Thr Gln Leu Glu Lys Arg Arg
225                 230                 235                 240

Ile Gln Lys Gln Val Glu Ile Lys Arg Leu Glu Glu Gln Leu Lys Asn
                245                 250                 255

Ser Lys Leu Pro Lys Gly Arg Asp Ile Thr Gly Thr Lys Ser Ser Gln
            260                 265                 270

Ala Phe Asn Asn Leu Ile Asn Gln Ile Pro Lys Asp Asp Glu Glu Phe
        275                 280                 285

Ala Glu Trp Val Ala Thr Phe Leu Arg Lys Ile Ser Lys Ile Pro Tyr
    290                 295                 300

Pro Ile Asp Tyr Gly Ser Ser Asp Leu Ser Trp Gly Lys Asp Lys Lys
305                 310                 315                 320

Gly Asn Ile Phe Val Tyr Phe Asn Gly Trp Ala Lys Tyr His Phe Gln
                325                 330                 335
```

```
Ile Cys Cys Asn Lys Arg Gln Leu His Phe Phe Glu Arg Phe Leu Glu
            340                 345                 350

Asp Tyr Lys Ala Phe Lys Ala Ser Glu Lys Gly Glu Glu Lys Leu Ser
        355                 360                 365

Gly Ser Leu Val Thr Leu Arg Ser Ala Gln Leu Leu Trp Gln Gln Gly
    370                 375                 380

Glu Gly Lys Gly Glu Pro Trp Lys Val Asn Lys Leu Ala Leu His Cys
385                 390                 395                 400

Thr Tyr Asp Ala Arg Leu Cys Thr Ala Glu Gly Thr Glu Glu Val Arg
                405                 410                 415

Gln Glu Lys Thr Asp Lys Ala Gln Lys Glu Ile Thr Lys Ala Glu Thr
            420                 425                 430

His Glu Asn Leu Asp Ser Asn Glu Gln Lys Lys Leu Asn Lys Asn Lys
        435                 440                 445

Ser Ser Leu Ser Arg Leu Lys Asn Ser Phe Ala Arg Pro Ser Glu Pro
    450                 455                 460

Thr Tyr Arg Gly His Cys Asn Ile Ile Val Gly Val Ser Phe His Pro
465                 470                 475                 480

Thr Glu Leu Ala Thr Leu Ala Val Val Asp Val Asn Thr Lys Lys Ile
                485                 490                 495

Leu Val Cys Lys Thr Val Lys Glu Leu Leu Gly Asn Ser Phe Arg Leu
            500                 505                 510

Leu Ser Arg Arg Arg Arg Gln Gln Val His Phe Arg Lys Glu Arg Glu
        515                 520                 525
```

```
Lys Ala Gln Lys Lys Asp Ser Pro Cys Asn Ile Gly Glu Ser Gln Leu
    530                 535                 540

Gly Glu Tyr Val Asp Lys Leu Leu Ala Lys Arg Ile Val Glu Val Ala
545                 550                 555                 560

Lys Thr Tyr Lys Ala Ser Cys Ile Ile Leu Pro Arg Leu Lys Asp Ala
                565                 570                 575

Thr Glu Ile Arg Thr Ser Val Ile Gln Ala Lys Ala Glu Thr Lys Phe
            580                 585                 590

Pro Gly Asp Val Asn Ala Gln Lys Leu Tyr Val Lys Glu Tyr Asn Arg
        595                 600                 605

Gln Ile His Asn Trp Ser Tyr Ser Arg Leu Gln Glu Ser Ile Lys Ser
    610                 615                 620

Lys Ala Gly Glu Leu Lys Ile Ser Ile Glu Phe Gly Ile Gln Pro Ser
625                 630                 635                 640

Tyr Asp Thr Leu Gln Glu Gln Ala Arg Asp Leu Ala Leu Ser Ala Tyr
                645                 650                 655

Gln Cys Arg Ile Asn Thr Ile Asp Arg
            660                 665
```

<210> 527
<211> 678
<212> PRT
<213> Nostocales

<400> 527

```
Met Ser Arg Asp Arg Gln Lys Lys Ser Thr Ser Pro Ile His Arg Thr
1               5                   10                  15

Ile Arg Cys His Leu His Ala Ser Glu Asp Val Leu Arg Lys Val Trp
            20                  25                  30
```

```
Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Lys
        35                  40                  45

Ser Val Ser Glu Gln Pro Glu Phe Glu Ala Asn Gln Glu Lys Gly Thr
    50                  55                  60

Ile Ser Lys Lys Glu Ile Thr Lys Leu Arg Lys Ala Leu Thr Asn Asp
65                  70                  75                  80

Ser Asp Ile Gln Gln Gln Ser Gly Arg Leu Gly Ser Ser Ala Asp Ser
                85                  90                  95

Leu Val Thr Glu Val Tyr Thr Ser Trp Leu Thr Leu Ser Gln Lys Ile
            100                 105                 110

Lys Lys Gln Lys Glu Gly Lys Glu Tyr Phe Leu Asn Asn Ile Leu Lys
        115                 120                 125

Ser Asp Val Glu Leu Val Glu Glu Ser Asn Cys Asp Leu Gln Thr Ile
    130                 135                 140

Arg Cys Lys Ala Gln Asp Ile Leu Ser Gln Pro Lys Glu Phe Leu Glu
145                 150                 155                 160

Lys Ile Ile Asn Asn Asp Ala Val Leu Asn Gln Thr Lys Ser Ala Arg
                165                 170                 175

Lys Lys Val Gln Asn Ser Ser Asn Glu Ile Asn Ala Ser Lys Gln Ser
            180                 185                 190

Glu Asn Ser Asp Leu Lys Glu Asn Val Asp Lys Asn Ile Pro Gln Thr
        195                 200                 205

Leu Thr Glu Ile Leu Tyr Lys Ile His Lys Ile Thr Gln Asp Ile Leu
    210                 215                 220

Thr Gln Cys Ala Val Ala Tyr Leu Ile Lys Asn His Asn Gln Val Ser
```

```
225                 230                 235                 240

Asp Ile Glu Glu Asp Ile Lys Asn Leu Lys Lys Arg Arg Thr Glu Lys
                245                 250                 255

Gln Val Gln Ile Lys Arg Leu Glu Glu Gln Ile His Asn Lys Lys Leu
            260                 265                 270

Pro Asn Gly Arg Asp Ile Thr Gly Glu Arg Tyr Asn Gln Ala Phe Asp
        275                 280                 285

Asn Leu Ile Asn Gln Val Pro Gln Asp Asn Glu Glu Phe Ala Glu Trp
    290                 295                 300

Ile Ala Ser Leu Ser Thr Lys Val Ser His Leu Pro Tyr Pro Ile Asp
305                 310                 315                 320

Tyr Leu Tyr Ser Asp Leu Thr Trp Tyr Lys Asn Glu Gln Glu Lys Ile
                325                 330                 335

Cys Val Tyr Phe Asn Gly Trp Ala Lys Phe His Phe Gln Ile Cys Cys
            340                 345                 350

Asn Lys Arg Gln Leu His Phe Phe Lys Ser Phe Leu Glu Asp Tyr Lys
        355                 360                 365

Ala Leu Lys Glu Ser Glu Lys Gly Glu Thr Lys Leu Ser Gly Ser Leu
    370                 375                 380

Val Thr Leu Arg Ser Val Gln Leu Leu Trp Gln Gln Gly Glu Gly Ala
385                 390                 395                 400

Gly Ala Pro Trp Lys Val Asn Lys Leu Ala Leu His Cys Thr Tyr Asp
                405                 410                 415

Ala Arg Leu Leu Thr Ala Glu Gly Thr Glu Asp Val Arg Gln Glu Lys
            420                 425                 430
```

```
Thr Asp Thr Thr Gln Lys Gln Val Thr Lys Ala Glu Ala Asn Glu Asn
        435                 440                 445

Ile Asp Ser Asp Glu Gln Lys Asn Leu Asn Arg Asn Ile Ser Ser Leu
    450                 455                 460

Ser Arg Leu Asn Asn Ser Phe Ala Arg Pro Ser Lys Pro Ile Tyr Arg
465                 470                 475                 480

Gly Gln Ser Asn Ile Ile Val Gly Val Ser Phe His Pro Val Glu Leu
                485                 490                 495

Val Thr Leu Ala Val Val Asp Ile Ile Thr Lys Glu Lys Ile Ile Cys
            500                 505                 510

Lys Thr Val Lys Gln Leu Leu Gly Asp Ala Phe Ser Leu Leu Ser Arg
        515                 520                 525

Arg Arg Arg Gln Gln Val His Phe Arg Lys Glu Arg Lys Lys Ala Gln
    530                 535                 540

Lys Lys Asp Ser Pro Cys Asn Ile Gly Glu Ser Gln Leu Gly Glu Tyr
545                 550                 555                 560

Val Asp Lys Leu Leu Ala Lys Arg Ile Val Glu Val Ala Lys Glu Tyr
                565                 570                 575

Gln Ala Ile Cys Ile Val Leu Pro Thr Leu Lys Asp Thr Arg Glu Ile
            580                 585                 590

Arg Thr Ser Val Ile Gln Ala Lys Ala Glu Thr Lys Phe Pro Gly Asp
        595                 600                 605

Val Asn Ala Gln Gln Leu Tyr Val Lys Glu Tyr Asn His Gln Ile His
    610                 615                 620

Asn Trp Ser Tyr Ser Arg Leu Gln Glu Ser Ile Lys Ser Lys Ala Ala
```

625 630 635 640

Glu Leu Lys Ile Ser Ile Glu Phe Ser Ile Gln Ala Ser Tyr Asp Thr
645 650 655

Leu Gln Glu Gln Ala Ile Asn Leu Ala Leu Ser Ala Tyr Gln Cys Arg
660 665 670

Ile Asn Thr Ile Gly Arg
675

<210> 528
<211> 692
<212> PRT
<213> Nostocaceae

<400> 528

Met Ile Leu Val Thr Gln Ile Glu Lys Gly Val Phe Ala Gly Asp Ile
1 5 10 15

Val Thr Met Ser Arg Asp Arg Lys Lys Gly Ser Lys Ser Pro Ser Leu
20 25 30

Arg Thr Ile Arg Cys His Leu His Thr Lys Glu Asp Val Leu Arg Lys
35 40 45

Val Trp Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Val Glu Leu
50 55 60

Leu Lys Ser Val Ser Glu Gln Pro Glu Phe Glu Thr Asn Lys Glu Asn
65 70 75 80

Gly Lys Ile Thr Lys Lys Glu Ile Thr Asn Leu Arg Lys Ser Leu Thr
85 90 95

Gln Asp Ser Gly Arg Leu Tyr Ser Ser Val Asp Asn Leu Val Gln Glu
100 105 110

```
Val Tyr Ser Ala Trp Leu Thr Leu Tyr Gln Lys Arg Lys Lys Gln Lys
        115                 120                 125

Glu Gly Lys Glu Tyr Phe Leu Asn Asn Ile Leu Lys Ser Asp Ile Glu
    130                 135                 140

Leu Val Glu Glu Ser Asn Cys Asp Leu Gln Ile Leu Arg Ala Lys Ala
145                 150                 155                 160

Gln Glu Ile Ile Ser Asn Pro Gln Asp Ile Leu Arg Gln Ile Thr Ile
                165                 170                 175

Asp Asn Pro Lys Asp Lys Pro Thr Lys Ser Ile Gln Lys Arg Val Arg
            180                 185                 190

Lys Asn Ile Asn Ala Ser Asn Ser Asp Thr Ala Lys Asn Asn Ile Leu
        195                 200                 205

Asn Ser Gln Glu Lys Thr Thr Glu Glu Asn Ile Ser Lys Ser Val Ile
    210                 215                 220

Glu Ile Leu Tyr Glu Ile His Lys Thr Thr Gln Asp Thr Ile Ile Arg
225                 230                 235                 240

Cys Ala Val Thr Tyr Leu Ile Lys Asn Tyr Thr Lys Ile Ser Asp Thr
                245                 250                 255

Glu Glu Asp Leu Asn Lys Leu Lys Glu Arg Arg Ala Glu Lys Glu Ile
            260                 265                 270

Glu Ile Lys Arg Leu Glu Lys Gln Ile Gln Asp Ser Arg Leu Pro Asn
        275                 280                 285

Gly Arg Asp Ile Thr Gly Ala Arg Tyr Leu Glu Ala Phe Asp Lys Leu
    290                 295                 300

Ile Asn Gln Val Pro Lys Asn Asn Glu Glu Phe Ala Asn Trp Ile Ala
305                 310                 315                 320
```

```
Asp Ala Ser Arg Lys Ile Ser Asn Leu Pro Tyr Pro Ile Asp Tyr Leu
                325                 330                 335

Tyr Ser Asp Leu Thr Trp Tyr Lys Asn Gln Asp Gly Lys Ile Phe Val
            340                 345                 350

Tyr Phe Asn Gly Trp Ser Lys Tyr His Phe Gln Ile Cys Cys Asn Lys
        355                 360                 365

Arg Gln Arg His Phe Phe Glu Arg Phe Leu Glu Asp His Lys Ala Trp
    370                 375                 380

Lys Glu Ser Glu Lys Gly Glu Val Lys Leu Ser Gly Ser Leu Val Thr
385                 390                 395                 400

Leu Arg Cys Val Gln Leu Leu Trp Gln Gln Gly Glu Gly Lys Gly Glu
                405                 410                 415

Pro Trp Lys Val Asn Lys Leu Ser Leu His Cys Thr Tyr Asp Thr Arg
            420                 425                 430

Leu Trp Thr Ala Glu Gly Thr Glu Glu Ala Arg Lys Glu Lys Ile Asn
        435                 440                 445

Lys Ile Gln Arg Gln Val Glu Gln Ala Glu Glu Thr Glu Asn Leu Asp
    450                 455                 460

Glu Gln Gln Gln Lys Gln Leu Lys Lys Asn Lys Ser Ser Leu Ser Arg
465                 470                 475                 480

Leu Asn Asn Ser Phe Asn Arg Pro Ile Gln Pro Ile Tyr Gln Gly Leu
                485                 490                 495

Ser Asn Met Ile Val Gly Val Ser Phe His Pro Val Glu Leu Ala Thr
            500                 505                 510
```

```
Val Ala Val Val Asp Thr Thr Thr Gln Lys Val Ile Ala Tyr Lys Thr
        515                 520                 525

Ile Asn Glu Leu Leu Asp Asn Ala Phe His Leu Leu Ser Arg Met Arg
    530                 535                 540

Arg Gln Gln Ile His Phe Arg Lys Glu Arg Lys Lys Ala Gln Lys Lys
545                 550                 555                 560

Asp Ser Pro Cys Asn Leu Gly Glu Ser Lys Leu Gly Glu Tyr Val Asp
                565                 570                 575

Lys Leu Leu Ala Lys Arg Ile Val Glu Val Ala Lys Glu Tyr Gln Ala
            580                 585                 590

Ile Cys Ile Val Leu Pro Lys Leu Lys Asp Met Lys Glu Ile Arg Thr
        595                 600                 605

Ser Val Ile Gln Ala Lys Ala Glu Thr Lys Phe Pro Gly Asn Val Asn
    610                 615                 620

Ala Gln Lys Leu Tyr Val Lys Glu Tyr Asn Arg Gln Val His Asn Trp
625                 630                 635                 640

Ser Tyr Asn Arg Leu Gln Glu Ser Ile Lys Ser Lys Ala Ala Glu Leu
                645                 650                 655

Lys Ile Ser Ile Glu Phe Gly Ile Gln Leu Ser Tyr Asp Thr Leu Gln
            660                 665                 670

Ala Gln Ala Arg Asp Leu Ala Leu Ser Ala Tyr Gln Cys Arg Ile His
        675                 680                 685

Thr Ile Asp Arg
    690
```

<210> 529
<211> 674

<212> PRT
<213> Nostoc sp. PCC 7120

<400> 529

Met Ser Arg Asp Arg Lys Lys Gly Ser Lys Ser Pro Ser Leu Arg Thr
1 5 10 15

Ile Arg Cys His Leu His Thr Lys Glu Asp Val Leu Arg Lys Val Trp
20 25 30

Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Val Glu Leu Leu Lys
35 40 45

Ser Val Ser Glu Gln Pro Glu Phe Glu Thr Asn Lys Glu Asn Gly Lys
50 55 60

Ile Thr Lys Lys Glu Ile Thr Asn Leu Arg Lys Ser Leu Thr Gln Asp
65 70 75 80

Ser Gly Arg Leu Tyr Ser Ser Val Asp Asn Leu Val Gln Glu Val Tyr
85 90 95

Ser Ala Trp Leu Thr Leu Tyr Gln Lys Arg Lys Lys Gln Lys Glu Gly
100 105 110

Lys Glu Tyr Phe Leu Asn Asn Ile Leu Lys Ser Asp Ile Glu Leu Val
115 120 125

Glu Glu Ser Asn Cys Asp Leu Gln Ile Leu Arg Ala Lys Ala Gln Glu
130 135 140

Ile Ile Ser Asn Pro Gln Asp Ile Leu Arg Gln Ile Thr Ile Asp Asn
145 150 155 160

Pro Lys Asp Lys Pro Thr Lys Ser Ile Gln Lys Arg Val Arg Lys Asn
165 170 175

Ile Asn Ala Ser Asn Ser Asp Thr Ala Lys Asn Asn Ile Leu Asn Ser

```
            180                 185                 190

Gln Glu Lys Thr Thr Glu Glu Asn Ile Ser Lys Ser Val Ile Glu Ile
        195                 200                 205

Leu Tyr Glu Ile His Lys Thr Thr Gln Asp Thr Ile Ile Arg Cys Ala
    210                 215                 220

Val Thr Tyr Leu Ile Lys Asn Tyr Thr Lys Ile Ser Asp Thr Glu Glu
225                 230                 235                 240

Asp Leu Asn Lys Leu Lys Glu Arg Arg Ala Glu Lys Glu Ile Glu Ile
                245                 250                 255

Lys Arg Leu Glu Lys Gln Ile Gln Asp Ser Arg Leu Pro Asn Gly Arg
            260                 265                 270

Asp Ile Thr Gly Ala Arg Tyr Leu Glu Ala Phe Asp Lys Leu Ile Asn
        275                 280                 285

Gln Val Pro Lys Asn Asn Glu Glu Phe Ala Asn Trp Ile Ala Asp Ala
    290                 295                 300

Ser Arg Lys Ile Ser Asn Leu Pro Tyr Pro Ile Asp Tyr Leu Tyr Ser
305                 310                 315                 320

Asp Leu Thr Trp Tyr Lys Asn Gln Asp Gly Lys Ile Phe Val Tyr Phe
                325                 330                 335

Asn Gly Trp Ser Lys Tyr His Phe Gln Ile Cys Cys Asn Lys Arg Gln
            340                 345                 350

Arg His Phe Phe Glu Arg Phe Leu Glu Asp His Lys Ala Trp Lys Glu
        355                 360                 365

Ser Glu Lys Gly Glu Val Lys Leu Ser Gly Ser Leu Val Thr Leu Arg
    370                 375                 380
```

```
Cys Val Gln Leu Leu Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp
385                 390                 395                 400

Lys Val Asn Lys Leu Ser Leu His Cys Thr Tyr Asp Thr Arg Leu Trp
                405                 410                 415

Thr Ala Glu Gly Thr Glu Glu Ala Arg Lys Glu Lys Ile Asn Lys Ile
            420                 425                 430

Gln Arg Gln Val Glu Gln Ala Glu Glu Thr Glu Asn Leu Asp Glu Gln
        435                 440                 445

Gln Gln Lys Gln Leu Lys Lys Asn Lys Ser Ser Leu Ser Arg Leu Asn
    450                 455                 460

Asn Ser Phe Asn Arg Pro Ile Gln Pro Ile Tyr Gln Gly Leu Ser Asn
465                 470                 475                 480

Met Ile Val Gly Val Ser Phe His Pro Val Glu Leu Ala Thr Val Ala
                485                 490                 495

Val Val Asp Thr Thr Thr Gln Lys Val Ile Ala Tyr Lys Thr Ile Asn
            500                 505                 510

Glu Leu Leu Asp Asn Ala Phe His Leu Leu Ser Arg Met Arg Arg Gln
        515                 520                 525

Gln Ile His Phe Arg Lys Glu Arg Lys Lys Ala Gln Lys Lys Asp Ser
    530                 535                 540

Pro Cys Asn Leu Gly Glu Ser Lys Leu Gly Glu Tyr Val Asp Lys Leu
545                 550                 555                 560

Leu Ala Lys Arg Ile Val Glu Val Ala Lys Glu Tyr Gln Ala Ile Cys
                565                 570                 575

Ile Val Leu Pro Lys Leu Lys Asp Met Lys Glu Ile Arg Thr Ser Val
```

```
            580                 585                 590

Ile Gln Ala Lys Ala Glu Thr Lys Phe Pro Gly Asn Val Asn Ala Gln
        595                 600                 605

Lys Leu Tyr Val Lys Glu Tyr Asn Arg Gln Val His Asn Trp Ser Tyr
    610                 615                 620

Asn Arg Leu Gln Glu Ser Ile Lys Ser Lys Ala Ala Glu Leu Lys Ile
625                 630                 635                 640

Ser Ile Glu Phe Gly Ile Gln Leu Ser Tyr Asp Thr Leu Gln Ala Gln
                645                 650                 655

Ala Arg Asp Leu Ala Leu Ser Ala Tyr Gln Cys Arg Ile His Thr Ile
            660                 665                 670

Asp Arg
```

<210> 530
<211> 640
<212> PRT
<213> Nostoc cycadae

<400> 530

```
Met Thr Gln Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Lys Leu Val
1               5                   10                  15

Ser Glu Gln Pro Glu Phe Glu Ala Asn Lys Glu Asn Gly Thr Ile Thr
            20                  25                  30

Lys Lys Glu Ile Thr Glu Leu Arg Lys Pro Leu Thr Asp Asp Ser Asp
        35                  40                  45

Phe Gln Glu Gln Ser Gly Arg Leu Cys Ser Ser Ala Asp Ser Leu Val
    50                  55                  60
```

```
Lys Glu Val Tyr Ser Ser Trp Leu Lys Leu Tyr Gln Gln Arg Lys Lys
65                  70                  75                  80

Gln Lys Glu Gly Lys Glu Tyr Phe Leu Asn Asn Ile Leu Lys Ser Asp
                85                  90                  95

Ala Glu Leu Val Gln Glu Ser Gln Cys Asn Leu Gln Thr Ile Arg Glu
            100                 105                 110

Lys Ala Gln Glu Ile Leu Asn Asn Pro Glu Lys Phe Ser Glu Gln Val
        115                 120                 125

Thr Asn Asn Gln Asn Val Lys Gln Lys Lys Ser Leu Arg Lys Lys Ser
    130                 135                 140

Asn Asn Asp Asn Lys Glu Ile Lys Gln Ser Lys Asn Gln Ala Tyr Lys
145                 150                 155                 160

Glu Asn Glu Asp Glu Ser Ser Pro Asn Thr Leu Thr Asp Ile Leu Tyr
                165                 170                 175

Lys Ile His Arg Glu Ala Gln Asp Ile Leu Thr Arg Cys Ala Val Ser
            180                 185                 190

Tyr Leu Ile Lys Asn Asn Asn Lys Val Ser Asp Ile Glu Glu Asp Ile
        195                 200                 205

Thr Gln Leu Glu Lys Arg Arg Ile Gln Lys Gln Val Glu Ile Lys Arg
    210                 215                 220

Leu Glu Glu Gln Leu Lys Asn Ser Lys Leu Pro Lys Gly Arg Asp Ile
225                 230                 235                 240

Thr Gly Thr Lys Ser Ser Gln Ala Phe Asn Asn Leu Ile Asn Gln Ile
                245                 250                 255

Pro Lys Asp Asp Glu Glu Phe Ala Glu Trp Val Ala Thr Phe Leu Arg
            260                 265                 270
```

```
Lys Ile Ser Lys Ile Pro Tyr Pro Ile Asp Tyr Gly Ser Ser Asp Leu
        275                 280                 285

Ser Trp Gly Lys Asp Lys Lys Gly Asn Ile Phe Val Tyr Phe Asn Gly
    290                 295                 300

Trp Ala Lys Tyr His Phe Gln Ile Cys Cys Asn Lys Arg Gln Leu His
305                 310                 315                 320

Phe Phe Glu Arg Phe Leu Glu Asp Tyr Lys Ala Phe Lys Ala Ser Glu
                325                 330                 335

Lys Gly Glu Glu Lys Leu Ser Gly Ser Leu Val Thr Leu Arg Ser Ala
            340                 345                 350

Gln Leu Leu Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp Lys Val
        355                 360                 365

Asn Lys Leu Ala Leu His Cys Thr Tyr Asp Ala Arg Leu Cys Thr Ala
    370                 375                 380

Glu Gly Thr Glu Glu Val Arg Gln Glu Lys Thr Asp Lys Ala Gln Lys
385                 390                 395                 400

Glu Ile Thr Lys Ala Glu Thr His Glu Asn Leu Asp Ser Asn Glu Gln
                405                 410                 415

Lys Lys Leu Asn Lys Asn Lys Ser Ser Leu Ser Arg Leu Lys Asn Ser
            420                 425                 430

Phe Ala Arg Pro Ser Glu Pro Thr Tyr Arg Gly His Cys Asn Ile Ile
        435                 440                 445

Val Gly Val Ser Phe His Pro Thr Glu Leu Ala Thr Leu Ala Val Val
    450                 455                 460
```

```
Asp Val Asn Thr Lys Lys Ile Leu Val Cys Lys Thr Val Lys Glu Leu
465                 470                 475                 480


Leu Gly Asn Ser Phe Arg Leu Leu Ser Arg Arg Arg Arg Gln Gln Val
                485                 490                 495


His Phe Arg Lys Glu Arg Glu Lys Ala Gln Lys Lys Asp Ser Pro Cys
            500                 505                 510


Asn Ile Gly Glu Ser Gln Leu Gly Glu Tyr Val Asp Lys Leu Leu Ala
        515                 520                 525


Lys Arg Ile Val Glu Val Ala Lys Thr Tyr Lys Ala Ser Cys Ile Ile
    530                 535                 540


Leu Pro Arg Leu Lys Asp Ala Thr Glu Ile Arg Thr Ser Val Ile Gln
545                 550                 555                 560


Ala Lys Ala Glu Thr Lys Phe Pro Gly Asp Val Asn Ala Gln Lys Leu
                565                 570                 575


Tyr Val Lys Glu Tyr Asn Arg Gln Ile His Asn Trp Ser Tyr Ser Arg
            580                 585                 590


Leu Gln Glu Ser Ile Lys Ser Lys Ala Gly Glu Leu Lys Ile Ser Ile
        595                 600                 605


Glu Phe Gly Ile Gln Pro Ser Tyr Asp Thr Leu Gln Glu Gln Ala Arg
    610                 615                 620


Asp Leu Ala Leu Ser Ala Tyr Gln Cys Arg Ile Asn Thr Ile Asp Arg
625                 630                 635                 640


<210>  531
<211>  563
<212>  PRT
<213>  filamentous cyanobacterium CCP5

<400>  531
```

```
Met Ser Gln Lys Thr Ile Arg Cys Arg Leu Val Ala Pro Glu Ser Thr
1               5                  10                  15

Arg Glu Ala Ile Trp Gln Leu Met Ala Glu Arg Asn Thr Pro Leu Val
            20                  25                  30

Asn Glu Val Leu Arg Gln Leu Pro Glu Asn Ser Asp Phe Ser Lys Trp
        35                  40                  45

Gln Arg Arg Gly Lys Leu Pro Asp Leu Pro Val Lys Gln Leu Val Asp
    50                  55                  60

Gly Leu Lys Ser Asp Pro Arg Phe Ser Asp Gln Pro Val Trp Tyr Tyr
65                  70                  75                  80

Ile Ser Ala Gln Lys Gln Val Thr Tyr Thr Phe Lys Ser Trp Leu Ser
                85                  90                  95

Leu Gln Lys Arg Lys Gln Cys Arg Leu Glu Gly Lys Arg Arg Trp Leu
            100                 105                 110

Asp Ile Leu Arg Thr Asp Ser Glu Leu Ala Gly Glu Ala Lys Cys Ser
        115                 120                 125

Val Gly Ala Leu Arg Ser Ala Ala Ser Asn Ile Leu Lys Lys Val Asp
    130                 135                 140

Asp Ser Asp Pro Phe Lys Leu Leu Leu Lys Glu Tyr Gly Thr Ser Lys
145                 150                 155                 160

Ser Ala Lys Arg Gln Cys Ala Leu Ala Tyr Leu Leu Lys Arg Asp Ala
                165                 170                 175

Lys Leu Asp Pro Glu Glu Glu Asp Leu Glu Lys Leu Gly Gln Arg His
            180                 185                 190

Ser Lys Ala Glu Ile Gln Ile Lys Arg Leu Glu Thr Gln Leu Lys Ala
```

```
        195                 200                 205

Ser Leu Pro Lys Gly Arg Asp Leu Thr Gly Gln Ile Arg Ala Glu Ala
    210                 215                 220

Leu Thr Gln Ser Val Gln Ser Pro Pro Leu Asp Asp Glu Ala Tyr Ser
225                 230                 235                 240

Ala Trp His Ala Ser Leu Thr Arg Glu Ala Ala Thr Leu Pro Phe Pro
                245                 250                 255

Ile Ile Tyr Glu Thr Val Glu Ser Leu Val Trp Phe Lys Asp Thr Lys
            260                 265                 270

Gly Arg Tyr Ser Val Cys Phe Gln Gly Gln Gly Thr Ser Ala His Thr
        275                 280                 285

Phe Lys Val Tyr Cys Asp Lys Pro His Gln Gln Trp Phe Asp Arg Phe
    290                 295                 300

Trp Ile Asp Gln Glu Thr Lys Arg Ser Gly Gly Glu Arg His Ser Ala
305                 310                 315                 320

Gly Leu Phe Thr Leu Arg Ser Ala Arg Leu Ser Trp Ile Pro Ser Lys
                325                 330                 335

Lys His Gln Asn Glu Pro Glu Pro Trp Asn Arg Ser Tyr Leu Asn Leu
            340                 345                 350

Ser Cys Thr Val Asp Thr Asp Leu Trp Thr Gln Glu Gly Thr Gln Asn
        355                 360                 365

Val Met Gln Glu Lys Ala Ala Ala Thr Ala Ser Lys Leu Gln Ser Met
    370                 375                 380

Gln Glu Lys Glu Ser Leu Asp Lys Asn Gln Gln Gly Tyr Val Arg Arg
385                 390                 395                 400
```

```
Leu Glu Ser Thr Leu Thr Arg Leu Gln Thr Pro Tyr Pro Arg Pro Ser
                405                 410                 415

Arg Ala Leu Tyr Gln Gly Arg Ser Asp Ile Leu Val Gly Val Ser Met
            420                 425                 430

Gly Leu Asp Lys Pro Ala Thr Val Ala Val Val Asn Ala Leu Ser Gly
        435                 440                 445

Glu Val Leu Thr Tyr Arg Ser Thr Lys Gln Leu Leu Gly Glu Gln Tyr
    450                 455                 460

Pro Leu Leu Gln Arg Ala Arg Ser Glu Arg Thr Lys Val Ala His Gln
465                 470                 475                 480

Gly His Arg Gln Arg Arg Lys Gly Gly Lys Arg Val Asn Gln Glu Ser
                485                 490                 495

Asn Leu Gly Lys His Val Asp Arg Leu Leu Ala Lys Ala Ile Val Glu
            500                 505                 510

Val Ala His Lys Tyr Gln Ala Gly Ser Ile Val Leu Pro Asp Leu Ala
        515                 520                 525

His Ile Arg Glu Ile Val Glu Ser Glu Val Lys Gln Arg Ala Ala Glu
    530                 535                 540

Lys Val Pro Asp Phe Ile Asp Gly Gln Lys Gln Tyr Ala Lys Ala Tyr
545                 550                 555                 560

Arg Val Gln
```

<210> 532
<211> 660
<212> PRT
<213> Cyanothece sp. PCC 8801

<400> 532

```
Met Thr His Ile Thr Val Val Gln Cys Arg Leu Ile Ala Pro Glu Ser
1               5                  10                  15

Thr Leu Gln His Ile Trp Lys Met Met Ala Gln Gln Gln Thr Pro Leu
            20                  25                  30

Ile Asn Gln Leu Leu His Asp Ile Asn Thr His Pro Asp Ile Asn Thr
        35                  40                  45

Trp Leu Thr Ala Asn Gln Leu Pro Ser Lys Leu Val Glu Thr Leu Ala
    50                  55                  60

Gln Pro Leu Lys Thr Gln Ser Pro Tyr Gln Gly Leu Pro Gly Arg Phe
65                  70                  75                  80

Ile Thr Ser Ala Ile Ile Leu Val Lys Glu Met Tyr Ala Ser Trp Phe
                85                  90                  95

Ala Ile Gln Thr Gln Lys Arg Leu Ser Leu Glu Gly Lys Lys Arg Phe
            100                 105                 110

Leu Thr Ile Leu Lys Ser Asp Lys Gln Leu Ile Gln Asp Ser Gln Thr
        115                 120                 125

Asp Phe Leu Thr Leu Cys Tyr Lys Ala Gln Gln Leu Leu Lys Arg Thr
    130                 135                 140

Gln Asn Lys Leu Lys Leu Asp Glu Pro Gln His Ser Glu Lys Ala His
145                 150                 155                 160

Trp Ser Ile Ile Asn Ala Leu Tyr Pro Ala Tyr Asn Asn Ala Lys Thr
                165                 170                 175

Pro Ile Ser Arg Ala Ala Phe Ala Leu Leu Ile Lys Asn Asn Gly Gln
            180                 185                 190
```

```
Val Pro Asp Thr Pro Glu Asn Pro Asp Tyr Tyr Gln Gln Arg Arg Lys
        195                 200                 205

Arg Lys Glu Ile Gln Ile Arg Arg Leu Glu Glu Gln Leu Lys Ala Ser
    210                 215                 220

Leu Pro Lys Gly Arg Ile Leu Asp Ser Lys His Trp Glu Asn Thr Leu
225                 230                 235                 240

Lys Leu Ala Gln Thr Pro Ile Thr Thr Ile Glu Glu Ile Thr Ser Leu
                245                 250                 255

Gln Thr Gln Leu Leu Gln Lys Tyr Ser His Leu Pro Phe Pro Val Phe
            260                 265                 270

Tyr Gly Thr Asn Thr Asp Leu Thr Trp Phe Lys Asn Pro Gln Gly Arg
        275                 280                 285

Ile Cys Val Lys Phe Asn Gly Leu Asn Gln Tyr Pro Phe Gln Ile Ala
    290                 295                 300

Cys Asn Lys Arg Gln Tyr Pro Trp Phe Gln Arg Phe Phe Thr Asp Tyr
305                 310                 315                 320

Gln Ser Tyr Lys Ser His Lys Gln Gln Val Pro Thr Gly Leu Met Val
                325                 330                 335

Leu Arg Ser Ala Arg Leu Leu Trp Gln Pro Thr Asn Gly Gln Gly Glu
            340                 345                 350

Pro Trp Asn Thr His His Leu Ser Leu His Cys Ala Ile Asp Asn Asp
        355                 360                 365

Leu Trp Thr Ile Ser Gly Ile Gln Gln Val Lys Gln Gln Lys Ile Leu
    370                 375                 380

Gln Thr Glu Gln Lys Ile Ala Asn Phe His Ser Lys Ala Leu Glu Lys
385                 390                 395                 400
```

```
Glu Leu Thr Pro Asn Gln Gln Gln Arg Leu Lys Ala Ser Gln Thr Ser
                405                 410                 415

Leu Asn Leu Leu Lys Thr Phe Asp Ile Asn Glu Phe Phe Pro Ser Lys
            420                 425                 430

Cys Ser Leu Tyr Gln Gly Ser Pro Asp Ile Ile Leu Gly Val Ser Ile
        435                 440                 445

Gly Leu Glu Asn Pro Ala Thr Ile Ala Ile Ile Asn Ile Ser Thr Gln
    450                 455                 460

Glu Ile Leu Thr Tyr Arg Thr Thr Lys Gln Leu Leu Ser Arg Thr Arg
465                 470                 475                 480

Lys Val Arg Asn Lys Lys Pro Asn Ser Asn Asn Ser Asn Gln Ser Leu
                485                 490                 495

Ser Ser Ala Tyr Lys Gln Ile Ser Asn Tyr Glu Leu Phe Leu Gln Tyr
            500                 505                 510

Gln Gln Gln Lys His His Asn Gln His Gln Arg His Asn Ala Gln Ile
        515                 520                 525

Asn Asp Ala Asn Asn Asn Tyr Gly Glu Ala Asn Leu Gly Leu Tyr Leu
    530                 535                 540

Asn Arg Leu Leu Ala Lys Ala Ile Leu Glu Leu Ala Gln Gln Tyr Gln
545                 550                 555                 560

Val Ser Leu Ile Ile Leu Pro Ser Leu Lys Asn Lys Arg Glu Leu Ile
                565                 570                 575

Glu Ser Glu Ile Arg Ala Lys Ala Glu Leu Lys Tyr Pro Gly Cys Lys
            580                 585                 590
```

```
Glu Lys Gln Asp Ser Tyr Ala Lys Asp Tyr Arg Thr Asn Val His Gln
        595                 600                 605

Trp Ser Tyr Gln Gln Leu Ile Lys Cys Ile Glu Ser Lys Ala Ala Gln
    610                 615                 620

Ile Gly Ile Asp Thr Ala Thr Gly Lys Gln Met Asn Leu Glu Thr Ser
625                 630                 635                 640

Gln Asp Gln Ala Arg Asn Leu Val Leu Asn Phe Cys Gln Lys Phe Ser
                645                 650                 655

Pro Thr Gln Val
            660
```

<210> 533
<211> 659
<212> PRT
<213> Phormidium tenue

<400> 533

```
Met Ser Ile Ile Thr Ile Gln Cys Arg Leu Thr Ala Ser Val Ala Thr
1               5                   10                  15

Arg Gln His Leu Trp Asn Leu Met Ala His Ser Asn Thr Pro Leu Val
            20                  25                  30

Ser Glu Leu Met Arg Ile Ile Pro Leu Gln Pro Asp Phe Glu Asn Trp
        35                  40                  45

Arg Gln Ala Ser Lys Ile Pro Ala Lys Ala Ile Arg Asp Leu Cys Ala
    50                  55                  60

Ser Phe Arg Lys Asp Glu Arg Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Ser Ser Ala Ser Thr Met Val Ala Tyr Thr Tyr Asp Ala Trp Phe Ala
                85                  90                  95
```

```
Leu Gln Ala Ser Arg Leu Arg Arg Leu Tyr Gly Met Arg Arg Trp Leu
            100                 105                 110

Glu Ile Leu Gln Ser Asp Thr Glu Met Leu Lys Leu Cys Gly Val Ser
        115                 120                 125

Trp Glu Ser Phe Gln Glu Arg Ala Arg Ala Ile Leu Gln Thr Ala Thr
    130                 135                 140

Asp Gln Ile Gln Ala Lys Gln Pro Thr Pro Gln Pro Ala Arg Arg Gly
145                 150                 155                 160

Asn Lys Lys Gln Arg Lys Gln Ser Asp Lys Ile Val Ser Arg Arg Arg
                165                 170                 175

Leu Val Asp Arg Leu Phe Gln Leu Tyr Asn Glu Ser Pro Glu Thr Leu
            180                 185                 190

Asp Arg Cys Ala Ile Val Arg Leu Leu Lys Asn Gly Cys Thr Val Pro
        195                 200                 205

Glu Gln Ala Glu Gln Pro Glu Arg Tyr Gln Arg Met Leu Leu Ala Lys
    210                 215                 220

Gln Thr Gly Val Ser Arg Ile Glu Arg Glu Leu Ala Ser Arg Leu Pro
225                 230                 235                 240

Lys Gly Arg Asp Leu Thr Asp Glu Asn Phe Leu Asn Ala Leu Glu Leu
                245                 250                 255

Leu Thr Tyr Gln Ile Pro Thr Ser Thr Glu Glu Phe Ala Gln Trp Lys
            260                 265                 270

Ser Gln Leu Leu Arg Glu Pro Asn Pro Leu Pro Tyr Pro Val Leu Tyr
        275                 280                 285

Ser Gly Asn Leu Asn Leu Thr Trp Phe Val Glu Glu Val Pro Arg Gly
```

```
    290                 295                 300

Lys Ser Gln Lys Pro Lys Gln Gln Ile Cys Val Lys Leu Asn Gly Leu
305                 310                 315                 320

Ala Lys His Val Leu Lys Val Gln Cys Asp Ala Arg Gln His His Tyr
                325                 330                 335

Phe Gln Arg Phe Val Gln Asp Trp Asp Ile Tyr Asn Arg Gly Lys Gly
            340                 345                 350

Pro Ile Ser Gly Ser Leu Leu Leu Leu Arg Thr Ala Ser Ile Leu Trp
        355                 360                 365

Lys Pro Val Gln Gln Ser Arg His Arg Ala Thr Gly Glu Pro Trp Ser
    370                 375                 380

Asp His Ser Leu Tyr Leu His Cys Gln Ile Asp Thr Lys Leu Leu Thr
385                 390                 395                 400

Gln Glu Gly Ile Glu Glu Lys Arg Gln Lys Lys Leu Ala Ser Ala Gln
                405                 410                 415

Ser Ser Glu Gln Thr Arg His Ala Thr Pro Val Gln Ala Ala Arg Gln
            420                 425                 430

Gln Gly Ser Leu Asp Arg Leu Gln Arg Ser Ala Gln His Pro Ile His
        435                 440                 445

Leu Pro Ser Arg Thr Pro Tyr Gln Gly Gln Pro Gln Ile Ile Leu Gly
    450                 455                 460

Val Ser Phe Asn Leu Lys His Pro Val Thr Val Ala Val Val Asp Val
465                 470                 475                 480

Gln Ser Gln Glu Val Val Lys Tyr His Ser Ser Arg Gln Leu Leu Ser
                485                 490                 495
```

```
Thr Thr Asp Pro Lys Thr Asp Gln Ser His Leu Pro Gln Gln Gln Met
            500                 505                 510

Ala Gln Gln Gln Ser His Asp His Glu Arg His Lys Ala Leu Lys Lys
        515                 520                 525

Asp His Tyr Ala Pro Tyr Lys Glu Ala Asn Leu Gly Ala Tyr Leu Asn
    530                 535                 540

Gln Val Leu Ala Lys Arg Val Val Asp Ile Ala Ile Gln Phe Arg Val
545                 550                 555                 560

Ser Ser Ile Val Leu Pro Asp Thr Lys Gly Leu Arg Asp Lys Leu Glu
                565                 570                 575

Ala Gln Leu Arg Ala Lys Ala Ala Ser Lys Ile Val Gly Ser Val Ala
            580                 585                 590

Ala Gln Lys Arg Tyr Ala Arg Thr Ala Ser Ile Arg Leu His His Trp
        595                 600                 605

Ser Tyr Asn Gln Leu Ala Glu Leu Ile Lys Asn Arg Ala Ala Lys Leu
    610                 615                 620

Gly Ile Pro Val Glu Val Val Pro Gly Leu Val Ala Asp Ser Pro Gln
625                 630                 635                 640

Ala Thr Ala Arg Asp Val Val Phe Ser Ala Tyr Tyr Arg Arg Gln Ser
                645                 650                 655

Ala Ser Lys
```

<210> 534
<211> 453
<212> PRT
<213> filamentous cyanobacterium CCP2

<400> 534

```
Met Thr Arg Gly Ala Ile Ala Tyr Leu Leu Lys Asn Gly Gly Lys Leu
1               5                   10                  15

Pro Asp Lys Pro Glu Asp Leu Lys Lys Phe Val Lys Arg Arg Arg Lys
            20                  25                  30

Ala Glu Ile Arg Val Glu Arg Leu Thr Ser Thr Leu Lys Arg Met Arg
        35                  40                  45

Leu Pro Ser Gly Arg Asp Leu Thr Asp Gln Ala Trp Val Lys Thr Leu
    50                  55                  60

Ala Thr Ala Ala Phe Asp Val Pro Glu Asn Glu Glu Glu Ala Ala Leu
65                  70                  75                  80

Trp Gln Ala Val Leu Leu Ser Glu Thr Arg Lys Leu Pro Phe Pro Ile
                85                  90                  95

Thr Tyr Glu Thr Asn Gly Asp Leu Thr Trp Phe Leu Asn Asp Asn Gly
            100                 105                 110

Arg Leu Cys Val Thr Phe Asn Gly Leu Ser Glu His Pro Phe Glu Ile
        115                 120                 125

Tyr Cys Asp Gln Arg Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp
    130                 135                 140

Gln Glu Val Lys Lys Ala Ser Lys Asn Gln His Ser Ser Gly Ala Phe
145                 150                 155                 160

Thr Leu Arg Ser Ala Arg Ile Ala Trp Gln Ala Gly Lys Glu Gln Gly
                165                 170                 175

Asp Pro Trp Lys Val His His Leu Val Leu Phe Cys Thr Val Glu Thr
            180                 185                 190
```

```
Arg Phe Trp Thr Ala Glu Gly Thr Gln Gln Ile Cys Glu Glu Lys Ala
        195                 200                 205

Ala Glu Tyr Ala Lys Val Ile Ala Gly Thr Lys Ala Lys Gly Asn Leu
    210                 215                 220

Asn Lys Asn Gln Glu Lys Phe Ile Arg Ser Arg Glu Lys Thr Ile Ala
225                 230                 235                 240

Arg Met Gln Asn Pro Phe Pro Arg Pro Ser Arg Pro Leu Tyr Gln Gly
                245                 250                 255

Gln Pro Thr Ile Leu Ala Gly Val Ser Tyr Gly Leu Asp Arg Pro Ala
            260                 265                 270

Thr Leu Ala Ile Val Asp Ile Thr Thr Gly Lys Ala Ile Thr Tyr Arg
        275                 280                 285

Ser Ile Arg Gln Leu Leu Gly Asp Asn Tyr Gln Leu Leu Asn Arg Tyr
    290                 295                 300

Arg Leu Arg Gln Gln Arg Asn Ala His Arg Arg His Asn Arg Gln Arg
305                 310                 315                 320

Lys Gly Ala Ala Asn Gln Ile Gln Glu Ser Asn Leu Gly Glu Tyr Leu
                325                 330                 335

Asp Cys Leu Ile Ala Lys Ala Val Val Ser Val Ala Lys Ala Tyr Gln
            340                 345                 350

Val Ser Ser Ile Val Leu Pro Asp Leu Gly Asn Ile Arg Glu Met Val
        355                 360                 365

Glu Ala Glu Val Gln Ala Arg Ala Glu Gln Arg Ile Val Gly Tyr Glu
    370                 375                 380

Glu Gly Gln Arg Gln Tyr Ala Lys Gln Tyr Arg Ala Ser Val His Arg
385                 390                 395                 400
```

Trp Ser Tyr Gly Arg Leu Thr Glu Lys Ile Gln Ser Gln Ala Ala Gln
405 410 415

Ile Gly Ile Met Val Glu Gln Ala Lys Gln Met Phe Gln Gly Thr Pro
420 425 430

Gln Glu Lys Ala Lys Asn Leu Val Thr Glu Ala Tyr Asn Ser Arg Lys
435 440 445

Gln Glu Lys Ser Ser
450

<210> 535
<211> 434
<212> PRT
<213> Stanieria sp. NIES-3757

<400> 535

Met Arg Gln Lys Pro Glu Asp Pro Lys Lys Phe Ala Lys Arg Arg Arg
1 5 10 15

Lys Thr Glu Ile Lys Val Glu Arg Leu Leu Lys Lys Leu Asn Ser Gln
20 25 30

Thr Pro Lys Gly Arg Asp Leu Thr Gly Gln Gln Trp Leu Asp Thr Leu
35 40 45

Ile Thr Val Ala Thr His Val Pro Gln Asp Glu Val Gln Ala Lys Leu
50 55 60

Trp Gln Asp Ile Leu Leu Thr Lys Pro Lys Ser Val Pro Phe Pro Ile
65 70 75 80

Thr Tyr Glu Thr Asn Glu Asp Met Thr Trp Ser Lys Asn Glu Lys Ser
85 90 95

Arg Leu Cys Val Arg Phe Ser Gly Leu Gly Glu His Ile Phe Glu Ile

```
            100                 105                 110

Tyr Cys Asp Gln Arg Gln Leu Pro Leu Phe Gln Arg Phe Tyr Gln Asp
        115                 120                 125

Gln Glu Val Lys Lys Ala Ser Lys Asn Leu His Ser Ser Ala Leu Phe
    130                 135                 140

Leu Leu Arg Ser Ser Arg Ile Ala Trp Gln Glu Gly Glu Gly Lys Gly
145                 150                 155                 160

Glu Pro Trp Asn Val Asn His Leu Thr Leu Tyr Cys Thr Leu Gly Thr
                165                 170                 175

Arg Leu Leu Thr Ala Glu Gly Thr Glu Gln Val Arg Gln Glu Lys Ala
            180                 185                 190

Ala Glu Ile Ala Thr Thr Leu Thr Arg Met Lys Glu Lys Gly Asp Leu
        195                 200                 205

Asn Ala Lys Gln Gln Ala Phe Val Lys Arg Lys Gln Thr Cys Leu Ser
    210                 215                 220

Arg Ile Asn Asn Pro Phe Pro Arg Pro Asp Arg Pro Leu Tyr Gln Gly
225                 230                 235                 240

Gln Ala His Ile Leu Leu Gly Ile Tyr Met Gly Leu Glu Lys Pro Ala
                245                 250                 255

Thr Ala Ala Val Ile Asp Ala Ile Ser Gly Lys Val Ile Thr Tyr Arg
            260                 265                 270

Ser Thr Lys Gln Leu Leu Gly Asp Asn Tyr Gln Leu Leu Asn Arg Gln
        275                 280                 285

Arg Arg Gln Lys Ser Phe Leu Ser His Gln Arg His Leu Asn Gln Lys
    290                 295                 300
```

```
His His Ala Asn Asn Gln Leu Gly Glu Ser Lys Leu Gly Gln His Leu
305                 310                 315                 320


Asp Arg Leu Leu Ala Asn Ala Ile Val Asn Leu Ala Lys Thr Tyr Gln
                325                 330                 335


Val Gly Ser Ile Val Leu Pro Lys Leu Gly Asn Met Arg Glu Ile Val
            340                 345                 350


Gln Ser Glu Ile Gln Ala Leu Ala Glu Gln Lys Ile Pro Gly Asn Lys
        355                 360                 365


Glu Gly Gln Lys Lys Tyr Ala Lys Gln Tyr Arg Val Asn Val His Gln
    370                 375                 380


Trp Ser Tyr Gly Arg Leu Met Glu Asn Ile Lys Ala Gln Ala Ala Lys
385                 390                 395                 400


Ala Gly Ile Val Ile Glu Glu Ser Lys Gln Ser Ile Arg Gly Ser Pro
                405                 410                 415


Gln Asp Gln Ala Lys Glu Ile Ala Ile Ser Ala Tyr Thr Asn Arg Leu
            420                 425                 430


Asn Tyr
```

<210> 536
<211> 453
<212> PRT
<213> filamentous cyanobacterium CCP1

<400> 536

```
Met Thr Arg Gly Ala Ile Ala Tyr Leu Leu Lys Asn Gly Gly Lys Leu
1               5                   10                  15


Pro Asp Lys Pro Glu Asp Leu Lys Lys Phe Val Lys Arg Arg Arg Lys
            20                  25                  30
```

```
Ala Glu Ile Arg Val Glu Arg Leu Thr Ser Thr Leu Lys Arg Met Arg
        35                  40                  45

Leu Pro Ser Gly Arg Asp Leu Thr Asp Gln Ala Trp Val Lys Thr Leu
    50                  55                  60

Ala Thr Ala Ala Phe Asp Val Pro Glu Asn Glu Glu Glu Ala Ala Leu
65                  70                  75                  80

Trp Gln Ala Val Leu Leu Ser Glu Thr Arg Lys Leu Pro Phe Pro Ile
                85                  90                  95

Thr Tyr Glu Thr Asn Gly Asp Leu Thr Trp Phe Leu Asn Asp Asn Gly
            100                 105                 110

Arg Leu Cys Val Thr Phe Asn Gly Leu Ser Glu His Pro Phe Glu Ile
        115                 120                 125

Tyr Cys Asp Gln Arg Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp
    130                 135                 140

Gln Glu Val Lys Lys Ala Ser Lys Asn Gln His Ser Ser Gly Ala Phe
145                 150                 155                 160

Thr Leu Arg Ser Ala Arg Ile Ala Trp Gln Ala Gly Lys Glu Gln Gly
                165                 170                 175

Asp Pro Trp Lys Val His His Leu Val Leu Phe Cys Thr Val Glu Thr
            180                 185                 190

Arg Phe Trp Thr Ala Glu Gly Thr Gln Gln Ile Cys Glu Glu Lys Ala
        195                 200                 205

Ala Glu Tyr Ala Lys Val Ile Ala Gly Thr Lys Ala Lys Gly Asn Leu
    210                 215                 220
```

```
Asn Lys Asn Gln Glu Lys Phe Ile Arg Ser Arg Glu Lys Thr Ile Ala
225                 230                 235                 240

Arg Met Gln Asn Pro Phe Pro Arg Pro Ser Arg Pro Leu Tyr Gln Gly
                245                 250                 255

Gln Pro Thr Ile Leu Ala Gly Val Ser Tyr Gly Leu Asp Arg Pro Ala
            260                 265                 270

Thr Leu Ala Ile Val Asp Ile Thr Thr Gly Lys Ala Ile Thr Tyr Arg
        275                 280                 285

Ser Ile Arg Gln Leu Leu Gly Asp Asn Tyr Gln Leu Leu Thr Arg Tyr
    290                 295                 300

Arg Leu Arg Gln Gln Arg Asn Ala His Arg Arg His Asn Arg Gln Arg
305                 310                 315                 320

Lys Gly Ala Ala Asn Gln Ile Gln Glu Ser Asn Leu Gly Glu Tyr Leu
                325                 330                 335

Asp Cys Leu Ile Ala Lys Ala Val Val Ser Val Ala Lys Ala Tyr Gln
            340                 345                 350

Val Ser Ser Ile Val Leu Pro Asp Leu Gly Asn Ile Arg Glu Met Val
        355                 360                 365

Glu Ala Glu Val Gln Ala Arg Ala Glu Gln Arg Ile Val Gly Tyr Glu
    370                 375                 380

Glu Gly Gln Arg Gln Tyr Ala Lys Gln Tyr Arg Ala Ser Val His Arg
385                 390                 395                 400

Trp Ser Tyr Gly Arg Leu Thr Glu Lys Ile Gln Ser Gln Ala Ala Gln
                405                 410                 415

Ile Gly Ile Met Val Glu Gln Ala Lys Gln Met Phe Gln Gly Thr Pro
            420                 425                 430
```

```
Gln Glu Lys Ala Lys Asn Leu Val Thr Glu Ala Tyr Asn Ser Arg Lys
        435                 440                 445


Gln Glu Lys Ser Ser
    450
```

<210> 537
<211> 711
<212> PRT
<213> Crinalium epipsammum

<400> 537

```
Met Ser Asp Gln Thr Ser Gln Asn Asn Glu Ile Thr Ile Gln Ser Leu
1               5                   10                  15


Leu Glu Ala Pro Glu Glu Thr Leu Cys Phe Leu Trp Gln Leu Met Val
            20                  25                  30


Asn Val Thr Glu Leu Ile Asn Ser Leu Leu His His Ile Asn Thr His
        35                  40                  45


Pro Asp Phe Asp Ile Trp Leu Thr Gln Cys Ala Ile Pro Ala Ser Val
    50                  55                  60


Ile Asn Ser Phe Ile Lys Thr Ala Lys Thr Gln Ser Pro Tyr Arg Glu
65                  70                  75                  80


Met Pro Thr Arg Phe Ile Thr Ser Ala Gln Asn Leu Val Asn Glu Met
                85                  90                  95


Phe Lys Ser Trp Phe Glu Ile Gln Arg Leu Lys Arg Leu Ser Leu Lys
            100                 105                 110


Gly Lys Arg His Phe Phe Thr Ile Leu Lys Ser Asp Glu Glu Leu Gln
        115                 120                 125


Arg Glu Ser Asp Cys Thr Phe Asp Thr Leu Cys Gln Glu Ala Ala Ile
```

```
    130                 135                 140

Ile Leu Gln Gln Thr Gln Leu Gln Ile Glu Gln Lys Arg Leu Asp Ala
145                 150                 155                 160

Asn Gln Pro Pro Pro Thr Leu Asp Lys Gln Ala Phe Trp Glu Val Ala
                165                 170                 175

His Val Leu Tyr Lys Ala Tyr Asp Gln Ala Asp Thr Pro Leu Val Arg
            180                 185                 190

Ser Gly Ile Ala Leu Leu Leu Lys Asn Gln Asn Gln Val Pro Glu Gln
        195                 200                 205

Phe Glu Asp Pro Lys Lys Tyr Gln Gln Arg Arg Gln Ala Lys Gln Glu
    210                 215                 220

Glu Ile Glu Arg Leu Glu His Gln Leu Gln Ser Lys Ala Pro Lys Gly
225                 230                 235                 240

Arg Leu Thr Asp Gln Gln Glu Trp Leu Arg Ile Leu Glu Lys Ala Ser
                245                 250                 255

Gln Pro Ile Thr Glu Val Ala Glu Phe Arg Asp Ile Gln Ala Gln Leu
            260                 265                 270

Leu Arg Lys Phe Phe Ala Leu Val Tyr Pro Val Thr Phe Ser Thr Asn
        275                 280                 285

Thr Asp Leu Gln Trp Ser Thr Asn Gln Gln Gly Arg Ile Cys Val Gln
    290                 295                 300

Phe Tyr Gly Met Ser Lys Tyr Thr Phe Glu Ile Ala Cys Asp Arg Arg
305                 310                 315                 320

Gln Leu Asn Trp Phe Lys Arg Phe Leu Ala Asp Tyr Gln Leu Tyr Lys
                325                 330                 335
```

```
Gln His Lys Thr Gln Ile Pro Thr Gly Leu Met Pro Leu Arg Cys Ala
            340                 345                 350

Arg Leu Val Trp Thr Glu Gly Gln Asp Asp Phe Ala Leu Ile Val Ala
        355                 360                 365

Thr Trp Leu Leu Ile Ala Val Ile Gln His Lys Phe Tyr His Ile Ala
    370                 375                 380

Trp Leu Leu Leu Lys Asn His Arg Ile Ile Lys Ser Pro Pro Trp Arg
385                 390                 395                 400

Val His His Leu His Leu His Cys Ile Val Asp His Arg Leu Trp Thr
                405                 410                 415

Gln Glu Gly Lys Glu Ile Val Lys Ala Glu Lys Ile Pro Gln Thr Glu
            420                 425                 430

Lys Leu Ile Asn Asp Phe Gln Gln Lys Glu Arg Ile Gln Glu Asn Gly
        435                 440                 445

Leu Thr Thr Gly Gln Gln Gln Arg Leu Lys Ala Ser Glu Thr Ser Leu
    450                 455                 460

Arg Leu Leu Gln Asn Cys Asp His Phe Ala Ala Ser Lys Arg Ile Ser
465                 470                 475                 480

Tyr Arg Gly Gln Pro Asn Arg Ile Leu Gly Val Ser Ile Gly Leu His
                485                 490                 495

Glu Pro Val Thr Ile Met Ile Val Asn Thr Thr Thr Gly Lys Thr Leu
            500                 505                 510

Ala Ser Arg Asn Thr Lys Gln Leu Leu Asp Lys Lys Arg Arg Val Arg
        515                 520                 525

Asp Gln Gln Pro Glu Leu Pro Lys Tyr Glu Glu Arg Gln His Phe Thr
```

```
    530                 535                 540

Asn Ile Tyr Lys Glu Ile Ser Asp Tyr Glu Leu Phe Leu Phe Tyr Arg
545                 550                 555                 560

Gln Gln Lys Gln Gln His Gln His Gln Arg His Lys Ala Gln Ile Lys
                565                 570                 575

Ala Thr Pro Asp His Ser Lys Glu Ala Asn Leu Gly Leu Tyr Ile Asn
            580                 585                 590

Arg Leu Leu Ala Lys Ala Ile Ile Glu Phe Ala Gln Gln His Gln Val
        595                 600                 605

Ser Thr Ile Ile Leu Pro Asp Leu Lys Asn Lys Arg Glu Ser Ile Glu
    610                 615                 620

Ser Glu Ala Lys Ala Leu Ala Lys Leu Lys Ile Pro Lys Asp Lys Ser
625                 630                 635                 640

Arg Gln Gln Gln Tyr Thr Arg Asn Ile Leu Ser Glu Val Ser Gln Trp
                645                 650                 655

Ser Tyr Lys Gln Leu Ser Asp Cys Ile Ile Asn Lys Ala Ser Gln Ser
            660                 665                 670

Gly Ile Ala Ile Glu Ile Ile Gln Gln Ile Ser Gln Gly Asn Pro Tyr
        675                 680                 685

Gln Lys Ala Arg Asn Leu Ile Thr Thr Phe Thr Lys Asn Ser Gly Asn
    690                 695                 700

Lys Cys Ser Ala Lys Ile Glu
705                 710
```

<210> 538
<211> 453
<212> PRT

<213> Geminocystis herdmanii

<400> 538

```
Met Ile Val Tyr Leu Ile Lys Asn Gly Ser Arg Ile Pro Lys Asn Asn
1               5                   10                  15


Ile Glu Thr Thr Lys Lys Tyr Lys Arg Ile Lys Arg Lys Leu Glu Ile
            20                  25                  30


Lys Ile Arg Lys Leu Lys Arg Gln Val Glu Met Ser Ile Pro Ser Gly
        35                  40                  45


Arg Asp Leu Glu Gly Glu Lys Trp Leu Gln Thr Leu Ile Leu Ala Ser
    50                  55                  60


Asn Thr Met Pro Val Asp Gln Asn Glu Ser Asp Ser Trp Phe Ser Ala
65                  70                  75                  80


Leu Lys Arg Asn Ser Pro Ser Ile Pro Tyr Pro Ile Val Tyr Glu Thr
                85                  90                  95


Asn Glu Asp Leu Lys Trp Cys Leu Asn Asp Gln Asn Arg Ile Cys Ile
            100                 105                 110


Lys Phe Ser Gly Leu Ser Asp His Leu Phe Leu Ile Tyr Cys Asp Ser
        115                 120                 125


Arg Gln Leu Pro Tyr Phe Arg Arg Phe Tyr Glu Asp Gln Glu Leu Lys
    130                 135                 140


Lys Ala Ser Lys Asp Gln Phe Ser Ser Ala Leu Phe Thr Leu Arg Ser
145                 150                 155                 160


Ala Met Ile Ile Trp Lys Glu Asp Asp Gly Lys Gly Glu Ser Trp Asp
                165                 170                 175


Lys His Lys Leu Tyr Leu His Cys Thr Phe Asp Thr Asp Tyr Trp Thr
            180                 185                 190
```

```
Leu Glu Gly Thr Gln Val Ile Ala Gln Lys Lys Gln Glu Glu Val Leu
        195                 200                 205

Asn Leu Ile Asp Arg Met Lys Glu Lys Thr Asp Leu Thr Asp Thr Gln
    210                 215                 220

Lys Ala Phe Ile Gln Arg Lys Gln Thr Thr Leu Ala Arg Leu Asn Asn
225                 230                 235                 240

Ile Phe Pro Arg Pro Ser Lys Pro Ile Tyr Gln Gly Asn Pro Asn Leu
                245                 250                 255

Phe Leu Gly Val Ala Met Gly Leu Gln Glu Pro Val Thr Ile Ala Leu
            260                 265                 270

Val Asp Val Ser Thr Asn Lys Val Ile Leu Tyr Arg Asn Ile Lys Gln
        275                 280                 285

Leu Leu Gly Asp Asp Tyr His Leu Ile Arg Arg Arg Arg Asn Glu Lys
    290                 295                 300

Gln Lys Leu Asn His Gln Asn His Lys Ala Arg Lys Arg Ala Asn Phe
305                 310                 315                 320

Gln Gln Lys Gly Glu Ser Asn Leu Gly Glu Tyr Leu Asp Arg Leu Ile
                325                 330                 335

Ala Lys Ser Ile Leu Gln Ile Ala Glu Glu Tyr Gln Val Ser Thr Ile
            340                 345                 350

Ile Val Pro Arg Leu Asn Gln Ile Arg Ser Ile Thr Glu Ala Glu Ile
        355                 360                 365

Gln Ala Arg Ala Glu Glu Arg Ile Pro Glu Tyr Lys Glu Gly Gln Arg
    370                 375                 380
```

```
Lys Tyr Ala Gln Asp Tyr Cys Val Gln Val His Gln Trp Ser Tyr Gly
385                 390                 395                 400


Arg Leu Ile Asp Asn Ile Lys Ala Ile Ser Ser Lys Leu Gly Ile Val
                405                 410                 415


Val Glu Glu Gly Lys Gln Pro Lys Gln Gly Lys Phe Thr Asp Lys Ala
            420                 425                 430


Leu Gln Leu Ala Leu Ser Thr Gln Lys Asn Asn Arg Gln Asn Asn Pro
        435                 440                 445


Thr Lys Thr Asn Ser
    450
```

<210> 539
<211> 697
<212> PRT
<213> unclassified Cyanobacteria (miscellaneous)

<400> 539

```
Met Asp Gln Val Ile Pro Gly Tyr Met Lys Thr Ile Leu Cys Cys Leu
1               5                   10                  15


Cys Val Lys Val Glu Thr Arg Arg Phe Leu Trp Asn Ala Met Val Thr
            20                  25                  30


Tyr Thr Ala Leu Val Asn Glu Leu Leu Glu Leu Val Ser Gln His Pro
        35                  40                  45


Lys Phe Glu Val Trp Arg Gln Gln Gly Lys Ile Thr Arg Asp Glu Val
    50                  55                  60


Lys Ser Ile Leu Arg Pro Leu Lys Gln Asn Ser Val Tyr Ala Ala Leu
65                  70                  75                  80


Pro Gly Arg Phe Phe Thr Ser Ala Glu Leu Met Val Thr Tyr Ala Phe
                85                  90                  95
```

```
Lys Ser Trp Leu Ala Leu Gln Lys His Arg His His Gln Met Val Gly
            100                 105                 110

Lys Leu Arg Trp Leu Gln Val Ile Glu Ala Asp Leu Gln Ala Met Pro
        115                 120                 125

Thr Ser Asp Leu Ser Leu Glu Val Val Gln Ala Arg Ala Gln Gln Val
    130                 135                 140

Leu Glu His Ala Glu Gln Ser Thr Asp Thr Gln Gln Gly Arg Ser Ser
145                 150                 155                 160

Phe Leu Ser Arg Lys Gly Lys Arg Arg Gly Asn Pro Leu Met Gly Phe
                165                 170                 175

Leu Leu Asp Ala Tyr Glu Ala Ala Ser Asp Glu Leu Glu Arg Arg Ala
            180                 185                 190

Ile Cys Tyr Leu Leu Arg Asn Asp Leu Lys Val Val Glu Glu Asp Glu
        195                 200                 205

Asn Pro Glu Val Ile Gln Phe Arg Ile Asp Arg Lys Arg Ile Glu Val
    210                 215                 220

Glu Arg Leu Gln Asp Gln Leu Gln Ser Arg Leu Pro Lys Gly Arg Asp
225                 230                 235                 240

Pro Thr Asp Glu Arg Tyr Leu Glu Ala Leu Gly Ala Ala Ile Ala Leu
                245                 250                 255

Pro Asp Val Asp Leu Ser Pro Ile Asp Glu Glu Asp Trp Ser Gln Trp
            260                 265                 270

Lys Ala Gln Lys Gln Leu Pro Leu Leu Asn Pro Leu Pro Tyr Pro Ile
        275                 280                 285

Leu Trp Gly Ser Ser Ser Asp Leu Arg Trp Ser Ile Ile Ala Asn Ser
```

```
    290                 295                 300

Glu Ala Asp Gly Gln Pro Ser Lys Arg Arg Lys Ser Ser Lys Arg Pro
305                 310                 315                 320

Lys Glu Lys Ile Gln Val Gln Phe Asn Gly Leu Gly Lys His Thr Met
                325                 330                 335

Ser Ile Gln Cys Asp Arg Arg Gln Leu Pro Val Phe Lys Gln Phe Ala
            340                 345                 350

Glu Asp Tyr Ile Thr His Glu Ser Thr Ala Glu Glu Asp Lys Phe Gly
        355                 360                 365

Met Ser Leu Phe Ala Leu Arg Ser Ala Cys Leu Val Trp Lys Lys Asp
    370                 375                 380

Pro Gln Ala Ala Val Lys Arg Arg Lys His Lys Gln Lys Ala Lys Ala
385                 390                 395                 400

Gln Leu Asp Lys Ile Thr Asp Tyr Asp Ala Pro Trp Gln Thr His Arg
                405                 410                 415

Leu Tyr Leu His Cys Thr Val Asp Thr Arg Leu Ile Thr Lys Glu Gly
            420                 425                 430

Ser Glu Gln Val Arg Arg Glu Lys Ala Ser Arg Ala Glu Lys Leu Val
        435                 440                 445

Ala Ala Ser Val Gly Lys Glu Leu Thr Lys Thr Gln Gln Lys Asn Leu
    450                 455                 460

Lys Ser Asn Lys Thr Ser Val Glu Arg Leu Arg Arg Gln Pro Pro Glu
465                 470                 475                 480

Arg Pro Ser Ala Asn Leu Tyr His Gly Asn Pro Asp Ile Val Val Gly
                485                 490                 495
```

```
Ile Ser Leu Ser Arg His Glu Pro Val Thr Ala Val Val Leu Asp Arg
            500                 505                 510

Ser Thr Asp Arg Ala Leu Ala Cys Gln Arg Thr Lys Ala Leu Leu Lys
        515                 520                 525

Val Arg Ser Ile Lys Lys Thr Tyr Pro Asn Arg Ser Leu Leu Gln Arg
    530                 535                 540

Gln Lys Glu Gln Cys Arg Leu Val Asn Arg Trp Arg Ser Gln Arg Arg
545                 550                 555                 560

Tyr Asn Leu Ser Gln Arg Pro Glu Asp Gln Lys His Asp Asn Tyr Arg
                565                 570                 575

Gln Gln Asp Ala Glu Ser Ala Leu Gly Asp Tyr Leu Asp Arg Leu Leu
            580                 585                 590

Ala Ala Arg Val Ile Gln Leu Ala Gln Lys Trp Gln Ala Gly Ser Ile
        595                 600                 605

Val Leu Pro Ser Leu Gly Asn Ile Arg Glu Ile Val Glu Ser Ser Val
    610                 615                 620

Gln Ala Glu Ala Glu Arg Arg Tyr Pro Lys His Lys Glu Leu Gln Asp
625                 630                 635                 640

Lys Tyr Ala Lys Gln Tyr Arg Leu Glu Phe His Arg Trp Ser Tyr Gly
                645                 650                 655

Arg Leu Leu Lys Tyr Leu Lys Glu Cys Ala Arg Gln His Gly Leu Thr
            660                 665                 670

Ile Arg Gln Glu Arg Gln Pro Lys Gln Gly Ser Glu Gln Glu Lys Ala
        675                 680                 685

Leu Ala Leu Ile Ala Ser Ala Phe Leu
```

690 695

<210> 540
<211> 637
<212> PRT
<213> unclassified Cyanobacteria (miscellaneous)

<400> 540

Met Ala His Leu Asn Thr Pro Leu Val Thr Glu Leu Met Gln Val Ile
1 5 10 15

Gln His His Asn Asp Phe Val Asn Trp Gln Gln Arg Arg Glu Leu Pro
20 25 30

Met Gln Val Val Arg Asn Leu Cys Thr Ser Leu Arg Leu Asp Glu Arg
35 40 45

Phe Ser Gly Gln Pro Gly Arg Phe Tyr Ser Ser Ala Ala Met Met Val
50 55 60

Ala Tyr Thr Tyr Asp Ala Trp Phe Ala Leu Gln Ser Ser Arg Gln Gln
65 70 75 80

Gly Leu Asp Gly Leu Lys Arg Trp Ile Asp Ile Leu Lys Ser Asp Ala
85 90 95

Asp Met Leu Glu Leu Cys Gly Leu Asp Trp Lys Ser Phe Gln Ala Ser
100 105 110

Ala Lys Glu Ile Leu Gln Ser Val Thr Asp Gln Leu Gln Ser Asp Gln
115 120 125

Pro Lys Pro Ser Pro Ser His Lys Gly Ser Gln Gln Arg Arg Glu Gln
130 135 140

Ser Asp Arg Thr Val Ser Lys Arg Gln Leu Val Asn Gln Leu Phe Gln
145 150 155 160

```
Leu His Asp Glu Ser Pro Ser Leu Leu Thr Arg Cys Val Ala Val Tyr
                165                 170                 175

Leu Leu Lys Asn Gly Cys Ala Val Leu Glu Lys Pro Glu Lys Pro Glu
            180                 185                 190

Arg Tyr Gln Arg Met Leu Leu Gly Lys Lys Lys Ala Ala Lys Arg Leu
        195                 200                 205

Glu Glu Gln Leu Ala Ser Arg Leu Pro Lys Gly Arg Asp Leu Thr Asp
    210                 215                 220

Glu Thr Phe Leu Lys Ala Leu Glu Leu Leu Thr Tyr Gln Ile Pro Asn
225                 230                 235                 240

Ser Ala Glu Glu Leu Ala Arg Trp Lys Ala Gln Leu Leu Arg Lys Pro
                245                 250                 255

Asn Pro Leu Pro Phe Pro Ile Leu Tyr Gly Ser Asn Asn Asp Leu Thr
            260                 265                 270

Trp Phe Val Lys Glu Lys Pro Arg Gly Lys Ala Lys Pro Pro Lys Gln
        275                 280                 285

Gln Ile Cys Val Lys Phe Asn Gly Leu Gly Lys His Val Phe Arg Val
    290                 295                 300

Gln Cys Asp Arg Arg Gln His His Tyr Phe Gln Arg Phe Val Gln Asp
305                 310                 315                 320

Trp Glu Val Tyr Lys Cys Gly Lys Gly Pro Ile Ser Gly Ser Leu Leu
                325                 330                 335

Leu Leu Arg Thr Ala Ser Leu Leu Trp Lys Pro Ala Asn Gln Ser Ser
            340                 345                 350

His Gln Pro Thr Gly Asn Pro Trp Gln Asp Asn Tyr Leu Tyr Leu His
        355                 360                 365
```

```
Cys Gln Ile Asp Thr Gln Leu Leu Thr Arg Glu Gly Ile Glu Gln Lys
    370                 375                 380

Arg Gln Lys Lys Leu Asn Ser Thr Gln Asn Pro Asp Leu Ser Pro Ser
385                 390                 395                 400

Asp Pro Ala Ser Lys Ala Ala Arg Gln His Gln Gly His Val Lys Arg
                405                 410                 415

Leu Gln Pro Ile Glu Gln Tyr Pro Ile Pro Leu Pro Ser Arg Glu Pro
            420                 425                 430

Tyr Glu Gly Gln Pro His Leu Ile Leu Gly Val Ser Phe Ala Leu Gln
        435                 440                 445

His Pro Val Thr Leu Ala Val Val Asn Leu Gln Ser Lys Gln Ser Leu
    450                 455                 460

Tyr Tyr Arg Ser Thr Arg Gln Leu Leu Lys Thr Thr Asp Ala Lys Thr
465                 470                 475                 480

Asp Gln Ser His Leu Leu Arg Arg Arg Lys Thr Gln Gln Gln Arg His
                485                 490                 495

Ser Tyr Glu Arg His Lys Ala Leu Lys Arg Glu Gln Tyr Ala Pro Tyr
            500                 505                 510

Gln Glu Ala Asn Leu Gly Thr Tyr Leu Asn Gln Val Leu Ala Lys Arg
        515                 520                 525

Val Val Asp Val Ala Tyr Gln Ala Gln Val Ser Ala Ile Val Leu Pro
    530                 535                 540

Glu Thr Lys Gly Leu Arg Asp Lys Leu Glu Ala Gln Leu Arg Ala Arg
545                 550                 555                 560
```

```
Ala Ala Thr Lys Ile Val Gly Ser Val Ala Ala Gln Lys Arg Tyr Ala
                565                 570                 575


Arg Ala Ala Ser Leu Arg Leu His His Trp Ser Tyr Asn Gln Leu Ala
            580                 585                 590


Glu Leu Ile Lys Ser Lys Ala Ala Lys Leu Gly Ile Pro Ile Glu Ile
        595                 600                 605


Val Pro Ala Leu Val Ala Asp Ser Pro Gln Glu Ile Ala Arg Asn Ile
    610                 615                 620


Ala Leu Ser Ala Tyr Tyr Arg Arg Gln Ala Ala Ala Lys
625                 630                 635


<210>  541
<211>  393
<212>  PRT
<213>  Euhalothece sp. KZN 001

<400>  541

Met Thr Gly Glu Gln Trp Leu Glu Thr Leu Ile Thr Ala Ala Asn Thr
1               5                   10                  15


Val Pro Lys Asp Lys Glu Glu Phe Lys Ser Trp Gln Asn Ile Leu Leu
            20                  25                  30


Thr Lys Pro Lys Ser Ile Pro Phe Pro Ile Ser Tyr Glu Thr Asn Glu
        35                  40                  45


Asp Leu Thr Trp Ser Lys Asn Glu Lys Gly Arg Ile Cys Val Lys Phe
    50                  55                  60


Ser Gly Leu Gly Asp Tyr Thr Phe Gln Ile Tyr Cys Asp Gln Arg Gln
65                  70                  75                  80


Leu Lys Trp Phe Gln Arg Phe Tyr Glu Asp Gln Glu Thr Lys Arg Ala
                85                  90                  95
```

```
Ser Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu Arg Ser Ala Arg
            100                 105                 110

Ile Leu Trp Gln Glu Gly Thr Ala Lys Gly Gln Ala Trp His Arg Asn
        115                 120                 125

Tyr Ile Thr Leu Tyr Cys Thr Val Asp Thr Arg Leu Trp Thr Ala Glu
    130                 135                 140

Gly Thr Glu Gln Ile Lys Glu Glu Lys Ala Glu Glu Val Ala Arg Ile
145                 150                 155                 160

Leu Thr Asn Met Lys Asp Lys Gly Asp Leu Thr Lys Thr Gln Glu Ala
                165                 170                 175

Phe Ile Lys Arg Lys Gln Thr Thr Leu Asp Arg Leu Asn Asn Ser Tyr
            180                 185                 190

Pro Arg Pro Ser Lys Pro Leu Tyr Gln Gly Gln Ser His Leu Leu Leu
        195                 200                 205

Gly Val Ala Phe Gly Leu Glu Lys Pro Ala Thr Ile Ala Ile Ile Asn
    210                 215                 220

Gly Ser Thr Gly Lys Ala Ile Thr Tyr Arg Ser Ile Lys Gln Leu Leu
225                 230                 235                 240

Gly Glu Asn Tyr Lys Leu Leu Asn Arg His Arg Lys Gln Lys Gln Val
                245                 250                 255

Gln Ser His Gln Arg His Lys Asn Gln Lys Lys Phe Ala Pro Asn Gln
            260                 265                 270

Leu Lys Asn Ser Glu Leu Gly Glu Tyr Ile Asp His Leu Ile Ala Lys
        275                 280                 285

Ala Ile Val Asn Ile Ala Gln Glu Tyr Lys Val Gly Ser Ile Val Ile
```

290 295 300

Pro Lys Leu Glu Asn Ile Arg Glu Leu Ile Gln Ser Glu Val Lys Met
305 310 315 320

Arg Ala Glu Lys Lys Val Pro Gly Tyr Leu Glu Gly Gln Lys Lys Tyr
325 330 335

Ala Lys Gln Tyr Arg Ile Glu Val His Gln Trp Ser Tyr Gly Arg Leu
340 345 350

Ile Glu Thr Thr Lys Ser Lys Ala Asn Gln Gly Gly Ile Pro Ile Glu
355 360 365

Gln Ser Lys Gln Pro Ile Arg Gly Ser Pro Gln Glu Glu Ala Lys Glu
370 375 380

Ile Ala Ile Leu Ala Asp Gln Ala Arg
385 390

<210> 542
<211> 753
<212> PRT
<213> Geitlerinema sp. PCC 7407

<400> 542

Met Pro Ile Ile Thr Val Glu Cys Leu Leu Ala Ala Ser Glu Glu Thr
1 5 10 15

Arg Gln Tyr Val Trp Ser Leu Met Val Gln His Ala Val Leu Val Arg
20 25 30

Glu Leu Leu Glu Arg Ala Ala Gln His Pro Asp Phe Glu Arg Trp Gln
35 40 45

Ser Ala Gly Asn Leu Pro Ala Lys Ala Val Glu Arg Leu Ala Lys Glu
50 55 60

```
Ser Ser Asn Glu Glu Pro Pro Leu Leu Leu Glu Pro Arg Phe Ser Gln
65                  70                  75                  80

Leu Pro Asp Arg Phe Tyr Lys Ser Ala Ile Ser Thr Val Gln Thr Thr
                85                  90                  95

Tyr Lys Ser Trp Leu Ala Leu Gln His Gly Arg Gln Gln Gln Arg Asn
            100                 105                 110

Arg Lys Gln Leu Trp Leu Asp Ile Val Glu Asp Asp Leu Leu Thr Glu
        115                 120                 125

Tyr Asp Glu Ser Gln Leu Asp Ser Ile Ile Lys Lys Ala His Glu Ile
    130                 135                 140

Leu Ser Gln Leu Leu Ser Glu Met Lys Lys Glu Ala Asn Glu Thr Ser
145                 150                 155                 160

Glu Asp Lys Lys Val Arg Arg Lys Lys Ala Thr Lys Lys Lys Asp Lys
                165                 170                 175

Ala Gln Thr Asp Ser Glu Glu Met Gln Glu Glu Arg Lys Phe Ile Ser
            180                 185                 190

Ile Tyr Lys Leu Asn Lys Leu Tyr Asn Ser Ser Thr Asp Ala Val Thr
        195                 200                 205

Arg Arg Ala Ile Ala His Leu Val Arg Asn His Ser Gln Val Asn Glu
    210                 215                 220

Glu Glu Asp Pro Asp Lys Ile Pro Leu Glu Ile Glu Lys Thr Arg Ile
225                 230                 235                 240

Glu Ile Glu Arg Leu Asp Gln Gln Leu Lys Ser Gln Leu Pro Lys Gly
                245                 250                 255

Arg Asp Pro Phe Gly Thr Gln Tyr Gln Lys Asn Leu Glu Phe Ala Thr
            260                 265                 270
```

```
Glu Leu Pro Ser Lys Leu Ser Thr Ser Glu Glu Asp Val Ser Glu Phe
        275                 280                 285

Ile Lys Trp Asn Ala Glu Glu Gly Gln Arg Arg Ile Ala Val Met Arg
    290                 295                 300

Leu Pro Lys Ser Leu Pro Tyr Pro Ile Ser Phe Gly Ser Asn Thr Asp
305                 310                 315                 320

Leu Arg Trp Phe Gln Glu Thr Gln Glu Arg Lys Thr Leu Lys Gly Lys
                325                 330                 335

Lys Thr Asn Lys Pro Arg Asn Gln Ile Ile Val Arg Phe Gln Gly Leu
            340                 345                 350

Lys Asn His Ser Phe Lys Ile Leu Cys Asp Arg Arg Gln Leu Pro His
        355                 360                 365

Phe Gln Gln Phe Val Thr Asp Trp Lys Thr Tyr Gln Glu Leu Asp Arg
    370                 375                 380

Lys Gly Lys Ala Asp Ser Glu Lys Cys Ser Ala Ser Leu Phe Leu Leu
385                 390                 395                 400

Arg Ser Ala Arg Leu Ile Trp Arg Glu Asp Asn Arg Val Pro Pro Lys
                405                 410                 415

Ser Leu Arg Lys Lys Lys Gly Lys Gln Lys Asn Asn Ala Val Val Ala
            420                 425                 430

Ser Gly Lys Asn Val Gly Ser Ser Ser Asp Asn Arg Lys Thr Glu Pro
        435                 440                 445

Trp Asn Thr His Arg Leu Tyr Leu Gln Cys Ser Ile Asp Thr Arg Leu
    450                 455                 460
```

```
Leu Thr Ala Glu Gly Thr Glu Glu Val Arg Gln Glu Glu Ile Gly Gln
465                 470                 475                 480

Ile Ile Lys Gln Leu Glu Gly Asp Ser Lys Asp Ser Arg Lys Lys Lys
                485                 490                 495

Ala Val Thr Asp Asn Gln Glu Leu Thr Ala Gly Gln Met Ala Asp Arg
            500                 505                 510

Lys Arg Lys Ser Ser Thr Leu Thr Arg Leu Asn Asn Lys Ser Ala Phe
        515                 520                 525

Ser Arg Pro Ser Lys Lys Pro Tyr Gln Gly Gln Pro Asp Ile Val Val
    530                 535                 540

Gly Val Ser Phe Ser Arg His Lys Pro Ala Thr Ala Val Val Trp Asp
545                 550                 555                 560

Ala Lys Glu Asp Lys Ile Leu Glu Thr Gln Thr Val Arg Gln Leu Leu
                565                 570                 575

Val Asp Arg Lys Val Gln Asp Lys Arg Gly Asn Gln Thr Ile Val Gln
            580                 585                 590

Leu Lys Phe Gln Gln Tyr Arg Leu Val Gly Arg His Gln Arg Leu Arg
        595                 600                 605

Arg Asn Arg Leu Arg Arg Arg Asn Gln Glu Arg Ser Arg Gly Met Tyr
    610                 615                 620

Gln Gln Ser Lys Ser Glu Thr Asn Leu Gly Leu Tyr Val Asp Arg Leu
625                 630                 635                 640

Leu Ala Ala Arg Ile Val Glu Leu Ala Ile Lys Trp Lys Ala Gly Ser
                645                 650                 655

Ile Thr Leu Pro Lys Ile Glu Asn Ile Arg Glu Ser Val Glu Ser Glu
            660                 665                 670
```

```
Ile Arg Ala Arg Ala Glu Lys Lys Phe Pro Gly Leu Lys Glu Ala Gln
        675                 680                 685

Asp Lys Tyr Ala Lys Glu Phe Arg Ile Ser Phe His Gln Trp Ser Tyr
    690                 695                 700

Gly Arg Leu Asp Thr Ala Ile Arg Ser Lys Ala Ala Arg Val Gly Val
705                 710                 715                 720

Leu Ile Glu Thr Ala Trp Gln Pro Val Ser Gly Asp Leu Gln Asp Lys
                725                 730                 735

Ala Lys Asp Leu Ala Gln Ala Ala Tyr Tyr Thr Arg Glu Ser Ala Glu
            740                 745                 750

Arg
```

<210> 543
<211> 407
<212> PRT
<213> Richelia intracellularis

<400> 543

```
Met Thr Cys Cys Ser Ile Val Tyr Leu Leu Lys Asn Asn Cys Gln Val
1               5                   10                  15

Ser Leu Leu Glu Glu Glu Pro Asp Glu Tyr Ala Lys Leu Arg Arg Lys
            20                  25                  30

Lys Glu Ile Glu Ile Glu Arg Leu Lys Glu Gln Leu Lys Ser His Ile
        35                  40                  45

Pro Lys Gly Arg Asp Leu Thr Gly Leu Glu Trp Ser Asp Ile Leu Glu
    50                  55                  60

Lys Ile Ala Asn Ser Thr Pro Gln Thr Glu Asn Glu Ala Lys Leu Trp
```

```
65                  70                  75                  80

Gln Ala Ser Leu Leu Arg Lys Ser Arg Ser Val Pro Phe Pro Val Ala
                85                  90                  95

Tyr Glu Thr Ser Glu Asp Met Tyr Trp Glu Ile Asn Glu Gln Gly Arg
            100                 105                 110

Val Phe Val Arg Phe Asn Gly Leu Ser Lys Leu Lys Phe Glu Val Tyr
        115                 120                 125

Cys Asp Gln Arg His Val His Trp Phe Arg Gly Phe Val Glu Asp Trp
    130                 135                 140

Glu Thr Lys His Lys Gly Lys Asn Gln His Ser Ser Ser Leu Phe Thr
145                 150                 155                 160

Leu Arg Ser Gly Arg Leu Val Trp Leu Glu Gln Lys Ala Lys Gly Glu
                165                 170                 175

Pro Trp Asn Val Asn Arg Leu Ile Leu His Cys Ser Leu Asp Thr Arg
            180                 185                 190

Met Trp Ser His Glu Gly Thr Gln Gln Val Ile Asn Glu Lys Ile Val
        195                 200                 205

Lys Ile Glu Asn Thr Leu Thr Lys Val Lys Asp Lys Gly Glu Leu Asn
    210                 215                 220

Pro Lys Gln Gln Ala Phe Val Thr Arg Gln Lys Ser Thr Leu Ala Arg
225                 230                 235                 240

Ile Asn Thr Pro Phe Pro Arg Pro Ser Arg Thr Leu Tyr Gln Gly Lys
                245                 250                 255

Ser His Ile Leu Val Gly Val Ser Leu Gly Leu Glu Lys Phe Ala Thr
            260                 265                 270
```

```
Val Ala Val Leu Asp Ala Ile Gln Asn Lys Val Leu Ala Tyr Cys Ser
        275                 280                 285


Val Lys Gln Leu Leu Gly Asn Asn Tyr Lys Leu Leu Asn Arg Gln Arg
    290                 295                 300


Tyr Gln Lys Gln Arg Leu Ser Gln Glu Pro His Lys Thr Gln Lys Gln
305                 310                 315                 320


Phe Thr Pro Lys Asn Phe Gly Glu Ser Glu Leu Gly Gln Tyr Ile Asp
                325                 330                 335


Arg Leu Ile Ala Gln Lys Ile Val Ala Asn Ala Lys Thr Tyr His Ala
            340                 345                 350


Gly Ser Ile Val Leu Pro Lys Leu Gly Tyr Met Gly Glu Ile Ile Gln
        355                 360                 365


Ser Glu Val Gln Ala Lys Ala Glu Lys Lys Ile Pro Gly Tyr Leu Glu
    370                 375                 380


Gly Gln Gln Arg Tyr Ala Lys Glu Tyr Arg Lys Gln Val His Asn Trp
385                 390                 395                 400


Ser Tyr Gly Arg Leu Ile Glu
                405


<210>  544
<211>  807
<212>  PRT
<213>  Phormidesmis priestleyi

<400>  544

Met Val Ala Ser Lys Pro Lys Pro Leu Gly Asn Lys Lys Lys Pro Asp
1               5                   10                  15


Glu Leu Lys Lys Arg Gln Gln Pro Lys Glu Ser Trp Lys Thr Val Cys
            20                  25                  30
```

```
Cys Cys Leu Cys Ala Asp Glu Ser Thr Arg Lys Phe Leu Trp Glu Ala
        35                  40                  45

Met Glu Arg Tyr Thr Leu Leu Val Asn Leu Leu Ser Lys Gln Val Gly
    50                  55                  60

His Ala Pro Glu Phe Glu Gln Trp Lys Arg Gln Gly Trp Ile Ser Glu
65                  70                  75                  80

Lys Ala Val Val Ala Leu Cys Asn Ala Leu Lys Gln Glu Glu Gln Phe
                85                  90                  95

Lys Gly Leu Pro Ser Arg Phe Tyr Met Ser Ala Gln Ser Met Val Lys
            100                 105                 110

Asp Thr Phe Glu Gly Trp Val Lys Ser Gln Gln Arg Leu Ser Arg Lys
        115                 120                 125

Ile Ser Gly Lys Lys Arg Trp Leu Lys Ser Val Glu Glu Asp Ile Asp
    130                 135                 140

Leu Ala Lys Thr Thr Asp Phe Ser Pro Glu Val Ile Gln Asn Arg Ala
145                 150                 155                 160

Lys Glu Ile Leu Ser Glu Leu His His Gln Glu Thr Pro Ala Pro Gln
                165                 170                 175

Ser Ser Glu Ile Ser Asp Asp Ser Pro Asp Glu Ser Gln Gln Glu Asp
            180                 185                 190

Glu Asp Ser Asn Ser Gln Arg Ser Ile Leu Ser Leu Leu Phe Asp Arg
        195                 200                 205

Tyr Lys Val Thr Glu Asp Tyr Leu Ser Arg Arg Ala Val Val His Leu
    210                 215                 220
```

```
Leu Lys Asn Gly Cys Glu Val Asn Glu Glu Ile Glu Asp Pro Glu Lys
225                 230                 235                 240


Leu Gln Gln Arg Leu Ala Thr Lys Arg Glu Glu Ile Gln Arg Leu Glu
                245                 250                 255


Ala Gln Leu Ala Ser Arg Leu Pro Lys Gly Arg Asp Pro Thr Gly Glu
            260                 265                 270


Lys Ala Asn Asn Phe Leu Lys Glu Ala Ile Gln Phe Pro Lys His Arg
        275                 280                 285


Asn Cys Tyr Pro Glu Leu Phe Leu Phe Asp Ile Phe Tyr His Tyr Ala
    290                 295                 300


Leu Leu Pro Met Pro Ser Val Gln Tyr Ala Val Tyr Leu Leu Gln Ala
305                 310                 315                 320


Ile Leu Ile Glu Ser Asn Val Val Glu Ser Glu Phe Ser Ala Trp Gln
                325                 330                 335


Glu Ala Met Thr Glu Arg Leu Ser Asn Ala Ala Lys Ile Pro Asn Ser
            340                 345                 350


Leu Leu Tyr Pro Leu Ile Phe Gly Ser Thr Asp Asp Leu Tyr Trp Ser
        355                 360                 365


Phe Glu Ser Lys Glu Lys Asn Gln His Asp Ser Glu Leu Gly Lys Pro
    370                 375                 380


Cys Glu Gly Thr Lys Ser Arg Lys Arg Pro Ser Lys Arg Lys Arg Lys
385                 390                 395                 400


Gln Leu Lys Thr Arg Ser Glu Glu Arg Ile Tyr Val Arg Phe Lys Gly
                405                 410                 415


Leu Ser Asp Tyr Asn Phe Lys Ile Ala Cys Asp Arg Arg Gln Leu Pro
            420                 425                 430
```

```
Ile Phe Gln Met Phe Thr Arg Asp Trp Leu Ser Asn Lys Lys Leu Asp
        435                 440                 445

Lys Glu Lys Lys Ser Ser Leu Gly Leu Phe Ala Leu Arg Ser Ala Lys
    450                 455                 460

Leu Ile Trp Gln Glu Asp Lys Gln Leu Leu His Lys Lys Gly Lys Ser
465                 470                 475                 480

Lys Gln Ala Ser Ser Glu Glu Leu Asp Thr Ser Ser Gln Glu Ser Ile
                485                 490                 495

Pro Arg Trp Lys Thr His Arg Leu Tyr Leu His Cys Ser Ile Asp Ser
            500                 505                 510

Asp Leu Leu Thr Ala Glu Gly Ile Glu Lys Val Gln Pro Arg Lys Ile
        515                 520                 525

Ser Glu Thr Ser Lys Asn Leu Asp Asn Ala Arg Lys Lys Glu Gln Glu
    530                 535                 540

Leu Leu Ala Gln Val Ser Asn Ser Asn Leu Thr Glu Gln Asp Lys Gln
545                 550                 555                 560

Glu Leu Glu Asn Glu Leu Ile Lys Lys Arg Lys Lys Ile Leu Ser Cys
                565                 570                 575

Lys Thr Ser Leu Val Gln Leu Asn Asn Pro Pro Pro Arg Pro Ser Lys
            580                 585                 590

Val Pro Tyr Gln Gly Glu Ala Asn Ile Thr Leu Gly Val Ser Phe Cys
        595                 600                 605

Arg Gln Glu Leu Val Gly Val Ala Val Val Asp Leu Gln Thr Gln Gln
    610                 615                 620
```

```
Val Leu Glu Tyr Tyr Ser Ile Arg Lys Leu Leu Thr Asn Gln Arg Val
625                 630                 635                 640


Lys Lys Ser Arg Arg Asn Arg Ser Leu Leu Gln Leu Gln Leu Glu Lys
                645                 650                 655


Tyr Arg Leu Val Asn Arg Leu Arg Lys Leu Arg Arg His Asn Leu Val
            660                 665                 670


Asp Arg Gln Glu Glu Gln Lys Gln Ala Arg Tyr Val Glu Ser Lys Ala
        675                 680                 685


Glu Ser Asn Leu Gly Gln Tyr Leu Glu Arg Val Ile Ala Ala Lys Ile
    690                 695                 700


Ala Gln Val Ala Leu Glu Trp Lys Ala Ser Ser Val Val Ile Pro Asn
705                 710                 715                 720


Leu Gly Asp Met Gly Glu Tyr Ile Glu Ser Ala Val Gln Ala Arg Ala
                725                 730                 735


Lys Gln Leu Phe Pro Asn His Arg Glu Arg Gln Lys Asn Tyr Ala Lys
            740                 745                 750


Gln Phe Arg Val Gly Gly His Arg Trp Ser Tyr Arg Arg Leu Thr Glu
        755                 760                 765


Phe Ile His Ser Arg Thr Leu Ser Glu Gly Ile Ser Ile Lys Ala Gly
    770                 775                 780


Arg Gln Pro Ala Thr Gly Ser Leu Ala Asn Lys Ala Leu Lys Thr Ala
785                 790                 795                 800


Leu Ser Gly His Asn Phe Val
                805
```

<210> 545
<211> 668

<212> PRT
<213> filamentous cyanobacterium CCP4

<400> 545

Met Val Thr Tyr Thr Ala Leu Val Asn Glu Leu Leu Glu Leu Val Ser
1 5 10 15

Gln His Pro Lys Phe Glu Val Trp Arg Gln Gln Gly Lys Ile Thr Arg
20 25 30

Asp Glu Val Lys Ser Ile Leu Arg Pro Leu Lys Gln Asn Ser Val Tyr
35 40 45

Ala Ala Leu Pro Gly Arg Phe Phe Thr Ser Ala Glu Leu Met Val Thr
50 55 60

Tyr Ala Phe Lys Ser Trp Leu Ala Leu Gln Lys His Arg His His Gln
65 70 75 80

Met Val Gly Lys Leu Arg Trp Leu Gln Val Ile Glu Ala Asp Leu Gln
85 90 95

Ala Met Pro Thr Ser Asp Leu Ser Leu Glu Val Val Gln Ala Arg Ala
100 105 110

Gln Gln Val Leu Glu His Ala Glu Gln Ser Thr Asp Thr Gln Gln Gly
115 120 125

Arg Ser Ser Phe Leu Ser Arg Lys Gly Lys Arg Arg Gly Asn Pro Leu
130 135 140

Met Gly Phe Leu Leu Asp Ala Tyr Glu Ala Ala Ser Asp Glu Leu Glu
145 150 155 160

Arg Arg Ala Ile Cys Tyr Leu Leu Arg Asn Asp Leu Lys Val Val Glu
165 170 175

Glu Asp Glu Asn Pro Glu Val Ile Gln Phe Arg Ile Asp Arg Lys Arg

```
            180                 185                 190

Ile Glu Val Glu Arg Leu Gln Asp Gln Leu Gln Ser Arg Leu Pro Lys
        195                 200                 205

Gly Arg Asp Pro Thr Asp Glu Arg Tyr Leu Glu Ala Leu Gly Ala Ala
    210                 215                 220

Ile Ala Leu Pro Asp Val Asp Leu Ser Pro Ile Asp Glu Glu Asp Trp
225                 230                 235                 240

Ser Gln Trp Lys Ala Gln Lys Gln Leu Pro Leu Leu Asn Pro Leu Pro
                245                 250                 255

Tyr Pro Ile Leu Trp Gly Ser Ser Ser Asp Leu Arg Trp Ser Ile Ile
            260                 265                 270

Ala Asn Ser Glu Ala Asp Gly Gln Pro Ser Lys Arg Arg Lys Ser Ser
        275                 280                 285

Lys Arg Pro Lys Glu Lys Ile Gln Val Gln Phe Asn Gly Leu Gly Lys
    290                 295                 300

His Thr Met Ser Ile Gln Cys Asp Arg Arg Gln Leu Pro Val Phe Lys
305                 310                 315                 320

Gln Phe Ala Glu Asp Tyr Ile Thr His Glu Ser Thr Ala Glu Glu Asp
                325                 330                 335

Lys Phe Gly Met Ser Leu Phe Ala Leu Arg Ser Ala Cys Leu Val Trp
            340                 345                 350

Lys Lys Asp Pro Gln Ala Ala Val Lys Arg Arg Lys His Lys Gln Lys
        355                 360                 365

Ala Lys Ala Gln Leu Asp Lys Ile Thr Asp Tyr Asp Ala Pro Trp Gln
    370                 375                 380
```

```
Thr His Arg Leu Tyr Leu His Cys Thr Val Asp Thr Arg Leu Ile Thr
385                 390                 395                 400

Lys Glu Gly Ser Glu Gln Val Arg Arg Glu Lys Ala Ser Arg Ala Glu
                405                 410                 415

Lys Leu Val Ala Ala Ser Val Gly Lys Glu Leu Thr Lys Thr Gln Gln
            420                 425                 430

Lys Asn Leu Lys Ser Asn Lys Thr Ser Val Glu Arg Leu Arg Arg Gln
        435                 440                 445

Pro Pro Glu Arg Pro Ser Ala Asn Leu Tyr His Gly Asn Pro Asp Ile
    450                 455                 460

Val Val Gly Ile Ser Leu Ser Arg His Glu Pro Val Thr Ala Val Val
465                 470                 475                 480

Leu Asp Arg Ser Thr Asp Arg Ala Leu Ala Cys Gln Arg Thr Lys Ala
                485                 490                 495

Leu Leu Lys Val Arg Ser Ile Lys Lys Thr Tyr Pro Asn Arg Ser Leu
            500                 505                 510

Leu Gln Arg Gln Lys Glu Gln Cys Arg Leu Val Asn Arg Trp Arg Ser
        515                 520                 525

Gln Arg Arg Tyr Asn Leu Ser Gln Arg Pro Glu Asp Gln Lys His Asp
    530                 535                 540

Asn Tyr Arg Gln Gln Asp Ala Glu Ser Ala Leu Gly Asp Tyr Leu Asp
545                 550                 555                 560

Arg Leu Leu Ala Ala Arg Val Ile Gln Leu Ala Gln Lys Trp Gln Ala
                565                 570                 575

Gly Ser Ile Val Leu Pro Ser Leu Gly Asn Ile Arg Glu Ile Val Glu
```

```
            580                 585                 590

Ser Ser Val Gln Ala Glu Ala Glu Arg Arg Tyr Pro Lys His Lys Glu
        595                 600                 605

Leu Gln Asp Lys Tyr Ala Lys Gln Tyr Arg Leu Glu Phe His Arg Trp
    610                 615                 620

Ser Tyr Gly Arg Leu Leu Lys Tyr Leu Lys Glu Cys Ala Arg Gln His
625                 630                 635                 640

Gly Leu Thr Ile Arg Gln Glu Arg Gln Pro Lys Gln Gly Ser Glu Gln
                645                 650                 655

Glu Lys Ala Leu Ala Leu Ile Ala Ser Ala Phe Leu
            660                 665


<210>  546
<211>  655
<212>  PRT
<213>  Nostoc flagelliforme

<400>  546

Met Ser Ser Asn Ser Lys Lys Asp Ser Asn Ser Gln Ile Leu Arg Thr
1               5                   10                  15

Ile Arg Cys Asp Leu Tyr Thr Ser Glu Asp Val Leu Arg Lys Val Trp
            20                  25                  30

Glu Glu Met Thr Glu Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Lys
        35                  40                  45

Thr Val Ser Glu Gln Pro Glu Phe Glu Ala Asn Lys Glu Ser Gly Lys
    50                  55                  60

Ile Thr Lys Lys Glu Ile Thr Gly Leu Arg Lys Ser Leu Thr Glu Asp
65                  70                  75                  80
```

```
Ser Gly Arg Pro Tyr Ser Ser Val Asp Asn Leu Val Lys Gln Val Tyr
                85                  90                  95

Ser Ser Trp Leu Thr Leu Tyr Gln Lys Arg Lys Gln Gln Lys Glu Gly
            100                 105                 110

Lys Glu Tyr Phe Leu Thr His Ile Leu Lys Ser Asp Ile Glu Leu Val
        115                 120                 125

Glu Glu Ser Asn Cys Asp Leu Ser Thr Ile Arg Ser Lys Ala Gln Glu
    130                 135                 140

Ile Ile Arg Lys Pro Glu Glu Phe Leu Asn Glu Ile Asn Pro Lys Asp
145                 150                 155                 160

Thr Asn Asn Arg Gln Arg Lys Ser Ser Gln Lys Gly Arg Lys Lys Gln
                165                 170                 175

His Lys Ser Lys Glu Glu Asn Lys Asn Phe Glu Asn Ser Asn Thr Glu
            180                 185                 190

Ala Ser Leu Thr Lys Asp Asp Ser Lys Ser Leu Thr Asp Thr Leu Tyr
        195                 200                 205

Lys Ile His Arg Glu Thr Lys Asn Ile Leu Thr Arg Cys Ala Val Ala
    210                 215                 220

Tyr Leu Ile Lys Asn Asp Glu Lys Ile Ser Asn Leu Glu Glu Glu Asn
225                 230                 235                 240

Thr Lys Ser Leu Glu Lys Arg Arg Thr Glu Lys Glu Val Glu Ile Lys
                245                 250                 255

Arg Leu Glu Lys Gln Ile Gln Asn Thr Arg Leu Pro Asn Gly Arg Asp
            260                 265                 270

Ile Thr Gly Asp Thr Tyr Thr Lys Ala Phe Asp Asn Leu Ile Asn Gln
        275                 280                 285
```

```
Val Pro Lys Asp Asn Asp Glu Cys Ala Ile Trp Ile Ala Asn Leu Leu
    290                 295                 300

Asn Lys Ile Ser Ser Leu Pro Tyr Pro Ile His Tyr Val Tyr Ser Asp
305                 310                 315                 320

Leu Thr Trp Tyr Lys Thr Glu Glu Gly Asn Ile Met Val Tyr Phe Asn
                325                 330                 335

Gly Trp Lys Asp Tyr Lys Phe Gln Ile Cys Cys Asn Gln Arg Gln Leu
            340                 345                 350

His Leu Phe Glu Arg Phe Leu Glu Asp His Lys Val Phe Lys Lys Ser
        355                 360                 365

Glu Lys Ser Gly Glu Lys Leu Ser Ala Ser Leu Phe Thr Leu Arg Ser
    370                 375                 380

Val Gln Leu Leu Trp Gln Gln Lys Glu Pro Asn Lys Val Arg Leu Arg
385                 390                 395                 400

Arg Lys Asp Lys Ser Glu Lys Val Lys Leu Lys Tyr Ala Ser Pro Ser
                405                 410                 415

Pro Lys Pro Lys Ser Gln Asn Thr Thr Glu Val Lys Asn Ser Asp Pro
            420                 425                 430

Asn Arg Ile Glu Ser Glu Pro Trp Lys Val Tyr Lys Leu Ala Leu His
        435                 440                 445

Cys Thr Tyr Asp Ala Arg Leu Trp Thr Ala Glu Gly Thr Glu Glu Ala
    450                 455                 460

Arg Lys Gln Asn Val Asp Lys Thr Gln Lys Gln Ile Asn Gln Ala Glu
465                 470                 475                 480
```

```
Glu Asn Glu Asn Leu Asp Glu Gln Gln Gln Lys Gln Leu Lys Lys Asn
                485                 490                 495

Lys Ser Ser Leu Ser Arg Leu Asn Asn Ser Phe Leu Arg Pro Ser Lys
            500                 505                 510

Pro Ile Tyr Gln Gly Gln Ser Asn Ile Ile Val Gly Val Ser Phe His
        515                 520                 525

Pro Val Glu Leu Val Thr Leu Ala Val Val Asp Ile Asn Thr Lys Glu
    530                 535                 540

Phe Ile Leu Asn Lys Thr Ala Lys Gln Leu Leu Gly Asp Ser Ser Tyr
545                 550                 555                 560

Leu Leu Ser Arg Arg Arg Arg Gln Gln Val His Phe Arg Lys Lys Arg
                565                 570                 575

Glu Gln Ala Gln Lys Lys Asp Ser Pro Cys Asn Ile Gly Glu Ser Gln
            580                 585                 590

Leu Gly Glu Tyr Val Asp Lys Leu Leu Ala Lys Arg Ile Val Gly Val
        595                 600                 605

Ala Lys Gln Tyr Gln Ala Ser Ser Ile Val Leu Leu Arg Ser Lys Asn
    610                 615                 620

Ile Thr Glu Ile Arg Thr Ser Ile Ile Gln Ala Lys Ala Gln Thr Lys
625                 630                 635                 640

Phe Gln Gly Gly Arg Ile Met Ser Ile Ser Asn Thr Tyr Ser Gln
                645                 650                 655
```

<210> 547
<211> 755
<212> PRT
<213> filamentous cyanobacterium CCP2

<400> 547

```
Met Val Lys Tyr Thr Leu Leu Val Asn Arg Leu Leu Glu Gln Val Gly
1               5                  10                  15

Gln Leu Ser Glu Phe Lys Gln Trp Gln Glu Lys Gly Ser Ile Ser Lys
            20                  25                  30

Glu Pro Val Lys Gln Leu Cys Asp Ala Leu Lys Lys His His Ala Glu
        35                  40                  45

Phe Gln Gly Leu Pro His Arg Phe Tyr Ile Ser Ala Lys Leu Met Val
    50                  55                  60

Thr Tyr Thr Phe Glu Ser Trp Leu Ala Leu Gln Gln Arg Arg Arg Arg
65                  70                  75                  80

Lys Ile Asp Gly Lys Arg Arg Trp Leu Asn Arg Val Glu Asp Asp Ile
                85                  90                  95

Glu Leu Ala Lys Val Thr Asp Phe Ser Pro Glu Met Ile Gln Asn Arg
            100                 105                 110

Ala Arg Lys Ile Leu Ala Glu Ile His Pro Ser Asn Pro Val Glu Pro
        115                 120                 125

Glu Pro Glu Thr Ser Ser Asp Asn Glu Ile Asn Glu Gly Glu Asn Cys
    130                 135                 140

Gln Glu Glu Glu Glu Met Asn Gln Pro Lys Ser Leu Leu Ser Cys Leu
145                 150                 155                 160

Phe Asp Leu Tyr Asp Ser Thr Glu Asp Ala Leu Thr Leu Arg Ala Ile
                165                 170                 175

Val His Leu Leu Lys Asn Asn Gly Glu Val Asn Glu Glu Asp Glu Asp
            180                 185                 190

Pro Lys Lys Leu Glu Leu Arg Leu Ala Ala Lys Arg Glu Glu Ile Gln
```

```
        195                 200                 205

Arg Leu Glu Lys Gln Leu Gln Gly Arg Leu Pro Lys Gly Arg Asp Pro
    210                 215                 220

Thr Gly Glu Thr Thr Thr Arg Phe Leu Glu Glu Ala Ile Lys Leu Pro
225                 230                 235                 240

Glu His Pro Thr Ala Tyr Pro Pro Arg Phe Leu Leu Asn Ala Phe Tyr
                245                 250                 255

Cys Tyr Ala Leu Leu Pro Met Pro Tyr Ile Gln Tyr Gly Val Tyr Leu
            260                 265                 270

Leu Asn Ala Ile Leu Asp Glu Ala Arg Ile Val Glu Ser Asp Phe Ile
        275                 280                 285

Thr Trp Arg Asp Thr Ile Ala Glu His Leu Val Asn Ala Ala Lys Arg
    290                 295                 300

Pro Asn Ser Leu Pro Tyr Pro Leu Ile Phe Gly Ser Thr Ser Asp Leu
305                 310                 315                 320

Val Trp Glu Ser Glu Ser Lys Arg Lys Gly Pro Asn Ala Pro Asp Thr
                325                 330                 335

Glu Gly Ala Leu Glu Gln Ser Gly Ala Lys Ser Ser Arg Lys Arg Pro
            340                 345                 350

Ser Lys Arg Lys Arg Thr Arg Leu Lys Thr Gln Ser Asp Glu Arg Ile
        355                 360                 365

Thr Val Arg Phe His Gly Met Ser Gln Tyr Arg Phe Lys Ile Tyr Cys
    370                 375                 380

Asp Arg Arg Gln Leu Pro Ile Phe Arg Gln Phe Leu Thr Asp Tyr Cys
385                 390                 395                 400
```

```
Thr His Lys Ala Leu Asp Glu Glu Asn Lys Phe Ser Met Gly Leu Phe
                405                 410                 415

Ala Leu Arg Ser Ala Ser Leu Ile Trp Lys Lys Asp Lys Gln Arg Pro
            420                 425                 430

His Lys Arg Asn Ser Ser Glu Pro Val Glu Pro Leu Ser Pro Trp Gln
        435                 440                 445

Thr His Arg Leu Tyr Leu His Cys Ser Ile Asp Ser Arg Leu Leu Thr
    450                 455                 460

Ala Glu Gly Thr Glu Gln Val Arg Phe Gln Lys Ile Leu Gln Thr Lys
465                 470                 475                 480

Arg Lys Leu Glu Gly Ala Lys Asn Lys Glu Gln Glu Ile Leu Arg Gln
                485                 490                 495

Lys Ser Glu Arg Gln His Thr Glu Ser Glu Gln Asp Leu Asp Asp Lys
            500                 505                 510

Leu Lys Lys Gln Arg Gln Asn Val Ala Arg Asn Gln Thr Ser Leu Asn
        515                 520                 525

Cys Leu Tyr Asn Pro Thr Pro Pro Arg Pro Ser Arg Val Arg Tyr Gln
    530                 535                 540

Gly Asn Pro Asn Ile Ala Ile Gly Val Ser Phe Cys Arg Gln Gln Leu
545                 550                 555                 560

Val Gly Val Gly Val Ile Asp Leu Gln Thr Gln Gln Val Gln Glu Tyr
                565                 570                 575

Tyr Ser Ile Arg Arg Leu Leu Ile Asn Arg Lys Val Thr Gln Val Lys
            580                 585                 590

Arg Gly Arg Ser Val Leu Gln Leu Lys Leu Lys Lys Tyr Arg Leu Val
```

595 600 605

Asn Gln Leu Cys Met Trp Lys Lys Lys Asn Ile Thr Gln Arg Thr Gln
610 615 620

Gln Gln Lys Gln Gly Leu Cys Ile Gln Asn Thr Thr Glu Ser Asn Leu
625 630 635 640

Arg Gln Tyr Leu Glu Arg Leu Val Ala Asp Arg Ile Val Glu Val Ala
645 650 655

Leu Lys His Gln Ala Gly Ser Ile Val Thr Pro Gln Leu Gly Glu Ile
660 665 670

Arg Glu Ser Ile Glu Ser Ala Val Gln Ala Ile Ala Lys Gln Leu Phe
675 680 685

Glu Asn His Arg Glu Ala Gln Gln Ala Tyr Ala Lys Gln Phe Arg Met
690 695 700

Asp Phe His Arg Trp Ser Tyr Gly Arg Leu Thr Asp Cys Ile His Ser
705 710 715 720

Arg Ala Arg Gln Glu Gly Ile Leu Val Gln Ala Gly Arg Gln Pro Val
725 730 735

Glu Gly Asn Leu Val Gly Lys Ala Leu Thr Ile Ala Leu Ser Gly Arg
740 745 750

Asn Leu Val
755

<210> 548
<211> 726
<212> PRT
<213> Chamaesiphon minutus

<400> 548

```
Met Ser Leu Ile Thr Phe Pro Phe Arg Leu Asp Ala Leu Gly Lys Thr
1               5                  10                  15

Pro Lys Asp Arg Glu Gln Val Arg Arg Tyr Phe Trp Glu Leu Met Thr
            20                  25                  30

Gln Gln His Thr Pro Leu Ile Asn Arg Leu Asn Leu Leu Val Ala Glu
        35                  40                  45

His Pro Lys Phe Ala Asn Trp Gln Ile Lys Asn Thr Val Asp Ala Asp
    50                  55                  60

Asp Leu Leu Cys Leu Trp Arg Ser Leu Lys Lys Gln Pro Gln Phe Gln
65                  70                  75                  80

Gly Ile Pro Asp Arg Ala Cys Val Ser Ala Arg Leu Val Thr His Asn
                85                  90                  95

Thr Tyr Glu Ser Trp Leu Ala Leu Gln Ala Asp Arg Gln Glu Lys Leu
            100                 105                 110

Thr Lys Leu Leu Asn Ser Val Glu Ile Leu Lys Pro Asp Val Glu Leu
        115                 120                 125

Ile Ala Ile Gly Ser Cys Asn Leu Asp Val Ile Arg Asn Arg Ala Lys
    130                 135                 140

Glu Val Leu Ser Glu Val Asn Thr Gln Ile Ser Asn Asp Ser Glu Lys
145                 150                 155                 160

Lys Lys Ser Gln Lys Ala Ile Glu Gly Gly Ile Tyr Lys Ile Leu Tyr
                165                 170                 175

Asp Lys His Arg Lys Thr Asp Asp Leu Val Glu Lys Cys Ala Ile Ala
            180                 185                 190

Tyr Leu Ile Lys Asn Arg Phe Lys Ile Asn Ser Asp Glu Thr Glu Glu
        195                 200                 205
```

```
Asp Val Lys Lys Leu Asn Ala Arg Arg His Thr Lys Gln Lys Glu Ile
    210                 215                 220

Glu Ile Ile Gln Lys Gln Leu His Ser Arg Leu Pro Lys Gly Arg Pro
225                 230                 235                 240

Trp Ala Gly Arg Asp Ile Phe Gly Glu Ile Ala Ser Ile Asp Val Arg
                245                 250                 255

Glu Thr Glu Trp Asn Ser Ile Glu Ser Ala Leu Leu Lys Gln Gln Thr
            260                 265                 270

Phe Met Pro His Pro Ile Leu Phe Glu Ser Ser Asp Asp Leu Ile Trp
        275                 280                 285

Ala Glu Pro Glu Lys Phe Gln Leu Lys Asp Leu Gln Val Glu Ala Gly
    290                 295                 300

Lys Ser Gly Ser Thr Glu Leu Asp Glu Phe Gln Asn Glu Asn Phe Gln
305                 310                 315                 320

Gly Glu Gln Ala Asn Ser Val Glu Ser Arg Lys Arg Val Cys Val Gly
                325                 330                 335

Phe Lys Ser Phe Glu Glu Lys Tyr Ala Phe Glu Val Ala Gly Asp Tyr
            340                 345                 350

Arg His Ile His Ala Val Trp Gln Ala Leu Lys Glu Arg Lys Ile Tyr
        355                 360                 365

Asp Lys Asn Ile Asp Glu Asn Thr Ser Ala Leu Phe Leu Val Arg Ser
    370                 375                 380

Ala Thr Leu Ile Trp Arg Asp Tyr Lys Lys Asn Glu Asn Arg Ile Val
385                 390                 395                 400
```

```
Arg Arg Arg Lys Ala Asn Asn Lys Arg Ser Lys Arg Glu Gly Gly Thr
                405                 410                 415

Ala Gly Thr Lys Pro Asp Ser Leu Arg Ala Pro Ala Phe Tyr Asp Pro
            420                 425                 430

Glu Phe Pro Trp Asn Arg Tyr Gln Leu Phe Leu His Cys Thr Ile Glu
        435                 440                 445

Thr Leu Tyr Val Ser Lys Glu Gly Thr Glu Leu Lys Leu Glu Met Gln
    450                 455                 460

Lys Lys Pro Ile Thr Lys Ala Leu Gln Thr Leu Glu Lys Asn Ile Thr
465                 470                 475                 480

Glu Ser Glu Glu Lys Gly Glu Ser Thr Lys Asn Arg Lys Asp Arg His
                485                 490                 495

Ser Arg Gln Ser Gly Thr Leu Arg Arg Met Glu Cys Tyr Asp Asp Asn
            500                 505                 510

Tyr Glu Arg Pro Ser Lys Ser Leu Tyr Thr Gly Gln Pro His Ile Val
        515                 520                 525

Thr Gly Ile Ala Leu Gly Ala Ser Gly Leu Val Thr Ala Thr Ile Val
    530                 535                 540

Asp Thr Ser Ser Gly Lys Ile Leu Glu Cys Arg Gly Arg Lys Ala Leu
545                 550                 555                 560

Leu Gly Lys Gln Asp Arg Leu Val Asn Arg Arg Gln Phe Gln Arg Gln
                565                 570                 575

Leu Asn Met Arg Arg Arg Thr Gln Asn Gln Arg Arg Gly Ala Asn Asn
            580                 585                 590

Gln Phe Gly Glu Ala Asn Leu Gly Asp Thr Ile Asp Arg His Ile Ala
        595                 600                 605
```

```
Asn Ala Val Val Asp Phe Ala Lys Thr Tyr Gln Ser Gly Cys Ile Val
    610                 615                 620

Leu Pro Asp Met Glu Asp Tyr Arg Arg Arg Lys Gln Ser Glu Met Ala
625                 630                 635                 640

Ala Leu Ala Glu Arg Glu Cys Ser Gly Trp Lys Gly Val Glu Lys Lys
                645                 650                 655

Phe Ala Lys Ala Gln Asn Val Lys Ile His Ser Trp Ser Tyr Gly Arg
            660                 665                 670

Ser Ile Glu Tyr Ile Thr Asn Gln Ala Glu Lys Glu Gly Met Leu Val
        675                 680                 685

Lys Ile Gly Arg Gln Pro Ile His Gly Ser Ser Gln Glu Gln Ala Lys
    690                 695                 700

Gln Met Ala Ile Glu Val Tyr Gln Asp Lys Thr Lys Phe Lys Gln Ser
705                 710                 715                 720

Leu Ser Asn Gln Ser Ala
                725
```

<210> 549
<211> 813
<212> PRT
<213> filamentous cyanobacterium CCP2

<400> 549

```
Met Asn Glu Leu Glu Glu Gly Ala Gly Phe Asn Glu Thr Val Leu Cys
1               5                   10                  15

Lys Leu Gly Ala Asp Glu Lys Val Arg Gln Asp Phe Trp Gln Trp Ser
            20                  25                  30

Ile Lys His Thr Leu Leu Val Asn Glu Leu Leu Ile Gln Val Ser Gln
```

```
        35                  40                  45

His Lys Asp Phe Glu Gln Trp Lys Asn Ser Gly Thr Ile Thr Lys Lys
    50                  55                  60

Ala Val Val Glu Leu Gly Lys Pro Phe Lys Asp Pro Glu Arg Glu Gln
65                  70                  75                  80

Phe Ile Glu Leu Pro Tyr Arg Phe His Thr Ser Ala Thr Leu Leu Val
                85                  90                  95

Phe Tyr Ile Tyr Gln Ser Trp Leu Lys Leu His Gln Lys His Ser Tyr
            100                 105                 110

Lys Leu Gln Gly Lys Lys Lys Trp Leu Ala Val Leu Asp Asn Asp Leu
        115                 120                 125

Glu Val Ala Lys His Thr Asp Phe Ser Pro Gln Met Ile Gln Thr Gln
    130                 135                 140

Ala Ser Glu Ile Leu Ser Gln Ala Ser Ala Gln His Glu Lys Ser Gln
145                 150                 155                 160

Gln Lys Arg Lys Lys Lys Ser Ser Lys Lys Ser Gly Glu Thr Ser Lys
                165                 170                 175

Ser His Leu Ala Ile Met Thr Ile Leu Phe Asp Arg His Glu Gln Ser
            180                 185                 190

Gln Asp Leu Leu Glu Arg Arg Ala Ile Ala His Leu Leu Lys Asn Gly
        195                 200                 205

Cys Gln Val Asn Asp Ala Glu Glu Asp Leu Glu Ala Leu Lys Leu Arg
    210                 215                 220

Leu Glu Lys Lys Arg Ile Gln Ile Ala Arg Leu Glu Lys Gln Leu Glu
225                 230                 235                 240
```

```
Arg Arg Leu Pro Asp Gly Arg Asp Pro Thr Gly Glu Arg Phe Ala Ser
                245                 250                 255

Asn Leu Ala Gln Ala Ile Ala Phe Ala Asp His Leu Thr Phe Val Pro
            260                 265                 270

Ala Lys Phe Trp Ile Asn Trp Tyr Gln Val Leu Gln Arg Asn Pro Asn
        275                 280                 285

Asp Glu Ser Asp Leu Val Ile Pro Phe Leu Gly Tyr Val Tyr His Gln
    290                 295                 300

Gln Ala Gly Asp Ala Gly Phe Asp Ala Trp Glu Gln Gly Asp Ser Glu
305                 310                 315                 320

Arg Ala Ala Leu Val Ser Thr Leu Tyr Glu Thr Leu Pro Tyr Pro Ile
                325                 330                 335

Leu Phe Gly Ser Ala Gly Asp Val Tyr Trp Ser Leu Lys Gln Val Asp
            340                 345                 350

Pro Asn Pro Gly Thr Thr Arg Gln Lys Gln Gln Ser His Arg Thr Pro
        355                 360                 365

Lys Arg Arg Arg Lys Pro Lys His Lys Gln Lys Val Gln Glu Arg Leu
    370                 375                 380

Cys Val Arg Phe Lys Gly Glu Glu Leu Lys Asn His His Phe Gly Val
385                 390                 395                 400

Tyr Cys Asp Arg Arg Gln Leu Pro Val Phe Lys Gln Phe Leu Thr Asp
                405                 410                 415

Arg Glu Val Gln Lys Gln Arg Lys Asp Thr Glu Lys Phe Met Gly Gly
            420                 425                 430

Ile Phe Thr Leu Arg Ser Ala Arg Leu Val Trp Lys Glu Asp Thr Glu
```

```
        435                 440                 445

Arg Leu Gln Arg Lys Arg Ala Ser Thr Thr Ser Leu Leu Trp Leu Lys
    450                 455                 460

Phe Leu Phe Ala Met Gln Arg Glu Glu Thr Val Thr Asp Lys Glu Leu
465                 470                 475                 480

Asp Ser Trp Ile Ile Ser Phe Leu Cys Ile Asn Thr Ile Phe Pro Trp
                485                 490                 495

Gln Ser His Arg Leu Tyr Leu His Cys Thr Ile Asp Ser Arg Leu Leu
            500                 505                 510

Thr Ala Glu Gly Thr Lys Glu Val Ile Ala Gln Lys Thr Ala Ala Thr
        515                 520                 525

Gln Gln Tyr Leu Glu Gln Phe Lys Pro Glu Thr Ala Thr Pro Lys Pro
    530                 535                 540

Gln Ala Val Glu Arg Val Glu Glu Glu Arg Gln Thr Pro Gln Ala Arg
545                 550                 555                 560

Gly Gly Thr Thr Val Lys Lys Lys Glu Thr Thr Leu Ala Arg Ser Lys
                565                 570                 575

Asn Pro Pro Pro Ala Arg Pro Ser Arg Leu Leu Tyr Lys Gly Arg Ser
            580                 585                 590

Asp Ile Ala Ala Val Val Val Val Ser Arg Phe Ala Ile Val Ala Val
        595                 600                 605

Ala Ile Val Asn Thr Gln Thr Gln Glu Ile Leu Glu Phe Gln Lys Ile
    610                 615                 620

Lys Asp Leu Leu Thr Glu His Arg Ser Asp Val Leu Glu Glu Arg Leu
625                 630                 635                 640
```

```
Lys Lys His Gln Gly Met Leu Lys Gly Gly Arg Ser Leu Glu Gln Leu
                645                 650                 655

Gln Leu Gln Gln Tyr Arg Leu Val Lys Arg Trp Arg Lys His Arg Lys
            660                 665                 670

Lys Asn Leu Thr Gln Arg Gln Glu Glu Gln Lys Arg Gly Leu Tyr Lys
        675                 680                 685

Arg Ser Asn Gln Glu Ser Asn Leu Ala Gln Tyr Leu Asn Arg Leu Leu
    690                 695                 700

Ala Lys Arg Ile Val Gln Leu Cys Gln Thr Tyr Gln Val Gly Met Ile
705                 710                 715                 720

Val Leu Pro Glu Leu Gly Asn Ile Gly Glu Asn Phe Glu Cys Glu Ile
                725                 730                 735

Gln Ala Lys Ala Arg Gln Lys Phe Pro Gly Asp Asn Val Gln Leu Gln
            740                 745                 750

Lys Gln Tyr Leu Lys Glu Leu Arg Met Arg Met His Arg Trp Asn Tyr
        755                 760                 765

Lys Asn Leu Leu His Ala Ile Arg Gln Tyr Ala Thr Pro Ala Arg Ile
    770                 775                 780

Pro Val Thr Thr Arg Trp Gln Pro Lys Glu Gly Ala Leu Arg Asp Lys
785                 790                 795                 800

Ala Ala Val Met Ala Arg Ala Val Pro Pro Gly Val Pro
                805                 810
```

<210> 550
<211> 397
<212> PRT
<213> Geminocystis herdmanii

<400> 550

```
Met Gly Arg Asn Leu Thr Asn Asp Ser Trp Leu Glu Ile Leu Asn Phe
1               5                  10                  15

Val Ser Asp Thr Ile Pro Gln Thr Asp Glu Glu Ala Lys Gln Trp Gln
            20                  25                  30

Asp Gln Leu Leu Arg Gln Ser Lys Ser Val Pro Tyr Pro Val Met Phe
        35                  40                  45

Asn Thr Asn Glu Asp Leu Arg Trp Ser Lys Asn Lys Lys Gly Arg Leu
    50                  55                  60

Cys Val Thr Phe Asn Gly Leu Gly Lys Leu Val Phe Glu Ile Tyr Cys
65                  70                  75                  80

Asp Gln Arg Gln Leu Lys Trp Phe Glu Arg Phe Tyr Glu Asp Gln Glu
                85                  90                  95

Val Lys Arg Lys Gly Lys Asn Gln His Ser Ser Ser Leu Phe Thr Leu
            100                 105                 110

Arg Ser Gly Met Leu Leu Trp Gln Glu His Glu Gly Lys Gln Glu Pro
        115                 120                 125

Trp Gln Asn Asn His Leu Thr Leu Tyr Cys Ala Leu Asp Thr Cys Phe
    130                 135                 140

Glu Thr Ala Glu Gly Thr Glu Leu Val Arg Gln Lys Lys Val Lys Glu
145                 150                 155                 160

Val Val Asn Leu Ile Asp Ala Met Asn Asn Lys Ser Glu Arg Thr Lys
                165                 170                 175

Thr Gln Asp Ala Phe Ile Lys Arg Lys Gln Ser Thr Leu Ala Arg Leu
            180                 185                 190
```

```
Asp Asn Ser Phe Pro Arg Pro Ser Lys Pro Leu Tyr Gln Gly Asn Gln
        195                 200                 205

Asn Ile Val Val Ala Val Ser Met Ser Leu Glu Tyr Pro Ala Thr Ile
    210                 215                 220

Ala Val Phe Asn Met Ser Ser Gln Glu Val Leu Thr Tyr Arg Ser Thr
225                 230                 235                 240

Lys Gln Leu Leu Asp Asn Asn Tyr Gln Val Leu Asn Arg Gln Arg Lys
                245                 250                 255

Gln Lys Gln Arg Leu Ser His Gln Arg His Lys Thr Gln Arg Gln Asn
            260                 265                 270

Ser Ser Asp Phe Phe Thr Gln Gln Glu Ser Glu Leu Gly Gln Tyr Leu
        275                 280                 285

Asp Arg Leu Leu Ala Gln Ser Ile Val Ser Ile Ala Thr Gln Tyr Gln
    290                 295                 300

Ala Ser Thr Ile Leu Leu Pro Asn Leu Lys Asn Ile Arg Asp Ser Ile
305                 310                 315                 320

Gln Ala Glu Ile Glu Ala Lys Ala Glu Ala Lys Ile Pro Asn Cys Lys
                325                 330                 335

Glu Ala Gln Lys Lys Tyr Leu Lys Asn Tyr Arg Ile Asn Ile His His
            340                 345                 350

Trp Ser Tyr Gly Arg Leu Ile Asp Ser Ile Gln Leu Gln Ala Leu Lys
        355                 360                 365

Leu Asp Ile Leu Ile Gln Glu Val Lys Gln Pro Ile Arg Gly Ser Pro
    370                 375                 380

Gln Glu Lys Ala Lys Gln Met Ala Ile Leu Thr Leu Glu
385                 390                 395
```

<210> 551
<211> 397
<212> PRT
<213> Geminocystis sp. NIES-3708

<400> 551

Met Gly Arg Asn Leu Thr Asn Asp Ser Trp Leu Gly Met Leu Asn Leu
1 5 10 15

Val Ser Asn Thr Ile Pro Gln Thr Asp Glu Glu Ala Lys Gln Trp Gln
20 25 30

Asp Gln Leu Leu Arg Gln Ser Lys Ser Val Pro Tyr Pro Val Met Phe
35 40 45

Asn Thr Asn Glu Asp Leu Arg Trp Ser Lys Asn Lys Lys Gly Arg Leu
50 55 60

Cys Val Thr Phe Asn Gly Leu Gly Lys Leu Val Phe Glu Ile Tyr Cys
65 70 75 80

Asp Gln Gln Gln Leu Lys Trp Phe Glu Arg Phe Tyr Glu Asp Gln Glu
85 90 95

Val Lys Arg Lys Gly Lys Asn Gln His Ser Ser Ala Leu Phe Thr Leu
100 105 110

Arg Ser Gly Met Leu Leu Trp Gln Glu His Glu Gly Lys Gln Glu Ala
115 120 125

Trp Gln Asn Asn His Leu Thr Leu Tyr Cys Ser Leu Asp Thr Cys Phe
130 135 140

Glu Thr Ala Glu Gly Thr Glu Leu Val Arg Gln Lys Lys Val Lys Glu
145 150 155 160

Val Val Asn Leu Ile Asp Ala Met Asn Asn Lys Ser Glu Arg Thr Lys

```
                165                 170                 175

Thr Gln Asp Ala Phe Ile Lys Arg Lys Gln Ser Thr Leu Ala Arg Leu
            180                 185                 190

Asp Asn Ser Phe Pro Arg Pro Ser Lys Pro Leu Tyr Gln Gly Asn Gln
        195                 200                 205

Asn Ile Val Val Ala Val Ser Met Ser Leu Glu Tyr Pro Ala Thr Ile
    210                 215                 220

Ala Met Phe Asn Met Ser Ser Gln Glu Val Leu Thr Tyr Arg Ser Thr
225                 230                 235                 240

Lys Gln Leu Leu Asp Asn Asn Tyr His Leu Leu Asn Arg Gln Arg Asn
                245                 250                 255

Gln Lys Gln Arg Leu Ser His Gln Arg His Lys Thr Gln Arg Gln Asn
            260                 265                 270

Ser Ser Asp Phe Phe Thr Gln Gln Glu Ser Glu Leu Gly Gln Tyr Leu
        275                 280                 285

Asp Arg Leu Leu Ala Gln Ser Ile Val Ser Ile Ala Lys Gln Tyr Gln
    290                 295                 300

Ala Ser Thr Ile Leu Leu Pro Asn Leu Lys Asn Ile Arg Asp Ser Ile
305                 310                 315                 320

Gln Ala Glu Ile Glu Ala Lys Ala Glu Ala Lys Ile Pro Asn Cys Lys
                325                 330                 335

Glu Ala Gln Lys Lys Tyr Leu Lys Asn Tyr Arg Ile Asn Ile His His
            340                 345                 350

Trp Ser Tyr Gly Arg Leu Ile Asp Ser Ile Gln Leu Gln Ala Ser Lys
        355                 360                 365
```

```
Leu Asp Ile Leu Ile Gln Glu Val Lys Gln Pro Ile Arg Gly Ser Pro
    370                 375                 380


Gln Glu Lys Ala Lys Gln Met Ala Ile Leu Thr Leu Glu
385                 390                 395


<210>  552
<211>  364
<212>  PRT
<213>  Cyanothece

<400>  552

Met Leu Lys Arg Leu Gln Glu Gln Ile Asn Ser Arg Leu Pro Gln Gly
1               5                   10                  15


Arg Asp Val Thr Asn Glu Asn Trp Leu Glu Thr Leu Lys Ile Ala Cys
            20                  25                  30


Cys Thr Asp Pro Glu Asn Ile Glu Glu Ala Arg Ser Trp Gln Asp Asn
        35                  40                  45


Leu Leu Thr Lys Ser Ser Ser Ile Pro Phe Pro Ile Asn Tyr Glu Thr
    50                  55                  60


Asn Glu Asp Leu Thr Trp Ser Lys Asn Glu Lys Gly Arg Leu Cys Val
65                  70                  75                  80


Gln Phe Asn Gly Ile Ser Asp Leu Lys Phe Glu Ile Tyr Cys Gly Asn
                85                  90                  95


Arg Gln Leu Lys Trp Phe Gln Arg Phe Tyr Glu Asp Gln Gln Ile Lys
            100                 105                 110


Lys Ser Ser Lys Asn Gln His Ser Ser Ala Leu Phe Thr Leu Arg Ser
        115                 120                 125


Gly Arg Ile Leu Trp Gln Glu Glu Thr Gly Lys Ser Gln Pro Trp Asn
    130                 135                 140
```

```
Val His Arg Leu Thr Leu Gln Cys Thr Leu Asp Thr Arg Leu Trp Thr
145                 150                 155                 160

Gln Glu Arg Thr Glu Glu Val Lys Gln Glu Lys Ala Glu Glu Ile Ala
                165                 170                 175

Lys Val Leu Thr Ser Met Asn Glu Lys Gly Asp Leu Thr Lys Asn Gln
            180                 185                 190

Gln Ala Phe Ile Lys Arg Lys Gln Ser Thr Leu Asp Arg Leu Glu Asn
        195                 200                 205

Pro Phe Pro Arg Pro Ser Gln Pro Leu Tyr Gln Gly Lys Ser Asn Ile
    210                 215                 220

Leu Val Gly Val Ser Met Glu Leu Lys Lys Pro Ala Thr Ile Ala Val
225                 230                 235                 240

Ile Asp Gly Met Thr Arg Lys Val Leu Thr Tyr Arg Asn Ile Lys Gln
                245                 250                 255

Leu Leu Gly Lys Asn Tyr Pro Leu Leu Asn Arg Gln Arg Arg Gln Lys
            260                 265                 270

Gln Leu Gln Ser His Gln Arg Asn Val Ala Gln Gln Lys Glu Ala Phe
        275                 280                 285

Asn Gln Phe Gly Asp Ser Glu Leu Gly Gln His Ile Asp Arg Leu Leu
    290                 295                 300

Ala Lys Ala Ile Ile Ser Ile Ala Gln Glu Tyr Gln Ala Gly Ser Ile
305                 310                 315                 320

Val Val Pro Lys Leu Lys Asp Ile Arg Glu Ala Ile Gln Ser Glu Ile
                325                 330                 335
```

```
Gln Thr Lys Ala Glu Ala Lys Ile Pro Asn Cys Ile Glu Ala Gln Ala
            340                 345                 350


Glu Tyr Ala Lys Lys Tyr Arg Ile Gln Val His Gln
        355                 360


<210>  553
<211>  393
<212>  PRT
<213>  Nostoc carneum NIES-2107

<400>  553

Met Ser Gln Lys Thr Ile Gln Cys Arg Leu Ile Ala Ser Glu Ser Thr
1               5                   10                  15


Arg Gln Lys Leu Trp Lys Leu Met Ala Glu Leu Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Leu Leu Glu Gln Leu Ser Lys His Pro Asp Leu Glu Lys Trp
        35                  40                  45


Arg Lys Asn Gly Lys Leu Pro Ser Asn Val Val Tyr Gln Ile Cys Gln
    50                  55                  60


Pro Leu Lys Thr His Pro Ser Phe Lys Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80


Leu Ser Ala Ile His Val Val Asp Tyr Ile Tyr Lys Ser Trp Leu Ala
                85                  90                  95


Ile Gln Lys Arg Leu Gln Gln Gln Leu Asp Gly Lys Leu Arg Trp Ile
            100                 105                 110


Glu Met Leu Asn Ser Asp Ala Glu Leu Val Glu Ile Ser Gly Cys Ser
        115                 120                 125


Leu Glu Ala Ile Arg Thr Lys Ala Ala Glu Ile Leu Ala Met Thr Thr
    130                 135                 140
```

```
Leu Glu Ser Ser Ser Asn Thr Ser Val Thr Lys Thr Lys Asn Thr Lys
145                 150                 155                 160

Lys Ser Lys Asn Ser Asn Ser Ser Ala Ser Asn Ser Asp Arg Ser Leu
                165                 170                 175

Ser His Lys Leu Phe Asp Ala Tyr Gln Glu Thr Asp Asp Ile Leu Ser
            180                 185                 190

Arg Ser Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Leu Asn Asn
        195                 200                 205

Lys Glu Glu Asp Pro Glu Lys Phe Ala Gln Arg Arg Arg Lys Val Glu
    210                 215                 220

Ile Gln Ile Gln Arg Leu Thr Asp Lys Leu Thr Ser Arg Ile Pro Lys
225                 230                 235                 240

Gly Arg Asp Leu Thr Asn Ser Lys Trp Leu Glu Thr Leu Phe Thr Ala
                245                 250                 255

Thr Thr Thr Val Pro Glu Asp Asn Thr Glu Ala Lys Arg Trp Gln Asp
            260                 265                 270

Ile Leu Leu Arg Arg Ser Ser Ser Val Pro Phe Pro Val Val Phe Glu
        275                 280                 285

Thr Asn Glu Asp Leu Val Trp Ser Thr Asn Glu Lys Ser Arg Leu Cys
    290                 295                 300

Val His Phe Asn Gly Leu Ser Asp Leu Thr Phe Glu Val Tyr Cys Asp
305                 310                 315                 320

Ser Arg Gln Leu His Trp Phe Lys Arg Phe Leu Glu Asp Gln Gln Thr
                325                 330                 335

Lys Arg Lys Ser Lys Asn Gln His Ser Ser Gly Leu Phe Thr Leu Arg
```

```
            340                 345                 350

Asn Gly Arg Leu Ala Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp
        355                 360                 365

Gln Leu His Arg Leu Thr Leu Tyr Tyr Arg Gln Asp Arg Cys Ala Pro
    370                 375                 380

Ser Asn Lys Gly Ala Asp Val Leu Leu
385                 390
```

<210> 554
<211> 781
<212> PRT
<213> Leptolyngbya ohadii

<400> 554

```
Met Ala Ile Lys Thr Leu Arg Leu Leu Leu Cys Phe Asp Glu Asn Thr
1               5                   10                  15

Arg Lys Gln Leu Trp Asp Leu Ser Val Arg His Thr Leu Leu Ile Asn
            20                  25                  30

Gln Leu Leu Val Glu Leu Pro Lys Gln Ser Lys Phe Glu Ser Trp Arg
        35                  40                  45

Lys Lys Gly Ser Ile Pro Arg Lys Glu Ile Gln Leu Gln Leu Thr His
    50                  55                  60

Leu Lys Asn Lys Lys Phe Val His Leu Lys Glu Glu Gly Val Phe Glu
65                  70                  75                  80

Asp Ile Pro Ala Arg Met Leu Thr Ser Ala Val Leu Ser Val Gln Tyr
                85                  90                  95

Met Phe Ala Ser Ile Phe Ala Arg Gln Arg Lys Leu His Phe Gln Cys
            100                 105                 110
```

```
Glu Gly Lys Lys Thr Trp Leu Ala Ile Gln Glu Tyr Asp Leu Asp Leu
        115                 120                 125

Ala Gln Ser Thr Asp Phe Thr Pro Glu Gln Ile Arg Asp Arg Ala Lys
    130                 135                 140

Gln Phe Leu Glu Glu Val Glu Gln Arg Arg Gln Glu Leu Arg Glu Glu
145                 150                 155                 160

Asn Gln Ala Glu Gln Asp Leu Pro Ser Val Met Ser Leu Leu Phe Gln
                165                 170                 175

Leu Phe Lys Glu Thr Glu Thr Pro Leu Glu Gln Arg Ala Ile Ala Tyr
            180                 185                 190

Leu Leu Arg Asn Asp Cys Lys Val Lys Val Lys Lys Lys Lys Lys Lys
        195                 200                 205

Glu Gly Gly Glu Val Glu Glu Ala Glu Val Glu Asp Arg Asp Ala Ile
    210                 215                 220

Leu Leu Arg Leu Ser Lys Lys Arg Ile Gln Ile Gln Arg Phe Glu Glu
225                 230                 235                 240

Gln Met Ala Val Glu Leu Pro Ile Gly Arg Asp Pro Leu Gly Tyr Arg
                245                 250                 255

Thr Asp Gln Leu Ile Gln Ser Ala Ala Leu Phe Tyr Pro Glu Gly Glu
            260                 265                 270

Phe Glu Ala Trp Gln Lys Glu Phe Ala Val Arg Leu Ala Asn Leu Ser
        275                 280                 285

Ser Asp Leu Glu Thr Leu Pro Tyr Pro Val Leu Phe Gly Ser Asn Thr
    290                 295                 300

Asp Leu Tyr Trp Ser Phe Glu Thr Asn Thr Gln Pro Glu Glu Pro Lys
305                 310                 315                 320
```

```
Thr Ser Leu Cys Glu Ile Val Asn Pro Asn Gly Thr Pro Ser Ser Arg
                325                 330                 335

Arg Lys Pro Lys Arg Arg Arg Tyr Lys Lys Arg Lys Lys Leu Asn Thr
            340                 345                 350

Ala Arg Ile Cys Val Arg Phe Lys Gly Phe Ser Gly Ile Gln Gly Lys
        355                 360                 365

Thr Tyr Cys Asp Arg Arg Asp Leu Ala Thr Leu Arg Gln Trp Val Thr
    370                 375                 380

Asp Leu Glu Glu Asn Lys Arg Arg Ser Lys Glu Asp Lys Phe Ser Leu
385                 390                 395                 400

Ala Leu Leu Pro Leu Arg Ser Ala Cys Leu Leu Trp Glu Pro Asp Lys
                405                 410                 415

Gln His Ala Gly Glu Glu Lys Pro Trp Gln Ser His Arg Leu Tyr Leu
            420                 425                 430

His Cys Thr Ile Asp Thr Arg Leu Leu Thr Ala Glu Gly Thr Glu Gln
        435                 440                 445

Val Arg Gln Glu Lys Leu Thr Lys Val Asn Arg Tyr Leu Arg Gln Leu
    450                 455                 460

Arg Ile Glu Glu Gln Ala Asp Glu Ile Leu Ser Cys Ser Pro Pro Pro
465                 470                 475                 480

Ile Asp Asp Glu Asp Glu Glu Gln Val Val Ile Glu Asn Glu Glu Asn
                485                 490                 495

Thr Gln Ile Asn Lys Lys Asn Arg Thr Thr Arg Asp Arg Leu Ile Arg
            500                 505                 510
```

```
Asn Ser Pro Pro Pro Arg Pro Ser Gln Val Ala His Arg Gly Asp Pro
        515                 520                 525

Asp Ile Ala Met Lys Ile Ala Phe Ser Arg Gln Glu Ile Val Gly Thr
    530                 535                 540

Ala Val Met Asp Leu Gln Ser Gln Gln Val Leu Glu Tyr Cys Thr Pro
545                 550                 555                 560

Arg Glu Leu Leu Ser Glu Gln Arg Gln Glu Val Leu Lys Gln Arg Ser
                565                 570                 575

Ala Lys Leu His Ser Gln Pro Lys Arg Gln Gln Lys Ala Gln Asp Lys
            580                 585                 590

Ala Glu Ala Val Gln Gln Ser Glu Gly Lys Lys Ser Cys Ser Pro Tyr
        595                 600                 605

Lys Pro Lys Ile Asn Pro Lys Gln Leu Gln Leu Gln Pro Tyr Arg Leu
    610                 615                 620

Ile Asn Arg Trp Arg Arg Leu Arg Asp Gln Asn Ile Arg Asp Arg Gln
625                 630                 635                 640

Thr Glu Gln Gln Gln Gly Leu Tyr Arg Pro Ser Lys Ala Glu Ala Asn
                645                 650                 655

Leu Ser Gln Tyr Leu Asn Arg Leu Leu Ala Arg Arg Ile Ile Gln Arg
            660                 665                 670

Cys Gln His Trp Lys Val Ser Ile Ile Val Leu Pro Glu Leu Gly Asp
        675                 680                 685

Leu Arg Glu Ser Val Glu Ser Glu Ile Lys Ala Lys Ala Lys Gln Lys
    690                 695                 700

Phe Cys Asp Asp Asn Val Tyr Arg Gln Gln Gln Tyr Lys Lys Glu His
705                 710                 715                 720
```

```
Arg Met Gly Phe His Arg Trp Ser Tyr Lys Asn Leu Ser Gln Cys Ile
                725                 730                 735


Arg Ala Cys Ala Val Glu Val Gly Ile Ser Val Val Pro Gly Arg Gln
            740                 745                 750


Pro Arg Leu Gly Thr Leu Gln Glu Lys Val Ile Ala Val Ser Ser Asp
        755                 760                 765


Arg Leu Pro Arg Pro Glu Ser Val Asp Ser Pro Ala Ala
    770                 775                 780
```

<210> 555
<211> 356
<212> PRT
<213> Scytonema hofmanni

<400> 555

```
Met Asn Trp Leu Asn Leu Lys Asn Lys Pro Gly Arg Ile Phe Val Lys
1               5                   10                  15


Phe Asn Gly Leu Lys Lys Asn Ile Ile Asn Pro Glu Phe Tyr Ile Cys
            20                  25                  30


Cys Gly Ser Arg Gln Arg Asn Tyr Phe Gln Arg Phe Cys Gln Asp Trp
        35                  40                  45


Gln Val Trp His Asp Asn Glu Glu Thr Tyr Ser Ser Gly Leu Phe Phe
    50                  55                  60


Leu Arg Ser Ala Arg Leu Leu Trp Gln Glu Arg Lys Gly Ile Gly Ala
65                  70                  75                  80


Pro Trp Lys Val Asn Arg Leu Ile Leu Gln Cys Ser Ile Glu Thr Arg
                85                  90                  95


Leu Trp Thr Glu Glu Glu Thr Glu Leu Val Arg Thr Glu Lys Ile Val
```

```
            100                 105                 110

Lys Thr Glu Lys Thr Ile Arg Lys Met Glu Gln Glu Arg Asp Leu Thr
        115                 120                 125

Gln Lys Gln Leu Thr His Leu Gln Arg Glu Arg Thr Gln Arg Gln Lys
    130                 135                 140

Leu Asn Asn Pro Phe Pro Gly Arg Pro Ser Gln Pro Leu Tyr Gln Gly
145                 150                 155                 160

Lys Ser Asn Ile Ile Val Gly Val Ser Phe Gly Leu Asp Lys Pro Ala
                165                 170                 175

Thr Val Ala Val Val Asp Ala Ala Asn Asn Lys Val Leu Ala Tyr Arg
            180                 185                 190

Ser Thr Lys Gln Leu Leu Gly Lys Asn Tyr Asn Leu Leu Asn Arg Gln
        195                 200                 205

Arg Gln Gln Gln Gln Arg Leu Ser His Glu Arg His Lys Ala Gln Lys
    210                 215                 220

Gln Phe Ala Leu Asn Asp Phe Gly Glu Ser Glu Leu Gly Gln Tyr Val
225                 230                 235                 240

Asp Arg Leu Leu Ala Lys Glu Ile Ile Ala Ile Ala Lys Thr Tyr Lys
                245                 250                 255

Ala Gly Ser Ile Val Ile Pro Lys Leu Arg Asp Met Arg Glu Gln Ile
            260                 265                 270

Ser Ser Glu Ile Gln Ser Arg Ala Glu Lys Lys Cys Pro Gly Tyr Lys
        275                 280                 285

Glu Ala Gln Gln Lys Tyr Ala Lys Glu Tyr Arg Met Ser Ile His Arg
    290                 295                 300
```

```
Trp Ser Tyr Gly Arg Leu Ile Glu Ser Ile Lys Ser Gln Ala Ala Lys
305                 310                 315                 320


Ala Gly Ile Ser Thr Glu Ile Gly Thr His Gln Ile Arg Gly Ser Pro
                325                 330                 335


Glu Glu Lys Ala Arg Asp Leu Ala Val Phe Ala Tyr Gln Glu Arg Arg
            340                 345                 350


Ala Ala Leu Val
        355


<210>  556
<211>  800
<212>  PRT
<213>  Leptolyngbya ohadii

<400>  556

Met Arg Thr Ile Thr Phe Arg Leu Cys Ala Ser Glu Glu Thr Arg Lys
1               5                   10                  15


Ile Phe Trp Tyr Leu Cys Gln Glu His Thr Leu Leu Val Asn Ala Leu
            20                  25                  30


Ser His Lys Val Gln Gln Ser Lys Glu Phe Gln Thr Trp Gln Glu Lys
        35                  40                  45


Gly Trp Leu Pro Asn Lys Lys Leu Lys Leu Leu Asn Lys Glu Val Leu
    50                  55                  60


Glu Glu Lys Thr Ala Phe Gln Val Gln Val Leu Asp Gln Thr Lys Leu
65                  70                  75                  80


Pro Asp Leu Pro Ser Arg Phe Ile Ala Ser Ala Ile Arg Ala Asn Gln
                85                  90                  95


Gln Thr Trp Gly Ser Trp Ile Ala Gln Gln Arg Arg Arg Tyr Met Ser
            100                 105                 110
```

```
Leu Thr Gly Lys Gln Asp Trp Leu Gln Leu Gln Glu Cys Asp Leu Asp
        115                 120                 125

Leu Ser Gln Thr Thr Asp Phe Thr Phe Ala Gln Ile Cys Thr Glu Val
    130                 135                 140

Arg Glu Val Leu Ala Ser Val Thr Ala Gln Ile Ala Ala Glu Glu Gln
145                 150                 155                 160

Lys Lys Gln Asn Gln Lys Lys Arg Ser Arg Gln Thr Thr Lys Ala Lys
                165                 170                 175

Arg Thr Val Lys Lys Gln Lys Lys Val Ser Glu Ser Arg Arg Ile Thr
            180                 185                 190

Glu Ala Leu Phe Lys Leu Leu Lys Lys Lys Gln Asn Ala Leu Thr Met
        195                 200                 205

Arg Ala Ile Ala Tyr Leu Leu Arg Asn Asn Ala Thr Val Gln Glu Asp
    210                 215                 220

Glu Glu Asn Pro Gln Glu Ile Ala Leu Lys Leu Asp Gln Lys Arg Ile
225                 230                 235                 240

Glu Ile Glu Arg Leu Lys Thr Gln Leu Gln Ser Gln Phe Pro Lys Pro
                245                 250                 255

Arg Asp Pro Thr Gly Ala Ile Ala Asp Arg Tyr Ile Asn Glu Ala Leu
            260                 265                 270

Glu Lys Pro Ser Phe Ala Thr Ser Trp Lys Ile Leu Val Leu Phe Cys
        275                 280                 285

Leu Leu Ile Thr Asn Gln Glu Leu Pro Gly Leu Ser Leu Gln Phe His
    290                 295                 300
```

```
Ser His Leu Leu Gln Gln Leu Gln His Pro Asp Leu Ser Arg Glu Ala
305                 310                 315                 320

Gln Gln Ala Glu Phe Lys Ser Trp Glu Glu Gly Cys Leu Glu Arg Met
                325                 330                 335

Thr Lys Leu Ala Thr Val Leu Lys Ser Leu Pro Leu Pro Ile Ser Phe
            340                 345                 350

Asp Ser Ser Asp Asp Leu Tyr Trp Ser Val Glu Pro Lys Gln Gln Lys
        355                 360                 365

Ala Val Glu Pro Lys Glu Thr Thr Pro Ala Pro Thr Asp Gly Gln Pro
    370                 375                 380

Arg Arg Ser Pro Lys Arg Lys Arg Lys Asn Arg Arg Lys Ile Gln Val
385                 390                 395                 400

Gln Glu Arg Ile Val Val Arg Phe Lys Gly Leu Arg Glu His Lys Phe
                405                 410                 415

Gly Val Gln Cys Ser His Arg Asp Leu Ala Ile Leu Gln Gln Cys Gln
            420                 425                 430

Arg Glu Trp Glu Arg Tyr Gly Ser Leu Pro Asp Asp Lys Lys Phe Ser
        435                 440                 445

Leu Gly Leu Phe Pro Ala Arg Ala Ala Arg Leu Leu Trp Arg Lys Asp
    450                 455                 460

Lys Gln Gln Arg Lys Pro Ser Ala Asn Ser Pro Gly Glu Lys Ser Gln
465                 470                 475                 480

Val Glu Glu Trp Arg Gln Tyr Arg Leu Tyr Leu His Ile Thr Ile Asp
                485                 490                 495

Asp Arg Leu Leu Ser Ala Glu Gly Thr Glu Glu Val Arg Gln Glu Lys
            500                 505                 510
```

```
Leu Ile Lys Ala Gln Asp Asp Gln Lys Thr Met Arg Lys Arg Lys Ser
        515                 520                 525

Pro Arg Lys Lys Leu Glu Glu Ala Glu Leu Thr Gln Glu Gln Lys Glu
    530                 535                 540

Lys Lys Ala Lys Asp Gly Ala Ile Ala Lys Lys Arg Val Ala Ser Thr
545                 550                 555                 560

Gln Ala Arg Leu Ser Asp Pro Thr Arg Leu Lys Arg Pro Ser Arg Lys
                565                 570                 575

Pro Tyr Gln Gly Gln Ser His Ile Gln Val Arg Val Cys Phe Asn Gln
            580                 585                 590

Gln Glu Arg Val Ser Leu Ala Val Phe Asp Thr Gln Gln Gln Gln Val
        595                 600                 605

Leu Glu Tyr Val Ser Val Arg Asp Leu Leu Tyr Asp His Ser Ala Glu
    610                 615                 620

Lys His His Gln His Phe Ile Ser Asn Pro Lys Arg Lys Gly Lys Arg
625                 630                 635                 640

Thr Leu Glu Gln Met Gln Leu Glu Gln Tyr His Leu Leu Asp Arg Leu
                645                 650                 655

Arg Lys Gln Gln Val Lys Asn His Gln Arg Arg Met Arg Ala Gln Lys
            660                 665                 670

Gln Gly Tyr Tyr Lys Tyr Ser Lys Ser Glu Ser Asn Leu Gly Glu Tyr
        675                 680                 685

Leu Asp Arg Leu Leu Ala Ala Arg Ile Gly Gln Leu Ala Val Gln Trp
    690                 695                 700
```

```
Gln Ala Ser Ser Val Val Ile Pro Asp Leu Gly Asn Leu Arg Glu Ser
705                 710                 715                 720


Val Glu Ala Lys Leu Gln Ala Trp Ala Asp Leu Ile Phe Pro Lys Met
                725                 730                 735


Glu Glu Val Gln Gln Lys Thr Thr Lys Lys Ile Arg Val Ser Phe His
            740                 745                 750


Gly Trp Ser Tyr Gly Arg Leu Ala Arg Cys Ile Arg Ser Arg Ala Ala
        755                 760                 765


Arg Asp Gly Leu Ala Ile Val Ile Gly Gln Gln Pro Gln Gln Gly Ser
    770                 775                 780


Leu Gln Glu Lys Ala Arg Ala Val Ala Pro Ala Asn Ser Thr Thr Ala
785                 790                 795                 800


<210>  557
<211>  735
<212>  PRT
<213>  Nostoc sp. NIES-2111

<400>  557

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Thr
1               5                   10                  15


Leu Arg Thr Leu Trp Glu Leu Met Ala Asn Lys Tyr Thr Pro Phe Ile
            20                  25                  30


Asn Glu Leu Leu Val Gln Leu Gly Gln His Pro Glu Phe Glu Thr Trp
        35                  40                  45


Leu Lys Lys Gly Glu Val Pro Lys Glu Thr Ile Glu Arg Ile Asn Lys
    50                  55                  60


Ser Leu Ser Thr Gln Glu Pro Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80
```

```
Thr Ser Ala Ile Thr Leu Val Lys Glu Ile Tyr Lys Ser Trp Phe Thr
                85                  90                  95

Leu Gln Gln Arg Arg Leu Arg Gln Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Lys Ile Phe Lys Ser Asp Ile Glu Leu Gln Gln Glu Ser Gln Cys Asp
        115                 120                 125

Leu Asn Ile Ile Arg Thr Lys Ala Ser Glu Ile Leu Asn Ser Cys Ala
    130                 135                 140

Glu Gln Leu Thr Gln Asp Lys Asn Gln Gln Ser Lys Lys Lys Gly Lys
145                 150                 155                 160

Asn Thr Lys Lys Asn Lys Asn Glu Ser Ser Ala Ser Thr Leu Met Asn
                165                 170                 175

Leu Leu Phe Asn Leu Tyr Glu Thr Ser Asp Asp Cys Leu Tyr Arg Cys
            180                 185                 190

Ala Ile Ala Tyr Leu Ile Lys Asn Asn Cys Gln Val Ser Tyr Leu Glu
        195                 200                 205

Glu Glu Pro Glu Gln Tyr Ile Lys Arg Arg His Arg Lys Glu Ile Glu
    210                 215                 220

Ile Glu Arg Leu Arg Asp Lys Leu Lys Ser Arg Ile Pro Asn Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Lys Asp Trp Leu Ser Thr Leu Asn Lys Val Asn Asn
                245                 250                 255

Glu Ile Pro Lys Asp Glu Asn Glu Phe Lys Leu Trp Gln Lys Asn Leu
            260                 265                 270

Leu Lys Val His Asn Ser Met Pro Phe Thr Val Asp Tyr Arg Thr Asn
```

```
        275                 280                 285

Thr Asp Leu Asp Cys Leu Leu Gly Phe Leu Asn Lys Glu Thr Asn Ile
    290                 295                 300

Gln Lys Ile Ile Leu Cys Gln Met Tyr Cys Leu Lys Leu Ala Leu Lys
305                 310                 315                 320

Glu Gly Leu Tyr Ser Phe Ile Lys Tyr Leu Phe Ala Asp Val Asn Ser
                325                 330                 335

Ile Leu Asp Lys Ser Asn Glu Leu Leu Glu Leu Leu Gln His Ser Asn
            340                 345                 350

Asn Lys His Leu Ile Trp Gln Leu Tyr Leu Met Lys Leu Ser Leu Lys
        355                 360                 365

Ser Gly Leu Asp Thr Phe Ile Lys Tyr Met Tyr Ala Lys Ile Leu Asn
    370                 375                 380

Leu Ile Tyr Lys Gln Cys Lys Tyr Leu Val Gln Phe Asn Gly Leu Lys
385                 390                 395                 400

Glu Glu Leu Asn Ser Pro Glu Phe Tyr Ile Cys Cys Asp Lys Arg Gln
                405                 410                 415

Leu His Tyr Phe Lys Arg Phe Tyr Gln Asp Trp Gln Asn Trp His His
            420                 425                 430

Asn Glu Glu Lys Tyr Ser Ser Gly Leu Phe Leu Leu Arg Ser Ala Arg
        435                 440                 445

Leu Phe Trp Gln Glu Arg Thr Gly Lys Gly Lys Pro Trp Gln Ile His
    450                 455                 460

His Leu Ile Leu Gln Cys Ser Ile Asp Thr Arg Leu Leu Thr Lys Glu
465                 470                 475                 480
```

```
Gly Thr Glu Ile Val Arg Leu Glu Lys Ile Asn Gln Ala Asp Lys Thr
                485                 490                 495

Ile Ser Asn Met Glu Lys Lys Gly Glu Leu Ser Lys Asn Gln Leu Ser
            500                 505                 510

Arg Leu Lys Arg Glu Leu Thr Thr Arg Gln Lys Leu Asn His Ser Phe
        515                 520                 525

Pro Asp Leu Pro Ser Lys Pro Leu Tyr Gln Gly Lys Pro Asn Ile Leu
    530                 535                 540

Val Gly Val Ser Leu Gly Leu Gly Lys Pro Val Thr Leu Ala Val Val
545                 550                 555                 560

Asp Ala Ala Asn Gln Lys Val Leu Thr Tyr Arg Asn Val Lys Gln Leu
                565                 570                 575

Leu Gly Lys Lys Tyr Asn Leu Leu Asn Arg Gln Gln Gln Gln Gln Gln
            580                 585                 590

Tyr Phe Ser His Lys Arg His Lys Ala Gln Lys Asp Asn Ala Pro Asn
        595                 600                 605

Ser Phe Gly Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Ala
    610                 615                 620

Asn Ala Ile Val Ala Ile Ala Lys Thr Tyr Ser Ala Gly Ser Ile Val
625                 630                 635                 640

Leu Pro Lys Leu Arg Asp Met Arg Glu Ile Ile Gln Ser Glu Val Gln
                645                 650                 655

Ala Arg Ala Glu Glu Lys Ile Pro Gly Tyr Lys Lys Gly Gln Gln Glu
            660                 665                 670

Tyr Ala Lys Gln Tyr Leu Ile Ser Val His Arg Trp Ser Tyr Gly Arg
```

675 680 685

Leu Ile Glu Thr Ile Glu Ser Gln Ala Thr Gln Ala Gly Ile Leu Ile
690 695 700

Glu Ile Ser Ser Gln Pro Ser Arg Gly Asn Leu Leu Asp Lys Ala Arg
705 710 715 720

Asp Leu Ala Leu Phe Ala Tyr Gln Glu Arg Gln Leu Ala Ile Val
725 730 735

<210> 558
<211> 493
<212> PRT
<213> Cyanothece sp. PCC 7822

<400> 558

Met Pro Thr Ser Ser Lys Thr Ala Ile Lys Phe Glu Gly Glu Pro Glu
1 5 10 15

Asp Lys Glu Ala Tyr Leu Leu Arg Arg Thr Gln Lys Glu Ile Gln Ile
20 25 30

Gln Arg Leu Glu Ala Gln Ile His Ser Cys Ala Pro His Pro Arg Leu
35 40 45

Asn Asp Asp Ser Leu Trp Leu Asp Ala Leu Asn Gln Ser Leu Thr Gly
50 55 60

Ile Thr Glu Val Lys Asp Leu Gln Gln Ile Gln Arg Gln Leu Leu Gln
65 70 75 80

Lys Phe Pro His Leu Pro Tyr Pro Val Phe Tyr Asn Thr Asn Thr Asp
85 90 95

Leu Glu Trp Ser Ile Asn His Gln Gly Arg Ile Arg Val Ser Phe Asn
100 105 110

```
Gly Leu Lys Lys Lys Gly Ile Thr Leu Glu Ile Ala Cys Asp Glu Arg
        115                 120                 125

Gln Leu Pro Tyr Phe Gln Arg Ile Leu Ser Asp Tyr Gln Cys Phe Lys
    130                 135                 140

Arg Lys Asp Leu Pro Val Pro Val Pro Gly Gly Leu Met Leu Leu Arg
145                 150                 155                 160

Ser Ala Gln Leu Ile Trp Lys Pro Ile Glu Gly Lys Gly Gln Pro Trp
                165                 170                 175

Asn Thr His His Leu Tyr Leu His Cys Ala Ile Asn Asn Gln Leu Trp
            180                 185                 190

Ser Lys Thr Gly Met Ala Asn Ile Gln Gln Glu Leu Ile Gln Glu Thr
        195                 200                 205

Gln Lys Gln Leu Asn Lys Cys Phe Ala Lys Glu Glu Gln Asn Pro Leu
    210                 215                 220

Thr Asn Asn Gln Lys Lys Asn Ile Leu Arg Leu Glu Ser Ser Leu Gln
225                 230                 235                 240

Arg Leu Lys Thr Phe Asp Ile Ala Tyr Leu Asn Pro Phe Gln Ser His
                245                 250                 255

Ser Tyr Gln Gly Asn Pro His Ile Ile Val Gly Val Ala Ile Gly Leu
            260                 265                 270

Lys Thr Pro Ile Thr Ile Ala Ile Val Asp Leu Gln Thr Gln Ala Thr
        275                 280                 285

Leu Gly Phe Arg Ser Pro Lys Gln Leu Leu Lys Arg Arg Arg Gln Ile
    290                 295                 300

Leu Val Ala Lys Ala Lys Thr Glu Asp Lys Ile Arg Phe Ser Pro Arg
305                 310                 315                 320
```

```
Lys Lys Arg Glu Ile Thr Asp Tyr Glu Leu Phe Gln Asp Tyr Leu His
                325                 330                 335

Lys Lys His Ser Asn Lys His Glu Arg His Lys Ala Gln Lys Lys Phe
            340                 345                 350

Ala Asp Thr Gln Phe Gly Glu Ala Asn Ala Gly Leu Tyr Phe Asn Arg
        355                 360                 365

Leu Phe Ala Gln Ala Ile Val Glu Val Ala His Ser Tyr Gln Ala Ser
    370                 375                 380

Val Ile Val Leu Pro Asp Leu Thr Asn Ile Arg Glu Ala Ile Glu Ser
385                 390                 395                 400

Glu Val Arg Ala Arg Ala Glu Leu Lys Tyr Pro Gly Asn Lys Thr Gln
                405                 410                 415

Gln Gln Arg Tyr Ala Lys Asp Phe Arg Val Thr Val Asn Gln Trp Asn
            420                 425                 430

Tyr Asn Gln Leu Gly Gln Cys Ile Asn Tyr Ala Ala Lys Lys Ala Gly
        435                 440                 445

Leu Lys Ile Ala Ile Leu Lys Gln Thr Ile Lys Gly Ser Ser Gln Gln
    450                 455                 460

Lys Ala Arg Gln Ile Ala Leu Thr Tyr Trp Glu Lys Gln Gln Gln Thr
465                 470                 475                 480

Gln Thr Pro Phe Asn Val Gln Thr Pro Asn Asn Leu Val
                485                 490
```

<210> 559
<211> 311
<212> PRT
<213> Cyanobacterium sp. IPPAS B-1200

<400> 559

```
Met Lys Lys Ala Asn Lys Asn Lys Phe Ser Ser Ala Leu Phe Thr Leu
1               5                  10                  15


Arg Ser Ala Met Ile Ile Trp Lys Glu Asp Asp Gly Lys Gly Glu Leu
            20                  25                  30


Trp Asp Lys His Lys Leu Tyr Leu His Cys Thr Leu Asp Thr Asp Tyr
        35                  40                  45


Trp Thr Val Glu Gly Thr Gln Val Val Ala Gln Arg Lys Gln Lys Glu
    50                  55                  60


Val Leu Asn Ile Ile Asp Gly Met Lys Glu Lys Asp Asp Leu Arg Asp
65                  70                  75                  80


Thr Gln Lys Lys Phe Ile Gln Arg Lys Gln Thr Thr Leu Ala Arg Leu
                85                  90                  95


Asn Asn Ile Phe Pro Arg Pro Ser Lys Ser Ile Tyr Gln Gly Asn Pro
            100                 105                 110


Asp Leu Tyr Met Gly Val Ala Met Gly Leu Gln Glu Pro Val Thr Ile
        115                 120                 125


Ala Val Val Asp Val Gly Glu Gly Lys Ala Ile Leu His Arg Asn Ile
    130                 135                 140


Lys Gln Leu Leu Gly Asp Asp Tyr His Leu Leu Arg Arg Arg Arg Asn
145                 150                 155                 160


Glu Lys Gln Lys Leu Asn His Gln Asn His Lys Ala Arg Lys Arg Ala
                165                 170                 175


Asn Phe Gln Gln Lys Gly Glu Ser Asn Leu Gly Glu Tyr Val Asp Arg
            180                 185                 190
```

```
Leu Ile Ala Lys Ser Ile Leu Lys Ile Ala Gln Glu Tyr Glu Val Ser
        195                 200                 205


Thr Ile Ile Val Pro Arg Leu Ser Gln Met Arg Ser Ile Thr Glu Ala
    210                 215                 220


Glu Ile Gln Leu Arg Ala Glu Glu Arg Ile Pro Glu Tyr Lys Glu Gly
225                 230                 235                 240


Gln Arg Lys Tyr Ala Lys Asp Tyr Arg Val Gln Val His Gln Trp Ser
                245                 250                 255


Tyr Gly Arg Leu Ile Asp Asn Ile Lys Gly Asn Ser Ser Lys Leu Gly
            260                 265                 270


Ile Val Val Glu Glu Gly Thr Gln Pro Lys Gln Gly Thr Phe Thr Asp
        275                 280                 285


Lys Ala Leu Gln Leu Ala Leu Ser Thr Ser Lys Thr Asn His Lys Ala
    290                 295                 300


Asn Pro Thr Lys Ile Asn Ser
305                 310


<210>  560
<211>  443
<212>  PRT
<213>  Nodosilinea nodulosa

<400>  560

Met Phe Lys Leu Tyr Asp Glu Thr Glu Gln Ser Thr Ser Arg Asp Lys
1               5                   10                  15


Ala Ala Ile Ile Tyr Leu Ile Lys Asn Gly Cys Lys Ile Pro Ser Cys
            20                  25                  30


Gln Glu Asn Pro Lys Lys Phe Glu Glu Asn Arg Leu Asn Lys Gln Lys
        35                  40                  45
```

```
Ser Ile Glu Arg Ile Glu Arg Lys Leu Glu Gly Lys Thr Pro Lys Ile
    50                  55                  60

Arg Lys Phe Pro Leu Tyr Pro Ile Ala Phe Tyr Ser Ser Asp Asp Leu
65                  70                  75                  80

Arg Trp Ser Leu Ile Lys Arg Glu Asp Pro Lys Thr Lys Asp Ile Lys
                85                  90                  95

Glu Arg Ile Phe Val Thr Phe Lys Gly Met Gly Arg Asn Arg Ile Phe
            100                 105                 110

Glu Ile Cys Cys Gly Arg Arg Gln Leu Pro Ile Phe Gln Ile Phe Leu
        115                 120                 125

Glu Asp Trp Gln Leu Tyr Gln Gly Asn Glu Lys Glu Tyr Ser Leu Asp
    130                 135                 140

Met Val Leu Leu Arg Ser Ala Ser Leu Val Trp Arg Lys Cys Lys Glu
145                 150                 155                 160

Ser Ser Ser Lys Glu Ala Ala Asn Ser Leu Met Asp Ala Tyr Glu Pro
                165                 170                 175

Tyr Leu Lys Val Thr Ile Asp Ile Asp Asn Leu Thr Thr Glu Gly Ala
            180                 185                 190

Gly Val Ile Arg Asp Glu Lys Leu Lys Asp Val Glu Arg Arg Ile Gln
        195                 200                 205

Asn Tyr Gly Lys Leu Ala Glu Asp Lys Asp Leu Thr Pro Asn Gln Lys
    210                 215                 220

Thr Asn Leu Lys Gln Leu Lys Ser Arg Glu Thr Gly Leu Gly Asn Cys
225                 230                 235                 240
```

```
Phe Pro Arg Pro Ser Lys Pro Ala Tyr Glu Gly Asn Ala Asn Ile Ala
                245                 250                 255

Ile Gly Ile Ser Phe Cys Arg Gln Lys Val Ile Ala Ala Ala Ile Val
            260                 265                 270

Asp Leu Lys Lys Gly Lys Ala Ile Val Tyr Arg Thr Ala Gln Gln Leu
        275                 280                 285

Leu Gly Lys Asp Tyr Ser Gln Ile Pro Glu Tyr Arg His Arg Gln Arg
    290                 295                 300

Thr Asn Arg Asn Lys Arg Arg Lys Leu Gln Leu Gln Gly Lys Asn Ala
305                 310                 315                 320

Ser Ile Thr Glu Ala Gly Gln Gly Val His Leu Asn Arg Val Leu Ala
                325                 330                 335

Lys Ala Phe Val Arg Leu Ala Glu Glu Tyr Asn Ala Gly Val Ile Val
            340                 345                 350

Leu Pro Lys Thr Asp Gly Leu Arg Glu Ile Ile Gln Ser Gly Ile Glu
        355                 360                 365

Ala Met Ala Glu Gln Lys Tyr Pro Lys Asp Lys Ser Arg Gln Arg Gln
    370                 375                 380

Phe Leu Lys Glu Tyr Arg Ile Ser Val His Asn Trp Asp Tyr Phe Arg
385                 390                 395                 400

Leu Arg Arg Ser Ile Glu Glu Arg Ala Ala Lys Val Gly Ile Pro Val
                405                 410                 415

Lys Val Gly Cys Gln Pro Ser Lys Gly Tyr Leu Pro Gln Lys Ala Gln
            420                 425                 430

Gln Val Ala Leu Ser Val Leu Glu Arg Val Val
        435                 440
```

<210> 561
<211> 292
<212> PRT
<213> Cyanobacterium sp. IPPAS B-1200

<400> 561

Met Ile Ile Trp Lys Glu Asp Asp Gly Lys Gly Glu Leu Trp Asp Lys
1 5 10 15

His Lys Leu Tyr Leu His Cys Thr Leu Asp Thr Asp Tyr Trp Thr Val
20 25 30

Glu Gly Thr Gln Val Val Ala Gln Arg Lys Gln Lys Glu Val Leu Asn
35 40 45

Ile Ile Asp Gly Met Lys Glu Lys Asp Asp Leu Arg Asp Thr Gln Lys
50 55 60

Lys Phe Ile Gln Arg Lys Gln Thr Thr Leu Ala Arg Leu Asn Asn Ile
65 70 75 80

Phe Pro Arg Pro Ser Lys Ser Ile Tyr Gln Gly Asn Pro Asp Leu Tyr
85 90 95

Met Gly Val Ala Met Gly Leu Gln Glu Pro Val Thr Ile Ala Val Val
100 105 110

Asp Val Gly Glu Gly Lys Ala Ile Leu His Arg Asn Ile Lys Gln Leu
115 120 125

Leu Gly Asp Asp Tyr His Leu Leu Arg Arg Arg Arg Asn Glu Lys Gln
130 135 140

Lys Leu Asn His Gln Asn His Lys Ala Arg Lys Arg Ala Asn Phe Gln
145 150 155 160

Gln Lys Gly Glu Ser Asn Leu Gly Glu Tyr Val Asp Arg Leu Ile Ala

```
                165                 170                 175

Lys Ser Ile Leu Lys Ile Ala Gln Glu Tyr Glu Val Ser Thr Ile Ile
            180                 185                 190

Val Pro Arg Leu Ser Gln Met Arg Ser Ile Thr Glu Ala Glu Ile Gln
        195                 200                 205

Leu Arg Ala Glu Glu Arg Ile Pro Glu Tyr Lys Glu Gly Gln Arg Lys
    210                 215                 220

Tyr Ala Lys Asp Tyr Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg
225                 230                 235                 240

Leu Ile Asp Asn Ile Lys Gly Asn Ser Ser Lys Leu Gly Ile Val Val
                245                 250                 255

Glu Glu Gly Thr Gln Pro Lys Gln Gly Thr Phe Thr Asp Lys Ala Leu
            260                 265                 270

Gln Leu Ala Leu Ser Thr Ser Lys Thr Asn His Lys Ala Asn Pro Thr
        275                 280                 285

Lys Ile Asn Ser
    290
```

<210> 562
<211> 632
<212> PRT
<213> filamentous cyanobacterium CCP1

<400> 562

```
Met Thr Ile Leu Phe Asp Arg His Glu Gln Ser Gln Asp Leu Leu Glu
1               5                   10                  15

Arg Arg Ala Ile Ala His Leu Leu Lys Asn Gly Cys Gln Val Asn Asp
            20                  25                  30
```

```
Ala Glu Glu Asp Leu Glu Ala Leu Lys Leu Arg Leu Glu Lys Lys Arg
        35                  40                  45

Ile Gln Ile Ala Arg Leu Glu Lys Gln Leu Glu Arg Arg Leu Pro Asp
    50                  55                  60

Gly Arg Asp Pro Thr Gly Glu Arg Phe Ala Ser Asn Leu Ala Gln Ala
65                  70                  75                  80

Ile Ala Phe Ala Asp His Leu Thr Phe Val Pro Ala Lys Phe Trp Ile
                85                  90                  95

Asn Trp Tyr Gln Val Leu Gln Arg Asn Pro Asn Asp Glu Ser Asp Leu
            100                 105                 110

Val Ile Pro Phe Leu Gly Tyr Val Tyr His Gln Gln Ala Gly Asp Ala
        115                 120                 125

Gly Phe Asp Ala Trp Glu Gln Gly Asp Ser Glu Arg Ala Ala Leu Val
    130                 135                 140

Ser Thr Leu Tyr Glu Thr Leu Pro Tyr Pro Ile Leu Phe Gly Ser Ala
145                 150                 155                 160

Gly Asp Val Tyr Trp Ser Leu Lys Gln Val Asp Pro Asn Pro Gly Thr
                165                 170                 175

Thr Arg Gln Lys Gln Gln Ser His Arg Thr Pro Lys Arg Arg Arg Lys
            180                 185                 190

Pro Lys His Lys Gln Lys Val Gln Glu Arg Leu Cys Val Arg Phe Lys
        195                 200                 205

Gly Glu Glu Leu Lys Asn His His Phe Gly Val Tyr Cys Asp Arg Arg
    210                 215                 220

Gln Leu Pro Val Phe Lys Gln Phe Leu Thr Asp Arg Glu Val Gln Lys
225                 230                 235                 240
```

```
Gln Arg Lys Asp Thr Glu Lys Phe Met Gly Gly Ile Phe Thr Leu Arg
               245                 250                 255

Ser Ala Arg Leu Val Trp Lys Glu Asp Thr Glu Arg Leu Gln Arg Lys
            260                 265                 270

Arg Ala Ser Thr Thr Ser Leu Leu Trp Leu Lys Phe Leu Phe Ala Met
        275                 280                 285

Gln Arg Glu Glu Thr Val Thr Asp Lys Glu Leu Asp Ser Trp Ile Ile
    290                 295                 300

Ser Phe Leu Cys Ile Asn Thr Ile Phe Pro Trp Gln Ser His Arg Leu
305                 310                 315                 320

Tyr Leu His Cys Thr Ile Asp Ser Arg Leu Leu Thr Ala Glu Gly Thr
               325                 330                 335

Lys Glu Val Ile Ala Gln Lys Thr Ala Ala Thr Gln Gln Tyr Leu Glu
            340                 345                 350

Gln Phe Lys Pro Glu Thr Ala Thr Pro Lys Pro Gln Ala Val Glu Arg
        355                 360                 365

Val Glu Glu Glu Arg Gln Thr Pro Gln Ala Arg Gly Gly Thr Thr Val
    370                 375                 380

Lys Lys Lys Glu Thr Thr Leu Ala Arg Ser Lys Asn Pro Pro Pro Ala
385                 390                 395                 400

Arg Pro Ser Arg Leu Leu Tyr Lys Gly Arg Ser Asp Ile Ala Ala Val
               405                 410                 415

Val Val Val Ser Arg Phe Ala Ile Val Ala Val Ala Ile Val Asn Thr
            420                 425                 430
```

```
Gln Thr Gln Glu Ile Leu Glu Phe Gln Lys Ile Lys Asp Leu Leu Thr
        435                 440                 445

Glu His Arg Ser Asp Val Leu Glu Glu Arg Leu Lys Lys His Gln Gly
    450                 455                 460

Met Leu Lys Gly Gly Arg Ser Leu Glu Gln Leu Gln Leu Gln Gln Tyr
465                 470                 475                 480

Arg Leu Val Lys Arg Trp Arg Lys His Arg Lys Lys Asn Leu Thr Gln
                485                 490                 495

Arg Gln Glu Glu Gln Lys Arg Gly Leu Tyr Lys Arg Ser Asn Gln Glu
            500                 505                 510

Ser Asn Leu Ala Gln Tyr Leu Asn Arg Leu Leu Ala Lys Arg Ile Val
        515                 520                 525

Gln Leu Cys Gln Thr Tyr Gln Val Gly Met Ile Val Leu Pro Glu Leu
    530                 535                 540

Gly Asn Ile Gly Glu Asn Phe Glu Cys Glu Ile Gln Ala Lys Ala Arg
545                 550                 555                 560

Gln Lys Phe Pro Gly Asp Asn Val Gln Leu Gln Lys Gln Tyr Leu Lys
                565                 570                 575

Glu Leu Arg Met Arg Met His Arg Trp Asn Tyr Lys Asn Leu Leu His
            580                 585                 590

Ala Ile Arg Gln Tyr Ala Thr Pro Ala Arg Ile Pro Val Thr Thr Arg
        595                 600                 605

Trp Gln Pro Lys Glu Gly Ala Leu Arg Asp Lys Ala Ala Val Met Ala
    610                 615                 620

Arg Ala Val Pro Pro Gly Val Pro
625                 630
```

<210> 563
<211> 282
<212> PRT
<213> Phormidesmis priestleyi

<400> 563

```
Met Ala Trp Gln Glu Gly Arg Gly Glu Gly Glu Pro Trp Asn Leu His
1               5                   10                  15


Arg Leu Val Val Ser Cys Ala Ile Asp Thr Asp Ser Trp Ala Gln Glu
            20                  25                  30


Gly Thr Glu Gln Ile Arg Gln Lys Lys Ala Ser Glu Cys Ala Glu Ile
        35                  40                  45


Ile Ala Cys Asn Lys Val Lys Lys Asn Leu Ser Lys Asp Gln Glu Ala
    50                  55                  60


Phe Leu Lys Arg Arg Glu Thr Met Leu Ala Leu Leu Asp Asn Pro Phe
65                  70                  75                  80


Pro Arg Pro Ser Arg Pro Leu Tyr Gln Gly Gln Pro Ser Ile Leu Ala
                85                  90                  95


Gly Val Ser Tyr Gly Leu Asp Lys Pro Ala Thr Leu Ala Ile Ile Asp
            100                 105                 110


Ile Gln Thr Gly Lys Ala Ile Thr Tyr Arg Ser Ile Arg Gln Leu Leu
        115                 120                 125


Gly Glu Asn Tyr Lys Leu Leu Asn Arg Tyr Arg Leu Gln Gln Gln Arg
    130                 135                 140


Asn Ala His Gln Arg His Lys Asn Gln Gln Lys Gly Ala Phe Asn Arg
145                 150                 155                 160


Phe Gly Glu Ser Asn Ser Gly Lys His Leu Asp Arg Leu Ile Ala His
```

```
                165                 170                 175

Glu Ile Val Ala Ile Ala Gln Lys Tyr Gln Val Ser Ser Leu Ile Leu
            180                 185                 190

Pro Asp Leu Ser Asp Ile Arg Glu Ile Val Gln Gly Glu Val Gln Ala
        195                 200                 205

Arg Ala Glu Gln Glu Ile Pro Gly Ser Ile Glu Leu Gln Arg Gln Tyr
    210                 215                 220

Ala Leu Gln Tyr Arg Ala Ser Val His Arg Trp Arg His Ala Gln Leu
225                 230                 235                 240

Ser Gln Cys Ile Gly Ser Gln Ala Ala Gln Val Gly Ile Ser Ile Glu
                245                 250                 255

Val Val Lys Gln Pro Phe Thr Gly Thr Pro Gln Glu Lys Pro Lys Asn
            260                 265                 270

Leu Ala Ile Ala Ala Tyr Gln Ser Arg Lys
        275                 280
```

<210> 564
<211> 529
<212> PRT
<213> Lyngbya confervoides

<400> 564

```
Met Glu Arg Arg Ala Ile Cys His Leu Leu Arg His Asp Leu Lys Val
1               5                   10                  15

Ile Glu Glu Glu Asp Thr Pro Asp Thr Ile Gln His Val Ile Asp Arg
            20                  25                  30

Lys Arg Ile Glu Ile Glu Arg Leu Thr Glu Gln Leu Gln Ser Arg Leu
        35                  40                  45
```

```
Pro Lys Gly Arg Asp Pro Asn His Glu Arg Phe Val Glu Lys Leu Glu
    50                  55                  60

Ile Ala Val Ala Leu Pro Asp Cys Ser Pro Glu His Trp Asp Pro Glu
65                  70                  75                  80

Glu Phe Asp Glu Trp Arg Ile Gln Lys Gln Ile Ser Glu Leu Asn Thr
                85                  90                  95

Leu Pro Tyr Pro Ile Leu Phe Gly Ser Ala Ser Asp Leu Tyr Trp Asp
            100                 105                 110

Ile Leu Asp Asn Thr Thr Ser Ala Thr Thr Val Ser Ala Gln Lys Lys
        115                 120                 125

Ser Arg Lys Ser Lys Arg Pro Asn Glu Arg Leu Gln Val Arg Phe Lys
    130                 135                 140

Gly Leu Asp Glu His Lys Leu Arg Ile Gln Cys Asp Arg Arg Gln Leu
145                 150                 155                 160

Lys Ile Phe Arg Gln Phe Ser Thr Asp Tyr Ile Ser Asn Lys Leu Leu
                165                 170                 175

Pro Lys Asp Glu Lys Phe Gly Glu Gly Leu Cys Ala Leu Arg Ser Ala
            180                 185                 190

Cys Leu Ile Trp Lys Ala Asp Pro Glu Ala Ser Ala Asn Arg Lys Asn
        195                 200                 205

Arg Gln Lys Ala Ser Leu Arg Lys Asp Ser Arg Leu Arg Glu Leu Leu
    210                 215                 220

Glu Gln Asn Lys Val Cys Leu Ile Asp Tyr Pro Trp Glu Thr His Arg
225                 230                 235                 240

Leu Tyr Leu His Cys Thr Phe Asp Ser Arg Leu Leu Thr Gln Gln Gly
                245                 250                 255
```

```
Thr Glu Gln Val Arg Leu Gln Lys Leu Glu Ala Ala Gln Lys Ser Val
            260                 265                 270

Glu Lys Ile Lys Glu Arg Gln Ala Gly Asp Pro Ser Ile Thr Leu Thr
        275                 280                 285

Glu Asn Glu Lys Ala Arg Phe Lys Ala Lys Gln Thr Ser Ile Ser Arg
    290                 295                 300

Leu Glu Arg Asn Arg Pro Pro Glu Arg Pro Glu Cys Gln Ile Tyr Gln
305                 310                 315                 320

Pro Asn Pro Asn Ile Val Leu Gly Val Ser Leu Ser Arg His Glu Pro
                325                 330                 335

Val Thr Val Val Val Phe Asn Lys Glu Lys Asn Gln Val Leu Glu Cys
            340                 345                 350

Cys Ser Thr Glu Ser Leu Leu Lys Arg Arg Gly Ile Ile Ser Pro Arg
        355                 360                 365

Asn Lys Gln Ser Ile Val Lys Leu Gln His Glu Gln Gln Gln Leu Leu
    370                 375                 380

Arg Arg Trp Arg Arg Gln Arg His Tyr Asn Leu Tyr Gln Arg Pro Glu
385                 390                 395                 400

Glu Gln Lys Gln Gly Asp Tyr His Gln His Asp Ala Glu Ser Gln Leu
                405                 410                 415

Gly Asp Tyr Leu Asp Arg Leu Ile Ala Ala Arg Val Thr Glu Leu Ala
            420                 425                 430

Val Arg Arg Gln Ala Ile Ala Ile Val Leu Pro Gly Leu Gln Asn Ile
        435                 440                 445
```

```
Arg Glu Gly Val Glu Ser Asp Ile Gln Ala Arg Ala Lys Lys Lys His
    450                 455                 460

Pro His His Lys Lys Leu Gln Ala Gln Tyr Ala Lys Gln Tyr Arg Arg
465                 470                 475                 480

Glu Phe His Arg Trp Ser Phe Gly Arg Leu Gly Gln Tyr Ile Thr Glu
                485                 490                 495

Ala Ala Lys Gln Gln Gly Ile Val Ile Tyr Lys Gly Trp Gln Pro Lys
            500                 505                 510

His Gly Asn Glu Gln Glu Lys Ala Met Ala Val Ile Thr Ser Ala Thr
        515                 520                 525

Thr
```

<210> 565
<211> 286
<212> PRT
<213> Geminocystis sp. NIES-3708

<400> 565

```
Met Ile Ile Trp Lys Glu Asp Asp Gly Lys Gly Glu Leu Trp Asp Lys
1               5                   10                  15

His Lys Leu Tyr Leu His Cys Thr Phe Glu Thr Tyr Cys Leu Thr Ala
            20                  25                  30

Glu Gly Thr Ser Ala Ile Ala Gln Glu Lys Gln Glu Glu Val Thr Lys
        35                  40                  45

Ile Ile Asn Ile Met Lys Ala Lys Glu Glu Leu Thr Asp Thr Gln Lys
    50                  55                  60

Gly Phe Ile Arg Arg Lys Asn Ser Thr Leu Gly Lys Leu Asn Asn Thr
65                  70                  75                  80
```

```
Phe Leu Arg Pro Ser Lys Pro Leu Tyr Gln Gly Lys Ser Asn Ile Tyr
                85                  90                  95

Leu Gly Ile Ala Met Gly Leu Glu Gln Pro Val Thr Ile Ala Ile Val
            100                 105                 110

Asp Ile Glu Thr Asp Lys Val Ile Thr Tyr Gln Asn Pro Lys Gln Leu
        115                 120                 125

Leu Gly Val Asp Tyr Arg Leu Leu Arg Arg Gln Arg Thr Glu Lys Gln
    130                 135                 140

Lys Leu Ser His Gln Ser His Lys Ala Arg Lys Arg Phe Asn Phe Gln
145                 150                 155                 160

Gln Lys Gly Glu Ser Asn Leu Gly Glu Tyr Ile Asp Leu Leu Ile Ala
                165                 170                 175

Lys Ala Ile Leu Thr Val Ala Gln Glu Tyr Gln Val Ser Lys Ile Ile
            180                 185                 190

Ile Pro Arg Leu Lys Asp Met Arg Ser Ile Thr Glu Ala Lys Ile Gln
        195                 200                 205

Leu Arg Ala Glu Lys Arg Ile Pro Glu Tyr Lys Glu Gly Gln Lys Lys
    210                 215                 220

Tyr Ala Gln Asp Tyr Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg
225                 230                 235                 240

Leu Ile Glu His Val Arg Ala Ile Ala Leu Lys Val Gly Ile Val Val
                245                 250                 255

Val Glu Ala Lys Gln Pro Lys Gln Gly Thr Phe Thr Glu Lys Ala Leu
            260                 265                 270

Gln Leu Val Leu Ser Asn Thr Glu Lys Asn Leu Lys Lys Lys
```

275 280 285

<210> 566
<211> 287
<212> PRT
<213> Nostoc sp. 'Peltigera membranacea cyanobiont' 232

<400> 566

Met Leu Trp Gln Gln Gly Glu Gly Lys Gly Glu Pro Trp Lys Val His
1 5 10 15

Lys Leu Ala Leu His Cys Thr Tyr Asp Ala Arg Leu Trp Thr Ala Glu
20 25 30

Gly Thr Glu Glu Val Arg Lys Glu Lys Thr Asp Lys Ala Gln Lys Arg
35 40 45

Val Ser Lys Ala Glu Lys Asn Glu Lys Leu Asp Asn Ala Gln Gln Thr
50 55 60

Gln Leu Asn Lys Asp Lys Ser Ser Leu Ser Arg Leu Asn Asn Ser Phe
65 70 75 80

Asn Arg Pro Gly Lys Leu Ile Tyr Gln Gly Gln Ser Asn Ile Ile Val
85 90 95

Gly Ile Ser Phe His Pro Ile Glu Leu Ala Thr Ile Ala Ile Val Asp
100 105 110

Ile Asn Thr Lys Lys Val Leu Ala Cys Asn Thr Val Lys Gln Leu Leu
115 120 125

Gly Asn Gly Phe His Leu Leu Ser Arg Arg Arg Arg Gln Gln Val His
130 135 140

Leu Asn Lys Glu Arg Arg Lys Ala Gln Lys Lys Asp Ser Pro Cys Asn
145 150 155 160

```
Ile Gly Glu Ser Lys Leu Gly Glu Tyr Ile Asp Lys Leu Leu Ala Asn
                165                 170                 175


Arg Ile Val Glu Ile Ala Lys Ser Tyr Gln Ala Gly Cys Ile Ile Leu
            180                 185                 190


Pro Arg Leu Lys Asp Ile Lys Glu Ile Arg Thr Ser Ala Ile Gln Ala
        195                 200                 205


Lys Ala Glu Thr Lys Ile Pro Gly Asp Val Asn Gly Gln Lys Leu Tyr
    210                 215                 220


Val Lys Glu Tyr Asn Arg Gln Ile His Asn Trp Ser Tyr Asn Arg Leu
225                 230                 235                 240


Gln Glu Ser Ile Lys Ser Lys Ala Ala Glu Leu Lys Ile Ser Ile Glu
                245                 250                 255


Phe Gly Ile Gln Pro His Ser Gly Thr Leu Glu Glu Gln Ala Arg Asp
            260                 265                 270


Leu Ala Phe Tyr Ala Tyr Gln Ser Arg Asn His Thr Leu Gly Arg
        275                 280                 285


<210>  567
<211>  330
<212>  PRT
<213>  Phormidesmis priestleyi

<400>  567

Met Ser Phe Ile Thr Val Gln Cys Arg Leu Val Ala Ser Glu Glu Ile
1               5                   10                  15


Arg Gln Gln Leu Trp His Leu Met Ala Asp Lys Asn Thr Pro Leu Val
            20                  25                  30


Asn Lys Leu Leu Lys Ser Val Ser Gln His Asp Asp Phe Glu Val Trp
        35                  40                  45
```

```
Gln Arg Asn Gly Thr Val Pro Asp Lys Ser Val Arg Glu Leu Cys Asn
    50                  55                  60

Pro Leu Lys Val His Pro Gln Phe Glu Glu Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ser Leu Ile Val Thr Tyr Thr Tyr Gln Ser Trp Leu Glu
                85                  90                  95

Leu Gln Arg Lys Arg Arg Arg Ser Leu Asp Gly Arg Gln Arg Trp Leu
            100                 105                 110

Asn Val Val Lys Ser Asp Ala Glu Leu Val Gln Met Ser Gly Cys Asn
        115                 120                 125

Ile His Thr Ile Gln Asn Lys Ala Lys Glu Ile Leu Ala Gln Leu Asn
    130                 135                 140

Val Gln Ser Pro Gly Ala Gln Asn Gln Pro Lys Gln Lys Arg Lys Lys
145                 150                 155                 160

Lys Gln Asn Ser Lys Ala Asn Gly Asp Leu Met Ser Ala Leu Phe Gln
                165                 170                 175

Ala Tyr Glu Thr Val Asp Asp Ala Leu Ser Arg Cys Ala Ile Ala His
            180                 185                 190

Leu Leu Lys Asn Asp Cys Gln Val Cys Glu Gln Glu Glu Asp Pro Glu
        195                 200                 205

Ala Phe Ala Gln Arg Ile His Gly Lys Gln Arg Arg Ile Lys Glu Leu
    210                 215                 220

Glu Ala Gln Leu Ala Ser Arg Leu Pro Lys Gly Arg Asp Leu Thr Gly
225                 230                 235                 240

Glu Glu Phe Leu Glu Val Leu Ser Thr Ala Thr Ala Lys Val Pro Asp
```

```
                245                 250                 255

Asp Thr Ile Glu Gln Met Leu Trp Gln Ala Lys Leu Leu Ala Lys Pro
            260                 265                 270

Ala Thr Leu Leu Tyr Pro Ile Ile Phe Gly Ser Gln Thr Asp Leu Arg
        275                 280                 285

Trp Ser Thr Asn Glu Lys Gly Arg Ile Cys Val Ala Phe Lys Ala Arg
    290                 295                 300

Glu Gln Thr Arg Gly Gly Thr Leu Ala Ser Lys Leu Pro His Leu Thr
305                 310                 315                 320

Leu Leu Phe Arg Tyr Ser Ala Leu Glu Gly
                325                 330
```

<210> 568
<211> 300
<212> PRT
<213> Scytonema hofmanni

<400> 568

```
Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Asp Asp Thr
1               5                   10                  15

His Arg Gln Leu Trp Glu Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Glu Gln Leu Ala Gln His Thr Asp Phe Asp Lys Trp
        35                  40                  45

Leu Lys Gln Gly Glu Val Ser Lys Glu Ala Ile Glu Thr Ile Gln Lys
    50                  55                  60

Ser Leu Ile Thr Gln Glu Arg Phe Ala Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80
```

```
Thr Ser Ala Val Thr Leu Val Lys Glu Ile Tyr Lys Ser Trp Phe Ala
                85                  90                  95

Leu Gln Gln Gln Arg Gln Arg Lys Ile Glu Gly Lys Glu Arg Trp Leu
            100                 105                 110

Lys Met Leu Lys Ser Asp Ile Glu Leu Gln Gln Glu Ser Gln Ser Ser
        115                 120                 125

Leu Asp Ile Ile Arg Asn Lys Ala Asn Glu Ile Leu Asn Ser Phe Val
    130                 135                 140

Ala Lys Phe Thr Gln Pro Ile Lys Gln Pro Ser Lys Thr Lys Lys Gly
145                 150                 155                 160

Lys Lys Lys Lys Lys Thr Lys Asp Ser Thr Leu Phe Lys Ala Leu Phe
                165                 170                 175

Asp Leu Tyr Asp Lys Thr Glu Asp Ser Leu Ser Lys Cys Ala Ile Ala
            180                 185                 190

Tyr Leu Leu Lys Asn Asp Cys Gln Val Ser Glu Leu Asp Glu Glu Gln
        195                 200                 205

Val Gln Tyr Ala Gln Arg Arg Arg Arg Lys Glu Ile Glu Ile Gln Arg
    210                 215                 220

Leu Arg Glu Gln Leu Lys Ser Arg Lys Pro Lys Gly Arg Asp Leu Thr
225                 230                 235                 240

Gly Glu Lys Trp Leu Thr Thr Leu Glu Glu Ala Thr Asn Gln Val Pro
                245                 250                 255

Leu Asp Glu Phe Glu Ala Lys Ser Trp Gln Ala Ser Leu Leu Lys Val
            260                 265                 270

Thr Ser Asp Ile Pro Tyr Pro Val Asp Tyr Glu Thr Asn Thr Asp Leu
        275                 280                 285
```

```
Asp Trp Leu Ile Tyr Ser Tyr Pro Phe Arg Gly Gly
    290                 295                 300


<210>  569
<211>  269
<212>  PRT
<213>  Lyngbya sp. PCC 8106

<400>  569

Met Ser Ile Ile Thr Val His Cys Arg Leu Val Ala Pro Gln Asn Val
1               5                   10                  15


Arg Gln Gln Leu Trp Lys Leu Met Ser Asp Arg Asn Thr Pro Leu Val
            20                  25                  30


Asn Glu Leu Ile Ala Gln Ile Ser Gln His Pro Asp Phe Glu Thr Trp
        35                  40                  45


Arg Arg Lys Gly Lys Ile Pro Ala Gly Ile Val Lys Lys Leu Cys Glu
    50                  55                  60


Pro Leu Arg Ser Asp Pro Arg Phe Glu Gly Gln Pro Gly Arg Phe Tyr
65                  70                  75                  80


Thr Ser Ala Ile Ser Leu Val Asp Tyr Ile Phe Lys Ser Trp Leu Ala
                85                  90                  95


Val Gln Gln Arg Leu Gln Arg Lys Leu Asp Arg Lys Ile His Trp Leu
            100                 105                 110


Ser Met Leu Lys Ser Asp Glu Glu Leu Val Ala Glu Ser Asn His Thr
        115                 120                 125


Leu Glu Glu Ile Arg Ala Tyr Ala Thr Glu Ile Leu Ser Ser Val Glu
    130                 135                 140


Thr Gln Lys Asn Gln Pro Ser Pro Lys Lys Ser Pro Arg Lys Ser Pro
```

```
145                 150                 155                 160

Arg Lys Gly Lys Ile Lys Lys Asn Lys Gly Ser Gln Ser Pro Thr Asp
                165                 170                 175

Ile Leu Phe Glu Thr Tyr Asn Lys Thr Glu Asp Ile Leu Ser Arg Ser
            180                 185                 190

Ala Ile Cys Tyr Leu Leu Lys Asn Arg Leu Lys Met Ser Glu Lys Pro
        195                 200                 205

Glu Glu Ile Glu Lys Phe Ser Gln Arg Tyr Arg Lys Lys Glu Ile Glu
    210                 215                 220

Ile Gln Arg Leu Lys Glu Gln Leu Glu Gly Arg Leu Pro Gln Gly Arg
225                 230                 235                 240

Asp Leu Thr Gly Gln Lys Trp Leu Glu Thr Leu Ile Thr Ala Thr Thr
                245                 250                 255

Thr Val Pro Lys Asp Asn Pro Glu Ala Lys Ser Tyr Tyr
            260                 265
```

<210> 570
<211> 260
<212> PRT
<213> Leptolyngbya boryana

<400> 570

```
Met Asn His Leu Ala Leu Tyr Cys Thr Phe Asp Thr Arg Leu Met Ser
1               5                   10                  15

Ala Glu Gly Thr Leu Glu Ala Gln Gln Glu Lys Val Ala Lys Thr Leu
            20                  25                  30

Lys Lys Leu Thr His Pro Asn Pro Asp Pro Arg Asn His Ser Thr Leu
        35                  40                  45
```

```
Asp Arg Leu Gln Asn Leu Pro Glu Arg Pro Ser Arg Thr Pro Tyr Val
    50                  55                  60

Gly Asn Pro Glu Ile Leu Val Gly Ile Ser Ile Gly Leu Ala Asp Pro
65                  70                  75                  80

Ile Thr Val Ala Val Val Asn Gly Arg Thr Gly Glu Ile Leu Ala Tyr
                85                  90                  95

Arg Thr Pro Arg Ala Leu Leu Gly Glu Gln Tyr His Leu Leu Asn Arg
            100                 105                 110

His Arg Lys Glu Gln Gln His Arg Leu Gln Arg His Lys Asn Gln Gln
        115                 120                 125

Arg Gly Val Ala Tyr Gln Pro Ser Glu Ser Glu Leu Gly Gln Tyr Val
    130                 135                 140

Asp Gln Leu Leu Ala Asn Ser Thr Ile Asp Leu Ala Arg Thr Tyr Gln
145                 150                 155                 160

Ala Gly Ser Ile Val Val Pro Asn Leu Lys Asn Val Arg Asp Leu Leu
                165                 170                 175

Ala Ser Glu Ile Gln Ala Arg Ala Glu Gln Lys Cys Pro Gly Ser Val
            180                 185                 190

Ala Ala Gln Lys Gln Tyr Ala Lys Ala Tyr Arg Gln Ala Ile His Gln
        195                 200                 205

Trp Ser Tyr Asn Arg Leu Ile Gln Ala Ile Cys Ser Gln Ala Thr Gln
    210                 215                 220

Arg Gly Ile Thr Val Glu Val Gly Ser Gln Pro Leu Lys Gly Asn Pro
225                 230                 235                 240

Gln Glu Leu Ala Lys Asp Ile Ala Ile Ala Ala Tyr Tyr Ala Arg Ala
                245                 250                 255
```

Ile Thr Ala Lys
260

<210> 571
<211> 211
<212> PRT
<213> Phormidesmis priestleyi

<400> 571

Met Leu Ala Leu Leu Asp Asn Pro Phe Pro Arg Pro Ser Arg Pro Leu
1 5 10 15

Tyr Gln Gly Gln Pro Ser Ile Leu Ala Gly Val Ser Tyr Gly Leu Asp
20 25 30

Lys Pro Ala Thr Leu Ala Ile Ile Asp Ile Gln Thr Gly Lys Ala Ile
35 40 45

Thr Tyr Arg Ser Ile Arg Gln Leu Leu Gly Glu Asn Tyr Lys Leu Leu
50 55 60

Asn Arg Tyr Arg Leu Gln Gln Gln Arg Asn Ala His Gln Arg His Lys
65 70 75 80

Asn Gln Gln Lys Gly Ala Phe Asn Arg Phe Gly Glu Ser Asn Ser Gly
85 90 95

Lys His Leu Asp Arg Leu Ile Ala His Glu Ile Val Ala Ile Ala Gln
100 105 110

Lys Tyr Gln Val Ser Ser Leu Ile Leu Pro Asp Leu Ser Asp Ile Arg
115 120 125

Glu Ile Val Gln Gly Glu Val Gln Ala Arg Ala Glu Gln Glu Ile Pro
130 135 140

Gly Ser Ile Glu Leu Gln Arg Gln Tyr Ala Leu Gln Tyr Arg Ala Ser

```
145                 150                 155                 160


Val His Arg Trp Arg His Ala Gln Leu Ser Gln Cys Ile Gly Ser Gln
                165                 170                 175


Ala Ala Gln Val Gly Ile Ser Ile Glu Val Val Lys Gln Pro Phe Thr
            180                 185                 190


Gly Thr Pro Gln Glu Lys Pro Lys Asn Leu Ala Ile Ala Ala Tyr Gln
        195                 200                 205


Ser Arg Lys
    210


<210>  572
<211>  453
<212>  PRT
<213>  filamentous cyanobacterium CCP1

<400>  572

Met Val Lys Tyr Thr Leu Leu Val Asn Arg Leu Leu Glu Gln Val Gly
1               5                   10                  15


Gln Leu Ser Glu Phe Lys Gln Trp Gln Glu Lys Gly Ser Ile Ser Lys
            20                  25                  30


Glu Pro Val Lys Gln Leu Cys Asp Ala Leu Lys Lys His His Ala Glu
        35                  40                  45


Phe Gln Gly Leu Pro His Arg Phe Tyr Ile Ser Ala Lys Leu Met Val
    50                  55                  60


Thr Tyr Thr Phe Glu Ser Trp Leu Ala Leu Gln Gln Arg Arg Arg Arg
65                  70                  75                  80


Lys Ile Asp Gly Lys Arg Arg Trp Leu Asn Arg Val Glu Asp Asp Ile
                85                  90                  95
```

```
Glu Leu Ala Lys Val Thr Asp Phe Ser Pro Glu Met Ile Gln Asn Arg
            100                 105                 110

Ala Arg Lys Ile Leu Ala Glu Ile His Pro Ser Asn Pro Val Glu Pro
        115                 120                 125

Glu Pro Glu Thr Ser Ser Asp Asn Glu Ile Asn Glu Gly Glu Asn Cys
    130                 135                 140

Gln Glu Glu Glu Glu Met Asn Gln Pro Lys Ser Leu Leu Ser Cys Leu
145                 150                 155                 160

Phe Asp Leu Tyr Asp Ser Thr Glu Asp Ala Leu Thr Leu Arg Ala Ile
                165                 170                 175

Val His Leu Leu Lys Asn Asn Gly Glu Val Asn Glu Glu Asp Glu Asp
            180                 185                 190

Pro Lys Lys Leu Glu Leu Arg Leu Ala Ala Lys Arg Glu Glu Ile Gln
        195                 200                 205

Arg Leu Glu Lys Gln Leu Gln Gly Arg Leu Pro Lys Gly Arg Asp Pro
    210                 215                 220

Thr Gly Glu Thr Thr Thr Arg Phe Leu Glu Glu Ala Ile Lys Leu Pro
225                 230                 235                 240

Glu His Pro Thr Ala Tyr Pro Pro Arg Phe Leu Leu Asn Ala Phe Tyr
                245                 250                 255

Cys Tyr Ala Leu Leu Pro Met Pro Tyr Ile Gln Tyr Gly Val Tyr Leu
            260                 265                 270

Leu Asn Ala Ile Leu Asp Glu Ala Arg Ile Val Glu Ser Asp Phe Ile
        275                 280                 285

Thr Trp Arg Asp Thr Ile Ala Glu His Leu Val Asn Ala Ala Lys Arg
    290                 295                 300
```

```
Pro Asn Ser Leu Pro Tyr Pro Leu Ile Phe Gly Ser Thr Ser Asp Leu
305                 310                 315                 320


Val Trp Glu Ser Glu Ser Lys Arg Lys Gly Pro Asn Ala Pro Asp Thr
                325                 330                 335


Glu Gly Ala Leu Glu Gln Ser Gly Ala Lys Ser Ser Arg Lys Arg Pro
            340                 345                 350


Ser Lys Arg Lys Arg Thr Arg Leu Lys Thr Gln Ser Asp Glu Arg Ile
        355                 360                 365


Thr Val Arg Phe His Gly Met Ser Gln Tyr Arg Phe Lys Ile Tyr Cys
    370                 375                 380


Asp Arg Arg Gln Leu Pro Ile Phe Arg Gln Phe Leu Thr Asp Tyr Cys
385                 390                 395                 400


Thr His Lys Ala Leu Asp Glu Glu Asn Lys Phe Ser Met Gly Leu Phe
                405                 410                 415


Ala Leu Arg Ser Ala Ser Leu Ile Trp Lys Lys Asp Lys Gln Arg Pro
            420                 425                 430


His Lys Arg Asn Ser Ser Glu Pro Val Glu Pro Leu Ser Pro Trp Gln
        435                 440                 445


Thr His Arg Leu Tyr
    450


<210>  573
<211>  825
<212>  PRT
<213>  Leptolyngbya frigida

<400>  573

Met Gln Met Arg Thr Ile Lys Thr Asp Ser Ile Val Arg Ile Thr Gln
```

```
1               5                   10                  15

Arg Arg Lys Arg Lys Gly Val Thr Glu Asp Leu Pro Ser Phe Asp Glu
            20                  25                  30

Ala Ala Trp Cys Arg Leu Cys Glu Phe Ser Tyr Lys His Thr Leu Leu
        35                  40                  45

Val Asp Thr Ile Val Ser Gln Ile Lys Gln His His Lys Leu Ile Asn
    50                  55                  60

Trp Ile Arg Ser Ser Gln Glu Leu Gln Arg Gln Asp Asp Thr Thr Gln
65                  70                  75                  80

Glu Thr Glu Ala Lys Gln Gly Gln Asn Gly Leu Pro Glu Gly Leu Val
                85                  90                  95

Lys Ala Leu Cys Asp Ala Leu Ala Ser Thr Pro Gln Phe Ser Lys Met
            100                 105                 110

Ser Gly Arg Phe Tyr Thr Ser Ala Ile Asp Arg Val Glu Glu Leu Phe
        115                 120                 125

Lys Gly Trp Phe Ala Ala His Gln Lys Leu Ile His Lys Ile Arg Gly
    130                 135                 140

Lys Arg Arg Trp Leu Ala Val Val Glu Ser Asp Ala Ala Leu Ala Glu
145                 150                 155                 160

Thr Ser Asn Phe Ser Gln Gln Glu Ile Glu Ile Arg Ala Ala Gln Ile
                165                 170                 175

Leu Ala Glu Leu Glu Ala His Asn Gly Thr Asn Ala Gly Ser Asn Asp
            180                 185                 190

His Val Asp Phe Asn Thr Leu Phe Gln Lys Phe Asp Glu Thr Glu Glu
        195                 200                 205
```

```
Thr Leu Ala Arg Arg Ala Ile Ile His Leu Leu Lys Asn Gly Gly Lys
    210                 215                 220

Thr His Ala Glu Val Lys Lys Pro Arg Lys Arg Lys Arg Lys Gly Lys
225                 230                 235                 240

Ser Ile Ser Thr Gln Pro Leu Thr Leu Thr Glu Arg Leu Glu Ala Gln
                245                 250                 255

Arg Val Gly Ile Glu Arg Leu Glu Lys Gln Leu Leu Gly Gln Leu Pro
            260                 265                 270

Arg Ala Arg Asn Leu Phe Pro Glu Gln Ala Phe Glu His His Leu Glu
        275                 280                 285

Ala Val Ile Ala Met Pro Asn Ser Asp Ala Thr Glu Leu Glu Arg Tyr
    290                 295                 300

Tyr Phe Leu Tyr Phe Ser Leu Leu Leu Tyr Leu Ala Asp Ala Asn Glu
305                 310                 315                 320

Tyr Leu Gln Leu Glu Arg His Leu Leu Thr Thr Leu Val Leu Gln Trp
                325                 330                 335

Ser Lys Leu Gly Asp Leu His Tyr Tyr Arg Val Leu Ile Tyr Ala Phe
            340                 345                 350

Met Leu His Ala Ala Ser Ala Gln Gln Tyr Leu Gln Leu Gly Ser Tyr
        355                 360                 365

Leu Leu Gln Thr Ile Lys Leu Glu Ala Glu Arg Val Glu Ala Ala Phe
    370                 375                 380

Phe Ala Trp His Glu Ser Ile Thr Pro Lys Leu His Asp Phe Leu Arg
385                 390                 395                 400

Glu Pro Lys Ala Leu Pro Tyr Pro Ile Ser Phe Gly Tyr Asp Asp Val
```

```
                405                 410                 415

Arg Ser Trp Gln Met Asn Gln Lys Gly Lys Ile Phe Phe Lys Leu Asn
            420                 425                 430

Gly Trp Gly Asp Leu Leu Phe Glu Val Arg Cys His His Arg Gln Leu
        435                 440                 445

Pro Leu Ile Lys Thr Phe Leu Lys Asp Trp Gln Thr Lys Asn Ala Ser
    450                 455                 460

Glu Arg Lys Ala Gln Ser Ser Lys Lys Asp Pro Phe Thr Gly Ser Leu
465                 470                 475                 480

Met Leu Leu Arg Ser Ile Glu Leu Ile Trp Lys Pro Lys Glu Ala Ser
                485                 490                 495

Asp Gln Lys Asp Ala Gln Leu Cys Ser His Cys Glu Val Phe Gln Gln
            500                 505                 510

Ser Ser Glu Gln Gly Phe Trp Asn Glu Cys Lys Leu Thr Ile His Trp
        515                 520                 525

Thr Phe Asn Ala Glu Ala Leu Thr Arg Gln Gly Ser Glu Lys Met Arg
    530                 535                 540

Gln Arg Lys Leu Glu Leu Gln Leu Gln Gln Leu Gln Ala Lys Gln Ala
545                 550                 555                 560

Lys Leu Glu Gln Gln Gln Asp Arg Leu Asp Lys Leu Glu Gln Ala Ala
                565                 570                 575

Pro Glu Ala Ala Lys Ser Gln Glu Gln Leu Lys Arg Ile Arg Asn Leu
            580                 585                 590

Lys Lys Gln Ile Gln Gln Leu Gln Glu Asp Leu Ala Lys Leu Arg Pro
        595                 600                 605
```

```
Lys Leu Ala Cys Leu Gln Ala Ala Gln Pro Phe Gly Arg Pro Asp Arg
    610                 615                 620

Pro Leu Tyr Glu Gly Val Pro Asn Ile Phe Val Gly Val Leu Leu Asp
625                 630                 635                 640

Leu Asp Thr His Leu Ala Val Thr Val Val Asp Ala Met Arg Arg Lys
                645                 650                 655

Arg Leu Ala Leu Arg Ser Ala Pro Lys Ile Ser Ser Glu Gly Tyr Arg
            660                 665                 670

Leu Leu Gln Lys Tyr Phe Arg Gln Arg Gln Glu His Ser Lys Gln Arg
        675                 680                 685

Gln Glu Asp Gln Gln Ala Gln Arg Tyr Ser His Gln Thr Glu Ser Gly
    690                 695                 700

Leu Gly Gln Gln Val Asp Arg Leu Phe Ala Lys Gly Leu Val Glu Leu
705                 710                 715                 720

Ala Gln Ala Tyr Lys Ala Ser Thr Ile Val Ile Pro Ile Lys Gly Gly
                725                 730                 735

Trp Arg Glu Arg Leu Tyr Ser Gln Leu Val Ala Arg Ala Lys Leu Lys
            740                 745                 750

Cys Asn Gly Asn Lys Gln Ala Met Ala Arg Tyr Thr Lys Ala His Gly
        755                 760                 765

Glu Arg Leu His Gln Trp Asp Tyr Asn Arg Leu Ser Gln Ala Ile Thr
    770                 775                 780

Asp Cys Ala Ala Thr His Gly Ile Glu Val Val Leu Gln Lys Thr Val
785                 790                 795                 800

Phe Glu Thr Asp Val Phe Gln Gln Ala Ala Asn Leu Ala Ile Ala Ala
```

```
                805                 810                 815


Tyr Asp Ser Leu Asn Ser Ala Gln Thr
            820                 825


<210>  574
<211>  246
<212>  PRT
<213>  Leptolyngbya boryana

<400>  574

Met Ser Ala Glu Gly Thr Leu Glu Ala Gln Gln Glu Lys Val Ala Lys
1               5                   10                  15


Thr Leu Lys Lys Leu Thr His Pro Asn Pro Asp Pro Arg Asn His Ser
            20                  25                  30


Thr Leu Asp Arg Leu Gln Asn Leu Pro Glu Arg Pro Ser Arg Thr Pro
        35                  40                  45


Tyr Val Gly Asn Pro Glu Ile Leu Val Gly Ile Ser Ile Gly Leu Ala
    50                  55                  60


Asp Pro Ile Thr Val Ala Val Val Asn Gly Arg Thr Gly Glu Ile Leu
65                  70                  75                  80


Ala Tyr Arg Thr Pro Arg Ala Leu Leu Gly Glu Gln Tyr His Leu Leu
                85                  90                  95


Asn Arg His Arg Lys Glu Gln Gln His Arg Leu Gln Arg His Lys Asn
            100                 105                 110


Gln Gln Arg Gly Val Ala Tyr Gln Pro Ser Glu Ser Glu Leu Gly Gln
        115                 120                 125


Tyr Val Asp Gln Leu Leu Ala Asn Ser Thr Ile Asp Leu Ala Arg Thr
    130                 135                 140
```

```
Tyr Gln Ala Gly Ser Ile Val Val Pro Asn Leu Lys Asn Val Arg Asp
145                 150                 155                 160


Leu Leu Ala Ser Glu Ile Gln Ala Arg Ala Glu Gln Lys Cys Pro Gly
                165                 170                 175


Ser Val Ala Ala Gln Lys Gln Tyr Ala Lys Ala Tyr Arg Gln Ala Ile
            180                 185                 190


His Gln Trp Ser Tyr Asn Arg Leu Ile Gln Ala Ile Cys Ser Gln Ala
        195                 200                 205


Thr Gln Arg Gly Ile Thr Val Glu Val Gly Ser Gln Pro Leu Lys Gly
    210                 215                 220


Asn Pro Gln Glu Leu Ala Lys Asp Ile Ala Ile Ala Ala Tyr Tyr Ala
225                 230                 235                 240


Arg Ala Ile Thr Ala Lys
                245
```

<210> 575
<211> 252
<212> PRT
<213> Phormidesmis priestleyi

<400> 575

```
Met Glu Gln Lys Arg Gln Glu Gly Ile Ser Arg Leu Lys Lys Gln Leu
1               5                   10                  15


Glu Glu Ala Lys Asp Pro Glu Glu Leu Thr Glu His Gln Gln Ala Tyr
            20                  25                  30


Leu Lys Arg Gln Gln Ser Thr Leu Thr Arg Leu Gln Cys Leu Pro Gln
        35                  40                  45


Arg Gln Gly Lys Pro Arg Tyr Gln Gly Gln Pro Asp Ile Phe Val Gly
    50                  55                  60
```

```
Val Ser Ile Gly Leu Ile Asn Pro Val Thr Val Ala Val Val Asn Val
65                  70                  75                  80

Arg Thr Gly His Val Leu Ala Tyr Arg Ser Val Arg Gln Leu Leu Gly
                85                  90                  95

Asp Asn Tyr Arg Leu Phe Asn Arg His Arg Gln Gln Gln Gln Gln Asn
            100                 105                 110

Ala Leu Lys Arg His Lys Asn Gln Thr Lys Gly Tyr Thr His Gln Pro
        115                 120                 125

Ser Glu Ser Glu Leu Gly Gln Tyr Val Asp Arg Leu Leu Gly Lys Ser
    130                 135                 140

Ile Ile Glu Leu Ala Gln Gln Phe Gln Ala Ser Gly Ile Val Leu Pro
145                 150                 155                 160

His Thr Gln Asn Leu Arg Glu His Leu Ala Ala Glu Ile Asn Ala Arg
                165                 170                 175

Ala Glu Arg Lys Ser Asp Ser Lys Gln Val Gln Asn Lys Tyr Ala Lys
            180                 185                 190

Gln Ala Arg Ile Ser Ile His Arg Trp Ser Tyr Asp Arg Leu Leu Thr
        195                 200                 205

Ala Ile Arg Ala Gln Ala Glu Lys Ala Asp Met Thr Thr Glu Thr Ala
    210                 215                 220

Thr Gln Pro Arg Gln Gly Thr Pro Gln His Lys Ala Arg Asp Val Ala
225                 230                 235                 240

Ile Ala Ala Tyr His Phe Arg Gln Val Ser Ser Asn
                245                 250
```

<210> 576

<211> 204
<212> PRT
<213> Calothrix sp. NIES-4071

<400> 576

```
Met Arg Tyr Leu Gln Thr Gly Asn Leu His Ile Leu Val Gly Val Ser
1               5                  10                  15


Leu Gly Leu Lys Lys Pro Ala Thr Val Ala Ala Val Asp Val Val Ser
            20                  25                  30


Asn Lys Val Leu Ala Tyr Arg Ser Val Lys Gln Leu Leu Gly Gln Asn
        35                  40                  45


Tyr Lys Leu Leu Asn Arg Gln Arg Gln Gln Gln Gln Arg Leu Ala Gln
    50                  55                  60


Lys Arg His Glu Ser Gln Lys Lys Gln Ala Pro Asn Gln Leu Gly Glu
65                  70                  75                  80


Ser Glu Leu Gly Gln Tyr Leu Asp Arg Leu Leu Ala Lys Ser Ile Ile
                85                  90                  95


Asn Phe Ala Val Thr Tyr Gln Ala Ser Ser Ile Ala Leu Pro Lys Leu
            100                 105                 110


Arg Asp Met Arg Glu Ile Ile Gln Ser Glu Ile Gln Ala Lys Ala Glu
        115                 120                 125


Thr Lys Ile Ser Gly Tyr Lys Glu Gly Gln Gln Lys Tyr Ala Lys Glu
    130                 135                 140


Tyr Arg Met Ser Val His Arg Trp Gly Tyr Gly Arg Leu Ile Asp Asn
145                 150                 155                 160


Ile Gln Ala Gln Ala Ala Lys Ala Gly Ile Thr Ile Glu Thr Pro Ser
                165                 170                 175
```

Gln Gln Thr Lys Gly Ser Pro Gln Glu Gln Ala Lys Asp Leu Ala Ile
180 185 190

Cys Ala Tyr Lys Lys Arg Gln Ala Met Leu Asn Lys
195 200

<210> 577
<211> 222
<212> PRT
<213> Geminocystis sp. NIES-3708

<400> 577

Met Ile Cys Tyr His Thr Asn Thr Phe Asn Lys Thr Phe Leu Leu Val
1 5 10 15

Met Ala His Val Thr Ile Gln Cys Arg Leu Ile Ala Ser Gly Asp Thr
20 25 30

Arg Gln Phe Leu Trp Gln Leu Met Thr Glu Lys Asn Thr Pro Leu Ile
35 40 45

Asn Glu Ile Leu Leu Arg Ile Lys Gln His Pro Asp Phe Pro Asp Trp
50 55 60

Arg Ile Lys Lys Lys Leu Pro Lys Tyr Phe Leu Ala Arg Gln Ile Ala
65 70 75 80

Glu Leu Lys Asn Asn Tyr Pro Phe Glu Gly Gln Pro Ser Arg Phe Tyr
85 90 95

Ala Ser Val Asn Lys Ile Ile Ser Tyr Ile Tyr Lys Ser Trp Phe Glu
100 105 110

Val Gln Lys Thr Leu Asp Trp Lys Leu Gln Gly Asn Val Arg Trp Leu
115 120 125

Glu Met Leu Leu Pro Asp Thr Glu Leu Ile Lys His Phe Asp Asn Ser
130 135 140

```
Leu Glu Ser Leu Gln Gln Gln Ala Thr Leu Ile Leu Asp Ser Ile Asp
145                 150                 155                 160


Ser Thr Val Asn Lys Asp Gln Ile Ser Thr Ile Leu Phe Glu Lys His
                165                 170                 175


Asp Lys Thr Lys Lys Pro Asp Ile Arg Ser Ala Ile Ile Tyr Leu Leu
            180                 185                 190


Lys Asn Ala Cys Ala Ile Pro Lys Lys Pro Glu Thr Thr Glu Lys Tyr
        195                 200                 205


Gln Asp Leu Lys Arg Lys Val Glu Ile Lys Ile Thr Arg Leu
    210                 215                 220


<210>  578
<211>  324
<212>  PRT
<213>  Anabaenopsis circularis NIES-21

<400>  578

Met Thr Arg Tyr Cys Gln Asn Asn Ser Thr Gln Pro Ile Leu Arg Thr
1               5                   10                  15


Ile Ser Cys Tyr Leu Ser Gly Arg Glu Glu Ala Leu Arg Lys Ala Trp
            20                  25                  30


Glu Glu Thr Ala Gln Val Asn Thr Pro Leu Ile Val Asp Leu Ile Lys
        35                  40                  45


Ala Val Pro Glu Gln Pro Glu Phe Glu Thr His Lys Glu Thr Gly Thr
    50                  55                  60


Ile Thr Lys Lys Lys Ile Lys Glu Leu Arg Gln Ser Leu Thr Gln Asp
65                  70                  75                  80


Ser Asp Arg Thr Tyr Ser Ser Ala Asp Ser Leu Val Lys Glu Val Tyr
                85                  90                  95
```

```
Ala Ser Trp Leu Lys Leu Tyr Gln Thr Arg Lys Ile Gln Lys Glu Gly
            100                 105                 110

Lys Glu Tyr Phe Leu Lys Asn Ile Leu Lys Ser Asp Ala Glu Leu Val
        115                 120                 125

Glu Lys Ser Asn Cys Glu Leu His Thr Ile Arg Cys Lys Ala Lys Glu
    130                 135                 140

Ile Leu Ser Gln Val Glu Glu Phe Ile Asp Lys Ile Asn Asn Ser Glu
145                 150                 155                 160

Leu Gln Ile Thr Gln Thr Arg Ser Ala Lys Lys Lys Asn Asn Gln Asn
                165                 170                 175

Asn Asn Ser Ile Asn Thr Ile Leu Asn Lys Leu Phe Ser Lys Lys Ile
            180                 185                 190

Asn Lys Ser Val Lys Gln Ser Leu Asn Tyr Thr Leu Tyr Glu Ile His
        195                 200                 205

Arg Glu Ser Ser Asp Ser Leu Thr Gln Cys Ala Val Ala Tyr Leu Ile
    210                 215                 220

Lys Asn Gly Asn Lys Val Asn Glu Ala Glu Glu Asn Leu Val Gln Leu
225                 230                 235                 240

Asn Lys Arg Arg Ala Ala Lys Glu Val Glu Ile Lys Arg Leu Glu Thr
                245                 250                 255

Gln Ile Gln Asn Thr Arg Leu Pro Asn Gly Arg Asp Ile Thr Gly Ala
            260                 265                 270

Lys Ser Ser Gln Ala Phe Asn Asn Leu Ile Asn Gln Val Pro Asn Asp
        275                 280                 285
```

```
Asp Glu Glu Phe Ala Glu Trp Thr Ala Thr Phe Leu Lys Lys Ile Ser
    290                 295                 300

Asn Leu Pro Tyr Pro Ile Asn Tyr Leu Tyr Gly Asp Leu Thr Trp Tyr
305                 310                 315                 320

Lys Asn Glu Lys
```

<210> 579
<211> 304
<212> PRT
<213> Anabaenopsis circularis

<400> 579

```
Met Ser Gly Arg Glu Glu Ala Leu Arg Lys Ala Trp Glu Glu Thr Ala
1               5                   10                  15

Gln Val Asn Thr Pro Leu Ile Val Asp Leu Ile Lys Ala Val Pro Glu
            20                  25                  30

Gln Pro Glu Phe Glu Thr His Lys Glu Thr Gly Thr Ile Thr Lys Lys
        35                  40                  45

Lys Ile Lys Glu Leu Arg Gln Ser Leu Thr Gln Asp Ser Asp Arg Thr
    50                  55                  60

Tyr Ser Ser Ala Asp Ser Leu Val Lys Glu Val Tyr Ala Ser Trp Leu
65                  70                  75                  80

Lys Leu Tyr Gln Thr Arg Lys Ile Gln Lys Glu Gly Lys Glu Tyr Phe
                85                  90                  95

Leu Lys Asn Ile Leu Lys Ser Asp Ala Glu Leu Val Glu Lys Ser Asn
            100                 105                 110

Cys Glu Leu His Thr Ile Arg Cys Lys Ala Lys Glu Ile Leu Ser Gln
        115                 120                 125
```

```
Val Glu Glu Phe Ile Asp Lys Ile Asn Asn Ser Glu Leu Gln Ile Thr
    130                 135                 140

Gln Thr Arg Ser Ala Lys Lys Lys Asn Asn Gln Asn Asn Asn Ser Ile
145                 150                 155                 160

Asn Thr Ile Leu Asn Lys Leu Phe Ser Lys Lys Ile Asn Lys Ser Val
                165                 170                 175

Lys Gln Ser Leu Asn Tyr Thr Leu Tyr Glu Ile His Arg Glu Ser Ser
            180                 185                 190

Asp Ser Leu Thr Gln Cys Ala Val Ala Tyr Leu Ile Lys Asn Gly Asn
        195                 200                 205

Lys Val Asn Glu Ala Glu Glu Asn Leu Val Gln Leu Asn Lys Arg Arg
    210                 215                 220

Ala Ala Lys Glu Val Glu Ile Lys Arg Leu Glu Thr Gln Ile Gln Asn
225                 230                 235                 240

Thr Arg Leu Pro Asn Gly Arg Asp Ile Thr Gly Ala Lys Ser Ser Gln
                245                 250                 255

Ala Phe Asn Asn Leu Ile Asn Gln Val Pro Asn Asp Asp Glu Glu Phe
            260                 265                 270

Ala Glu Trp Thr Ala Thr Phe Leu Lys Lys Ile Ser Asn Leu Pro Tyr
        275                 280                 285

Pro Ile Asn Tyr Leu Tyr Gly Asp Leu Thr Trp Tyr Lys Asn Glu Lys
    290                 295                 300
```

<210> 580
<211> 234
<212> PRT
<213> Phormidesmis priestleyi

<400> 580

```
Met Ala Ile Leu Gln Ser Asp Asp Glu Leu Thr Ile Ala Ser Gln Ser
1               5                   10                  15

Asp Ile Asn Thr Leu Arg Ser Lys Ala Ser Glu Leu Leu Met Gln Leu
            20                  25                  30

Asn His Ser Asp Ser Gln Asp Asn Glu Pro Gln Pro Lys Lys Ala Arg
        35                  40                  45

Ser Lys Lys Lys Gly Lys Lys Glu Ser Lys Gln Pro Gly Ser Ala Ile
    50                  55                  60

Ser Ser Thr Leu Phe Thr Leu Tyr Gly Glu Thr Glu Glu Val Leu Thr
65                  70                  75                  80

Arg Cys Ala Ile Ala Tyr Leu Leu Lys Asn Gly Cys Lys Leu Pro Asp
                85                  90                  95

Arg Phe Glu Asp Pro Lys Lys Phe Ala Lys Arg Arg Arg Lys Thr Glu
            100                 105                 110

Ile Arg Leu Glu Arg Leu Ile Lys Thr Leu Glu Arg Thr Arg Phe Pro
        115                 120                 125

Lys Gly Arg Asp Leu Ser Glu His Thr Trp Leu Glu Thr Leu Thr Lys
    130                 135                 140

Ala Glu Gly Cys Val Pro Lys Asp Asp Asn Glu Ala Ala Asp Trp Gln
145                 150                 155                 160

Ala Lys Leu Leu Thr Glu Pro Ala Thr Leu Pro Phe Pro Val Asn Tyr
                165                 170                 175

Glu Thr Asn Glu Asp Leu His Trp Phe Leu Asn Glu Lys Gly Arg Leu
            180                 185                 190
```

```
Cys Val Asn Phe Asn Gly Leu Gly Glu His Ser Phe Glu Ile Tyr Cys
        195                 200                 205


Asp Gln Arg Val Arg Pro Thr Ala Pro Phe Ser Ser Leu Val Leu Tyr
    210                 215                 220


Ala Lys Ile Phe Val Thr Leu Arg Ser Asn
225                 230


<210>  581
<211>  173
<212>  PRT
<213>  Cyanobacterium sp. IPPAS B-1200

<400>  581

Met Thr Gln Ile Thr Ile Gln Cys Arg Leu Ile Ala Ser Ala Asp Thr
1               5                   10                  15


Arg Gln Phe Leu Trp Met Leu Met Ser Gln Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Ile Leu Thr Arg Ile Arg Glu Asn Pro Asp Phe Ser Gln Trp
        35                  40                  45


Glu Glu Lys Gly Lys Leu Pro Lys Asn Phe Ile Ser Gln Gln Ile Ala
    50                  55                  60


Glu Leu Lys Asn Asp Ser Cys Phe Gln Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80


Ala Ser Val Gly Lys Ile Ile Asp Tyr Ile Tyr Lys Ser Trp Phe Gln
                85                  90                  95


Ile Gln Arg Ile Asn Gln Phe Lys Leu Glu Gly Asn Thr Arg Trp Leu
            100                 105                 110


Lys Met Leu Lys Ser Asp Ala Glu Leu Ile Glu Ser Phe Asp Gly Ser
        115                 120                 125
```

```
Ile Glu Ala Leu Gln Asn Gln Ala Gln Gln Ile Leu Ser Gly Val Asp
    130                 135                 140


Ile Thr Ser Thr Gln Asn Arg Thr Ala Asp Phe Leu Phe Gln Glu Tyr
145                 150                 155                 160


Asn Lys Thr Lys Asp Pro Gln Thr Gln Ser Ala Ile Ala
                165                 170


<210>  582
<211>  178
<212>  PRT
<213>  Geminocystis herdmanii

<400>  582

Met Val Gln Val Thr Ile Gln Ser Arg Leu Ile Ala Ser Ala Asp Thr
1               5                   10                  15


Arg Gln Phe Leu Trp Leu Leu Met Ser Lys Lys Asn Thr Pro Leu Ile
            20                  25                  30


Asn Glu Ile Leu Thr Arg Ile Lys His His Pro Asp Phe Pro Gln Trp
        35                  40                  45


Arg Glu Lys Gly Arg Leu Pro Lys Asn Phe Ile Ala Gln Gln Ile Gln
    50                  55                  60


Glu Leu Lys Asn Asp Ser Arg Phe Gln Gly Gln Pro Ser Arg Phe Tyr
65                  70                  75                  80


Ala Ser Val Gly Lys Ile Ile Asp Tyr Ile Tyr Lys Ser Trp Phe Lys
                85                  90                  95


Val Gln Lys Ser Tyr Lys Ile Gln Leu Glu Gly Asn Ser Arg Trp Leu
            100                 105                 110


Glu Met Leu Lys Pro Asp Ser Leu Leu Ile Glu Ser Phe Asp Gly Ser
        115                 120                 125
```

Met Glu Ala Leu Gln Asn Gln Ala Gln Gln Ile Leu Asp Asn Ile Glu
130 135 140

Thr Thr Ser Thr Gln Glu Gly Ile Val Asp Tyr Leu Phe Gln Lys Tyr
145 150 155 160

Glu Lys Thr Glu Asp Cys Arg Met Arg Asp Ala Ile Ala Gln Arg His
165 170 175

Arg Arg

<210> 583
<211> 139
<212> PRT
<213> Anabaena sp. MDT14b

<400> 583

Met Ser Val Ile Thr Ile Gln Cys Arg Leu Val Ala Glu Glu Asp Ser
1 5 10 15

Leu Arg Gln Leu Trp Glu Leu Met Thr Glu Lys Asn Thr Pro Phe Ile
20 25 30

Asn Glu Ile Leu Leu Gln Ile Gly Lys His Pro Glu Phe Glu Thr Trp
35 40 45

Leu Glu Lys Gly Ser Leu Pro Ala Glu Leu Leu Lys Thr Leu Gly Asn
50 55 60

Ser Leu Lys Thr Gln Glu Pro Phe Thr Gly Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Ile Ala Leu Val Asp Tyr Val Tyr Lys Ser Trp Phe Ala
85 90 95

Leu Gln Lys Arg Arg Lys Asn Gln Ile Gln Gly Lys Gln Arg Trp Leu

```
            100                 105                 110


Lys Met Leu Lys Ser Asp Gln Glu Leu Glu Gln Glu Ser Gln Ser Ser
        115                 120                 125


Leu Glu Val Ile Arg Thr Lys Val Asn Gln Asn
    130                 135


<210>  584
<211>  208
<212>  PRT
<213>  Myxosarcina sp. GI1

<400>  584

Met Gly Val Ser Ile Gly Leu Gln Gln Pro Val Ser Val Ala Val Ile
1               5                   10                  15


Asn Val Pro Thr Gly Glu Val Leu Leu Asp Arg Asp Thr Lys Gln Leu
            20                  25                  30


Leu Asn Lys Pro Val Gln Gln Lys Pro Lys Gln Gly Lys Gln Ala Lys
        35                  40                  45


Arg His Thr Gln Tyr Gly Phe Leu Leu Arg Arg Arg Gln Gln Gln Gln
    50                  55                  60


Glu Asn Asp Phe Lys Arg Gln Gln Ala Gln Ile Lys Ala Gly Asp Asn
65                  70                  75                  80


Arg Phe Gly Glu Ser Asn Leu Gly Glu Tyr Val Asp Arg Leu Leu Ala
                85                  90                  95


Lys Ala Ile Val Glu Ile Ala Ile Asn Tyr Arg Val Ser Ser Ile Val
            100                 105                 110


Met Pro Asp Leu Thr Asn Ile Arg Glu Ile Leu Glu Ser Glu Ile Ala
        115                 120                 125
```

```
Ala Arg Ala Glu Ala Lys Ile Pro Gly Val Lys Lys Ala Gln Lys Leu
    130                 135                 140

Tyr Ala Lys Lys Tyr Arg Gln Asn Ile His Arg Trp Ser Tyr Ala Arg
145                 150                 155                 160

Leu Cys Glu Ala Ile Ala Phe Lys Ala Ala Arg His Asn Ile Ala Ile
                165                 170                 175

Glu Tyr Asp Lys Gln Val Ala Phe Lys Thr Leu Ser Val Met Pro Ala
            180                 185                 190

Lys Asp Leu Ala Leu Ser Val Tyr His Ser Arg Gln Gln Lys His Ser
        195                 200                 205
```

<210> 585
<211> 264
<212> PRT
<213> Leptolyngbya sp. NIES-3755

<400> 585

```
Met Pro Leu Ala Thr Pro Ile Glu Thr Gly Ala Arg Ser Glu Ile Pro
1               5                   10                  15

Lys Asp Ala Arg Thr Lys Ala Gln Ile Arg Glu Leu Lys Asn Leu Arg
            20                  25                  30

Lys Ala Ile Gln Asp Leu Gln Ala Asp Leu Ala Lys Pro Arg Pro Lys
        35                  40                  45

Leu Asp Cys Leu Gln Asn Ser Pro Ser Phe Asp Arg Pro Asp Arg Pro
    50                  55                  60

Leu Tyr Glu Gly Val Pro Asn Ile Phe Val Gly Val Leu Leu Asp Leu
65                  70                  75                  80

Asp Lys His Leu Val Val Thr Val Val Asp Ala Met Arg Arg Lys Val
                85                  90                  95
```

```
Leu Ala Leu Arg Asn Ala Arg Ser Ile Ser Lys Glu Gly Tyr Asp Leu
            100                 105                 110

Leu Gln Arg Tyr Phe Arg Gln Arg Arg Glu His Ser Lys Gln Arg Gln
        115                 120                 125

Ala Asp Gln Lys Ala His Arg Arg Val His Gln Thr Glu Ser Gly Leu
    130                 135                 140

Gly Gln Gln Val Ala Arg Leu Phe Ala Lys Gly Ile Val Glu Leu Ala
145                 150                 155                 160

Gln Gln Tyr Lys Ala Ser Thr Ile Val Ile Pro Glu Thr Asp Gly Trp
                165                 170                 175

Arg Asp Arg Leu Tyr Ser Gln Leu Val Ala Arg Ala Lys Ile Lys Cys
            180                 185                 190

Asn Gly Ser Lys Lys Ala Met Ala Arg Tyr Thr Lys Ala His Gly Glu
        195                 200                 205

Lys Leu His Gln Trp Asp Tyr Ser Arg Leu Ser Gln Ala Ile Val Asp
    210                 215                 220

Arg Ala Thr Thr Asp Gly Leu Lys Val Met Gln Gln Lys Thr Val Tyr
225                 230                 235                 240

Glu Glu Asp Val Phe Gln Gln Val Ala Asn Leu Ala Ile Ala Ala Tyr
                245                 250                 255

Asp Phe Leu Asn Leu Gly Glu Arg
            260
```

<210> 586
<211> 132
<212> PRT
<213> Hassallia byssoidea VB512170

<400> 586

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Ser Ser
1 5 10 15

Arg Gln Gln Leu Trp Glu Leu Met Ala Gln Leu Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Arg Gln Val Ser Gln His Pro Glu Phe Glu Thr Trp
35 40 45

Arg Gln Lys Gly Lys His Pro Thr Gly Ile Val Lys Glu Leu Cys Gln
50 55 60

Pro Leu Lys Ile Asp Pro Arg Phe Ile Gly Gln Pro Gly Arg Phe Tyr
65 70 75 80

Thr Ser Ala Ile Ala Leu Val Asn Tyr Ile Tyr Lys Ser Trp Phe Ala
85 90 95

Leu Met Lys Arg Ser Gln Tyr Gln Leu Glu Gly Lys Ile Arg Trp Leu
100 105 110

Glu Met Leu Asn Ser Arg Pro Leu Ala Lys Val Gly Gln Glu Asp Ser
115 120 125

Val Cys Glu Arg
130

<210> 587
<211> 249
<212> PRT
<213> Nostoc sp. 'Peltigera membranacea cyanobiont' 232

<400> 587

Met Thr Gln Lys Asn Thr Pro Leu Ile Leu Gln Leu Leu Lys Ser Val
1 5 10 15

Ser Glu Gln Pro Glu Phe Glu Ala Asn Lys Glu Lys Gly Glu Ile Thr

```
            20                  25                  30

Lys Lys Glu Ile Val Glu Leu Arg Lys Gly Leu Lys Lys Asn Pro Glu
        35                  40                  45

Phe Glu Glu Gln Ser Gly Arg Leu Arg Ser Ser Ala Glu Ser Phe Val
    50                  55                  60

Lys Glu Val Tyr Ser Ser Trp Leu Thr Leu Tyr Gln Lys Arg Lys Arg
65                  70                  75                  80

Gln Lys Glu Gly Lys Glu Tyr Phe Leu Glu Asn Ile Leu Lys Ser Asp
                85                  90                  95

Val Glu Leu Val Gly Glu Ser Asn Cys Asp Leu Glu Thr Ile Arg Ser
            100                 105                 110

Lys Ala Gln Glu Val Leu Thr Gln Pro Glu Glu Phe Ile Lys Gln Leu
        115                 120                 125

Thr Ile Asn Asp Glu Asp Val Lys Pro Thr Lys Ser Ala Arg Lys Arg
    130                 135                 140

Val Asn Lys Asn Ile Tyr Asn Lys Ser Thr Asp Ala Glu Gln Arg Glu
145                 150                 155                 160

Asp Ser Ser Ser Pro Asn Asn Val Asp Glu Asn Lys Leu Glu Thr Leu
                165                 170                 175

Thr Asn Val Leu Tyr Lys Ile His Lys Gln Thr Gln Asp Ile Leu Thr
            180                 185                 190

Arg Cys Ala Val Ala Tyr Leu Ile Lys Asn His Asn Lys Ile Ser Glu
        195                 200                 205

Leu Glu Glu Asp Val Gln Lys Leu Lys Lys Arg Arg Asn Glu Lys Lys
    210                 215                 220
```

```
Val Glu Ile Lys Arg Leu Glu Asn Gln Ile Gln Asp Asn Arg Leu Pro
225                 230                 235                 240


Ser Gly Arg Asp Lys Leu Leu Arg Ile
                245
```

<210> 588
<211> 130
<212> PRT
<213> Anabaena sp. AL09

<400> 588

```
Met Ala Glu Lys Asn Thr Pro Leu Ile Asn Glu Leu Leu Ser Gln Ile
1               5                   10                  15


Gly Lys His Pro Glu Phe Glu Thr Trp Arg Gln Lys Gly Lys His Pro
            20                  25                  30


Thr Gly Ile Val Lys Glu Leu Cys Glu Pro Leu Lys Ile Asp Pro Arg
        35                  40                  45


Phe Ile Gly Gln Pro Ala Arg Phe Tyr Thr Ser Ala Thr Ala Ser Val
    50                  55                  60


Asn Tyr Ile Tyr Lys Ser Trp Phe Ala Leu Met Lys Arg Phe Gln Ser
65                  70                  75                  80


Gln Leu Asp Gly Lys Leu Arg Trp Leu Glu Met Leu Asn Ser Asp Thr
                85                  90                  95


Glu Leu Val Glu Ala Ser Gly Val Ser Leu Asp Ile Leu Gln Thr Lys
            100                 105                 110


Ser Ala Glu Ile Leu Ala Gln Phe Ala Pro Gln Asn Pro Ala Lys Thr
        115                 120                 125


Gln Pro
    130
```

<210> 589
<211> 128
<212> PRT
<213> Anabaena sp. AL09

<400> 589

Met Ser Ala Pro Asn Gln Phe Gly Asp Ser Glu Leu Gly Glu Tyr Ile
1   5   10   15

Asp Arg Leu Leu Ala Lys Glu Ile Ile Ala Val Ala Gln Thr Tyr Lys
            20   25   30

Ala Gly Ser Ile Val Ile Pro Lys Leu Gly Asp Met Arg Glu Gln Ile
        35   40   45

Gln Ser Glu Ile Gln Ser Lys Ala Glu Gln Lys Ser Asp Ile Ile Glu
    50   55   60

Val Gln Lys Lys Tyr Ala Lys Gln Tyr Arg Val Ser Val His Gln Trp
65   70   75   80

Ser Tyr Gly Arg Leu Ile Ala Asn Val Gln Ser Gln Ala Asn Lys Ala
                85   90   95

Gly Ile Ala Ile Glu Glu Gly Lys Gln Pro Ile Arg Ala Ser Pro Gln
            100   105   110

Glu Lys Ala Lys Glu Leu Ala Ile Asn Ala Tyr Gln Ser Arg Lys Ala
        115   120   125

<210> 590
<211> 157
<212> PRT
<213> filamentous cyanobacterium CCP5

<400> 590

Met Ala Gly Val Ser Phe Gly Leu Asp Lys Pro Ala Thr Leu Ala Ile
1   5   10   15

```
Leu Asp Ile Thr Thr Gly Gln Thr Ile Ala Tyr Arg Ser Ile Arg Gln
            20                  25                  30

Leu Leu Gly Ser Asp Tyr Lys Leu Leu Asn Arg Gln Arg Gln Arg Gln
        35                  40                  45

His Gln Lys Ala Arg Gln Arg His Ser Glu Gln Leu Lys Phe Ala Pro
    50                  55                  60

Asn Arg Val Ser Glu Gly Ser Ile Gly Asp Tyr Ile Asp Ser Leu Ile
65                  70                  75                  80

Thr Lys Ala Ile Ile Gln Ile Ala Gln Gln Tyr Asn Ala Ser Ser Ile
                85                  90                  95

Val Leu Pro Asp Leu Ala Asn Ile Arg Glu Val Ile Gln Ser Glu Ile
            100                 105                 110

Gln Ala Arg Ala Glu Glu Lys Ser Ser Leu Lys Glu Val Gln Asp Lys
        115                 120                 125

Tyr Ala Arg Glu Tyr Leu Ala Arg Val His Arg Trp Ser Glu Ser Glu
    130                 135                 140

Ile Pro Arg Glu Phe Ala Lys Ser Leu Lys Gln Leu Arg
145                 150                 155
```

<210> 591
<211> 223
<212> PRT
<213> Cyanothece sp. PCC 7822

<400> 591

```
Met Ser Ser Leu Ser Val Ile Arg Ala Arg Leu Leu Ala Ser Glu Glu
1               5                   10                  15

Lys Leu Ser Tyr Leu Trp Gln Leu Met Ala Gln Pro Tyr Ser Gln Leu
```

```
            20                  25                  30

Ile Gln Leu Leu Leu Asp Tyr Ile Ala Asn His Pro Asp Phe Pro Thr
        35                  40                  45

Trp Leu Asp Lys Phe Arg Leu Pro Asp Thr Leu Ile Lys Glu Phe Ile
    50                  55                  60

Thr Thr His Gln Thr Lys Tyr Leu Cys Gln Glu Leu Pro Gly Arg Phe
65                  70                  75                  80

Arg Gln Ser Ala Val Thr Leu Val Lys Asn Ile Tyr Lys Ser Trp Phe
                85                  90                  95

Ala His Lys Lys Ser Lys Leu Leu Ser Leu Gln Gly Lys Lys Arg Phe
            100                 105                 110

Leu Ser Met Leu Lys Ser Asp Glu Gln Leu Leu Leu Glu Ser Gly Tyr
        115                 120                 125

Asp Leu Tyr Thr Leu Thr Ser His Ala Gln Asn Leu Leu Gln Gln Val
    130                 135                 140

Gln Leu Glu Leu Glu Glu Leu Trp Gln Gln Glu Gly Ile Lys Pro Glu
145                 150                 155                 160

Asp Glu Gln Ser Ile Phe Gly Lys Ile Thr Asn Lys Leu Tyr Glu Leu
                165                 170                 175

His Asp Lys Thr Gln Ser Ile Pro Lys Arg Cys Val Ile Ala Tyr Leu
            180                 185                 190

Ile Lys Asn Gly Asn Gln Ile Arg Gly Arg Thr Arg Arg Gln Arg Ser
        195                 200                 205

Leu Pro Thr Thr Ser His Pro Lys Arg Asn Pro Asn Ser Thr Pro
    210                 215                 220
```

<210> 592
<211> 126
<212> PRT
<213> Cyanobacterium sp. HL-69

<400> 592

Met Ser His Gln Asn His Lys Ala Lys Lys Arg Ala Asn Phe Gln Gln
1   5   10   15

Lys Gly Glu Ser Asn Leu Gly Glu Tyr Val Asp Arg Leu Leu Ala Lys
            20   25   30

Ser Ile Leu Lys Ile Ala Gln Glu Tyr Lys Val Ser Ile Ile Val Val
        35   40   45

Pro Arg Leu Lys Gln Met Arg Ser Ile Thr Glu Ala Glu Val Gln Ala
    50   55   60

Arg Ala Glu Glu Lys Ile Pro Glu Tyr Lys Glu Arg Gln Arg Lys Tyr
65   70   75   80

Ala Lys Asp Tyr Arg Val Gln Val His Gln Trp Ser Tyr Gly Arg Leu
                85   90   95

Ile Asp Asn Ile Lys Gly Asn Ser Ser Lys Leu Gly Ile Ile Val Glu
            100   105   110

Glu Gly Thr Gln Pro Lys Gln Gly Arg Val Leu Leu Glu Asn
        115   120   125

<210> 593
<211> 133
<212> PRT
<213> unicellular cyanobacterium SU2

<400> 593

Met Thr His Ile Thr Val Val Gln Cys Arg Leu Ile Ala Pro Glu Gly
1   5   10   15

```
Thr Leu Gln His Ile Trp Ala Met Met Ala Gln Gln Gln Thr Pro Leu
            20                  25                  30


Ile Asn Glu Arg Leu His Asn Ile Asn Thr His Pro Asp Ile Asn Thr
        35                  40                  45


Trp Leu Thr Ala Asn Gln Leu Pro Ser Lys Leu Val Glu Thr Leu Ala
    50                  55                  60


Gln Pro Leu Lys Thr Gln Pro Pro Tyr Gln Glu Leu Pro Gly Arg Phe
65                  70                  75                  80


Ile Thr Ser Ala Ile Thr Leu Val Lys Glu Met Tyr Ala Ser Trp Phe
                85                  90                  95


Ala Val Gln Thr Gln Lys Arg Leu Ser Leu Asp Gly Lys Lys Arg Phe
            100                 105                 110


Leu Ser Leu Leu Gln Ser Asp Glu Gln Leu Leu Gln Asp Ser Gln Thr
        115                 120                 125


Asp Phe Asp Thr Trp
    130


<210>  594
<211>  189
<212>  PRT
<213>  Lyngbya confervoides

<400>  594

Met Glu Thr Arg Glu Met Ser Gln Pro Asn Leu Pro Ala Tyr Met Lys
1               5                   10                  15


Thr Ile Met Cys Cys Leu Cys Ala Ser Pro Glu Thr Arg Arg Tyr Phe
            20                  25                  30


Trp Glu Thr Ile Val Ser Tyr Thr Leu Leu Val Asn Glu Leu Leu Glu
        35                  40                  45
```

```
Ala Val Pro Asn Arg Pro Glu Phe Pro Gln Trp Gln Arg Arg Gly Thr
    50                  55                  60

Ile Asp Arg Glu Ala Val Arg Ile Val Leu Lys Pro Leu Lys Thr Lys
65                  70                  75                  80

Pro Asp Tyr Ala Gly Leu Pro Lys Arg Phe Leu Thr Ser Ala Glu Leu
                85                  90                  95

Ile Val Cys Tyr Val Tyr Lys Ser Trp Leu Ala Leu Gln Lys Arg Arg
            100                 105                 110

Gln Trp Gln Leu Glu Gly Lys Arg Arg Trp Leu Ala Ala Ile Glu Gly
        115                 120                 125

Asp Leu Lys Ser Ile Leu Ser Ser Asp Leu Ser Leu Glu Thr Val Gln
    130                 135                 140

Ala Thr Ala Arg Gln Ile Leu Glu Gln Ala Glu Gln Asp Leu Glu Pro
145                 150                 155                 160

Pro Pro Ser Glu Ile Thr Lys Lys Gly Lys Lys Ser Lys Gln His Thr
                165                 170                 175

Ala Phe Leu Thr Leu Val Arg Cys Ser Ser Ser Asn Leu
            180                 185
```

<210> 595
<211> 255
<212> PRT
<213> Acaryochloris marina MBIC11017

<400> 595

```
Met Arg Ser Phe Glu Gly Lys Ser Leu Asn Thr Leu Lys Glu Thr Gln
1               5                   10                  15

Lys Thr Tyr Leu Lys Arg Thr Gln Ser Ser Ile Asn Arg Leu Gln Asn
```

```
            20                  25                  30

Ala Ser Leu Arg Arg Pro His Val Ser Pro Cys Ile Gly Asn Pro Glu
        35                  40                  45

Leu Thr Met Gly Val Ser Leu Tyr Cys Gly Leu Pro Leu Gln Ala Ser
    50                  55                  60

Ile Val Asn Asn Gln Thr Arg Lys Leu Val Ala Thr Ile Thr Ala Pro
65                  70                  75                  80

Gln Leu Leu Lys Leu Glu Gly Tyr Gln Asp Lys Leu Lys Pro Phe Lys
                85                  90                  95

Arg Ser Gln Phe Ala Tyr Leu Ile Gly Arg Val His Arg Gln Arg Val
            100                 105                 110

Tyr Trp Arg Lys Ile Lys Lys Lys Glu Phe Ser Lys Gly Arg Leu Arg
        115                 120                 125

Arg Ser Lys Arg Leu Glu Asn Leu Gly Lys Lys Cys Asp Gln Leu Ile
    130                 135                 140

Ala Tyr His Leu Ile Gln Trp Ala Gln Thr His Gln Val Gly Asp Ile
145                 150                 155                 160

Val Leu Pro Ser Pro His Gly Ile Gln Asp His Ile Glu Ala Arg Val
                165                 170                 175

Gln Ser Leu Ala Gln Leu Lys Phe Pro Asn Asn Lys Gln Leu Gln Lys
            180                 185                 190

Arg Tyr Ala Lys Ala Ile Arg Leu Arg Tyr Pro Arg Trp Ser Tyr Thr
        195                 200                 205

Arg Leu Ile Gln Cys Ile Ala Asp Cys Ala Glu Arg Arg Glu Met Lys
    210                 215                 220
```

```
Val Asn Ile Leu Lys Phe Tyr Lys Asn Ala Gly Pro Phe Glu Gln Ser
225                 230                 235                 240


Val Glu Ile Ala Tyr Ala His Leu Gln Tyr Glu Ala Pro Ser Ser
                245                 250                 255


<210>  596
<211>  583
<212>  PRT
<213>  Leptolyngbya sp. NIES-3755

<400>  596

Met Ser Met Lys Thr Ile Arg Ser Asp Ala Ile Val Lys Leu Asp Pro
1               5                   10                  15


Lys Pro Arg Gly Arg Lys Lys Asn Leu Glu Asp Leu Pro Pro Phe Asp
            20                  25                  30


Thr Ala Ala Trp Cys Arg Leu Cys Glu Arg Thr Tyr His His Thr Leu
        35                  40                  45


Leu Ile Asp Gln Ile Ser Glu Gln Ile Lys Gln Asp Pro Asp Val Ile
    50                  55                  60


Asn Trp Ile Arg Ala Thr Gln Asp Val Lys Ala Gln Thr Ser Ile Thr
65                  70                  75                  80


Thr Asp Thr Asp Gln Asp Thr Asp Thr Glu Gln Gly His Ser Trp Leu
                85                  90                  95


Pro Lys Glu Leu Val Gln Lys Leu Cys Asp Arg Leu Lys Glu Thr Pro
            100                 105                 110


Gln Phe Lys Gly Ile Ser Gly Arg Ile Phe Thr Ser Ala Thr Glu Arg
        115                 120                 125


Val Glu Glu Ile Tyr Lys Ser Trp Ile Ala Thr His Gln Lys Leu Ile
    130                 135                 140
```

```
Arg Gln Ile Arg Gly Lys Glu Arg Trp Leu Thr Ile Val Lys Ser Asp
145                 150                 155                 160

Ala Gly Leu Ala Glu Asn Ser Asn Phe Ser Gln Leu Glu Ile Glu Ser
                165                 170                 175

Arg Ala Glu Gln Val Leu Ser Glu Ile Glu Ala Glu Asn Glu Ser Glu
            180                 185                 190

Asp Glu Ser Asp Asp Ala Arg Asn Arg Arg Val Phe Asn Thr Leu Phe
        195                 200                 205

Asp Lys Phe Asp Thr Thr Glu Asp Val Leu Ser Arg Arg Ala Ile Ile
    210                 215                 220

His Leu Leu Lys Asn Gly Gly Lys Val His Trp Glu Pro Arg Lys Pro
225                 230                 235                 240

Arg Arg Arg Lys Gly Asn Gln Asp Lys Ser Ser Gln Pro Met Thr Leu
                245                 250                 255

Glu Glu Arg Leu Ala Ala Lys Gln Ile Glu Ile Asp Arg Leu Glu Lys
            260                 265                 270

Gln Leu Leu Ser Gln Leu Pro Arg Ala Arg Asn Leu Phe Pro Asp Trp
        275                 280                 285

Ala Phe Glu Glu Ala Leu Asp Asp Leu Leu Thr Leu Pro Asp Pro Asp
    290                 295                 300

Leu Ala Arg His Asn Gln Tyr Tyr Phe Leu Ala Phe Ser Leu Leu Ile
305                 310                 315                 320

His Gln Ser Asp Pro Ala Gln Asn Ile Arg Phe Lys Gln His Leu Leu
                325                 330                 335
```

```
Lys Ser Met Ser Phe Leu Trp Glu Lys Pro Asn Ser Leu Leu Tyr Tyr
            340                 345                 350

Arg Ile Leu Ile Phe Ser Phe Leu Leu Tyr Thr Thr Ser Lys Gln Lys
        355                 360                 365

His Leu Gln Phe Gly His Tyr Leu Leu Arg Ala Ile Lys Val Glu Ala
    370                 375                 380

Glu Arg Val Glu Ser Gln Phe Tyr Asp Trp Gln Ala Ser Ile Thr Pro
385                 390                 395                 400

Lys Leu Ser Glu Phe Leu Arg Glu Pro Lys Ser Leu Pro Tyr Pro Ile
                405                 410                 415

Ser Phe Gly Tyr Glu Gly Val Arg Ala Trp Gln Thr Asn Arg Glu Gly
            420                 425                 430

Lys Ile Phe Phe Lys Leu Asn Gly Trp Gly Asp Leu Ile Phe Glu Val
        435                 440                 445

Arg Cys His Arg Arg Gln Leu Pro Leu Ile Lys Thr Phe Leu Arg Asp
    450                 455                 460

Trp Gln Thr Lys Asp Gln Cys Glu Glu Glu Asp Gln Tyr Ser Gly Ser
465                 470                 475                 480

Phe Met Leu Leu Arg Ser Ile Glu Leu Ile Trp Lys Pro Arg Asp Asp
                485                 490                 495

Asn Gly Gln Gly Asp Thr Gln Leu Cys Ser Gln Cys Glu Val Phe Gln
            500                 505                 510

Gln Tyr Pro Gly Lys Gly Phe Trp Asn Glu Cys Lys Leu Ser Ile His
        515                 520                 525

Trp Thr Tyr Asp Ser Asp Ala Leu Thr Arg Gln Gly Leu Glu Lys Ile
    530                 535                 540
```

```
Arg Gln Arg Lys Leu Glu Pro Gln Leu Lys Lys Leu Asp Lys Lys Gln
545                 550                 555                 560


Glu Asp Leu Glu Glu Lys Gln Lys Leu Leu Gln Cys Leu Glu Ala Ile
                565                 570                 575


Pro Gln Ile Leu His His Ser
            580
```

<210> 597
<211> 581
<212> PRT
<213> Leptolyngbya sp. NIES-3755

<400> 597

```
Met Lys Thr Ile Arg Ser Asp Ala Ile Val Lys Leu Asp Pro Lys Pro
1               5                   10                  15


Arg Gly Arg Lys Lys Asn Leu Glu Asp Leu Pro Pro Phe Asp Thr Ala
            20                  25                  30


Ala Trp Cys Arg Leu Cys Glu Arg Thr Tyr His His Thr Leu Leu Ile
        35                  40                  45


Asp Gln Ile Ser Glu Gln Ile Lys Gln Asp Pro Asp Val Ile Asn Trp
    50                  55                  60


Ile Arg Ala Thr Gln Asp Val Lys Ala Gln Thr Ser Ile Thr Thr Asp
65                  70                  75                  80


Thr Asp Gln Asp Thr Asp Thr Glu Gln Gly His Ser Trp Leu Pro Lys
                85                  90                  95


Glu Leu Val Gln Lys Leu Cys Asp Arg Leu Lys Glu Thr Pro Gln Phe
            100                 105                 110


Lys Gly Ile Ser Gly Arg Ile Phe Thr Ser Ala Thr Glu Arg Val Glu
```

```
        115                 120                 125

Glu Ile Tyr Lys Ser Trp Ile Ala Thr His Gln Lys Leu Ile Arg Gln
    130                 135                 140

Ile Arg Gly Lys Glu Arg Trp Leu Thr Ile Val Lys Ser Asp Ala Gly
145                 150                 155                 160

Leu Ala Glu Asn Ser Asn Phe Ser Gln Leu Glu Ile Glu Ser Arg Ala
                165                 170                 175

Glu Gln Val Leu Ser Glu Ile Glu Ala Glu Asn Glu Ser Glu Asp Glu
            180                 185                 190

Ser Asp Asp Ala Arg Asn Arg Arg Val Phe Asn Thr Leu Phe Asp Lys
        195                 200                 205

Phe Asp Thr Thr Glu Asp Val Leu Ser Arg Arg Ala Ile Ile His Leu
    210                 215                 220

Leu Lys Asn Gly Gly Lys Val His Trp Glu Pro Arg Lys Pro Arg Arg
225                 230                 235                 240

Arg Lys Gly Asn Gln Asp Lys Ser Ser Gln Pro Met Thr Leu Glu Glu
                245                 250                 255

Arg Leu Ala Ala Lys Gln Ile Glu Ile Asp Arg Leu Glu Lys Gln Leu
            260                 265                 270

Leu Ser Gln Leu Pro Arg Ala Arg Asn Leu Phe Pro Asp Trp Ala Phe
        275                 280                 285

Glu Glu Ala Leu Asp Asp Leu Leu Thr Leu Pro Asp Pro Asp Leu Ala
    290                 295                 300

Arg His Asn Gln Tyr Tyr Phe Leu Ala Phe Ser Leu Leu Ile His Gln
305                 310                 315                 320
```

```
Ser Asp Pro Ala Gln Asn Ile Arg Phe Lys Gln His Leu Leu Lys Ser
                325                 330                 335

Met Ser Phe Leu Trp Glu Lys Pro Asn Ser Leu Leu Tyr Tyr Arg Ile
            340                 345                 350

Leu Ile Phe Ser Phe Leu Leu Tyr Thr Thr Ser Lys Gln Lys His Leu
        355                 360                 365

Gln Phe Gly His Tyr Leu Leu Arg Ala Ile Lys Val Glu Ala Glu Arg
    370                 375                 380

Val Glu Ser Gln Phe Tyr Asp Trp Gln Ala Ser Ile Thr Pro Lys Leu
385                 390                 395                 400

Ser Glu Phe Leu Arg Glu Pro Lys Ser Leu Pro Tyr Pro Ile Ser Phe
                405                 410                 415

Gly Tyr Glu Gly Val Arg Ala Trp Gln Thr Asn Arg Glu Gly Lys Ile
            420                 425                 430

Phe Phe Lys Leu Asn Gly Trp Gly Asp Leu Ile Phe Glu Val Arg Cys
        435                 440                 445

His Arg Arg Gln Leu Pro Leu Ile Lys Thr Phe Leu Arg Asp Trp Gln
    450                 455                 460

Thr Lys Asp Gln Cys Glu Glu Glu Asp Gln Tyr Ser Gly Ser Phe Met
465                 470                 475                 480

Leu Leu Arg Ser Ile Glu Leu Ile Trp Lys Pro Arg Asp Asp Asn Gly
                485                 490                 495

Gln Gly Asp Thr Gln Leu Cys Ser Gln Cys Glu Val Phe Gln Gln Tyr
            500                 505                 510

Pro Gly Lys Gly Phe Trp Asn Glu Cys Lys Leu Ser Ile His Trp Thr
```

```
        515                 520                 525

Tyr Asp Ser Asp Ala Leu Thr Arg Gln Gly Leu Glu Lys Ile Arg Gln
    530                 535                 540

Arg Lys Leu Glu Pro Gln Leu Lys Lys Leu Asp Lys Lys Gln Glu Asp
545                 550                 555                 560

Leu Glu Glu Lys Gln Lys Leu Leu Gln Cys Leu Glu Ala Ile Pro Gln
                565                 570                 575

Ile Leu His His Ser
            580
```

<210> 598
<211> 99
<212> PRT
<213> Tolypothrix campylonemoides VB511288

<400> 598

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Val Asn Thr
1               5                   10                  15

Arg Gln Gln Leu Trp Lys Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
            20                  25                  30

Asn Glu Leu Leu Ser Gln Val Ala Gln His Pro Glu Phe Glu Thr Trp
        35                  40                  45

Arg Gln Lys Gly Lys His Pro Thr Gly Ile Val Lys Glu Leu Cys Gln
    50                  55                  60

Pro Leu Lys Thr Asp Pro Arg Phe Ile Gly Gln Pro Ala Arg Phe Tyr
65                  70                  75                  80

Thr Ser Ala Ile Ala Leu Val Asn Tyr Asn Ile Glu Ser Arg Lys Pro
                85                  90                  95
```

Ile Gly Phe

<210> 599
<211> 131
<212> PRT
<213> filamentous cyanobacterium CCP5

<400> 599

Pro Glu Asp Gln Lys His Asp Asn Tyr Arg Gln Gln Asp Ala Glu Ser
1 5 10 15

Ala Leu Gly Asp Tyr Leu Asp Arg Leu Leu Ala Ala Arg Val Ile Gln
20 25 30

Leu Ala Gln Lys Trp Gln Ala Gly Ser Ile Val Leu Pro Ser Leu Gly
35 40 45

Asn Ile Arg Glu Ile Val Glu Ser Ser Val Gln Ala Glu Ala Glu Arg
50 55 60

Arg Tyr Pro Lys His Lys Glu Leu Gln Asp Lys Tyr Ala Lys Gln Tyr
65 70 75 80

Arg Leu Glu Phe His Arg Trp Ser Tyr Gly Arg Leu Leu Lys Tyr Leu
85 90 95

Lys Glu Cys Ala Arg Gln His Gly Leu Thr Ile Arg Gln Glu Arg Gln
100 105 110

Pro Lys Gln Gly Ser Glu Gln Glu Lys Ala Leu Ala Leu Ile Ala Ser
115 120 125

Ala Phe Leu
130

<210> 600
<211> 141
<212> PRT

<213> Geminocystis herdmanii

<400> 600

```
Met Ser Gln Lys Asn Thr Pro Leu Ile Ser Glu Leu Leu Leu Glu Leu
1               5                   10                  15


Ser Gln His Glu Asp Leu Glu Gln Trp Cys Glu Leu Gly Lys Leu Pro
            20                  25                  30


Ser Gly Leu Ile Ser Lys Leu Cys Asp Gln Leu Lys Gln Arg Ala Glu
        35                  40                  45


Phe Glu Gly Gln Pro Ser Arg Phe Tyr Tyr Ser Ala Ile Thr Leu Val
    50                  55                  60


Asp Tyr Ile Tyr Lys Ser Tyr Leu Arg Thr Gln Arg Arg Leu Arg Phe
65                  70                  75                  80


Gln Leu Gln Gly Gln Gln Arg Trp Phe Glu Met Phe Lys Ser Asp Thr
                85                  90                  95


Glu Leu Lys Asn Glu Thr Asn Phe Ser Leu Thr Asp Ile Arg Val Lys
            100                 105                 110


Ala Arg Glu Leu Phe Asp Lys Asp Leu Lys Asp Ser Ser Pro Asp Asp
        115                 120                 125


Tyr Phe Lys Thr Tyr Glu Ser Thr Ser Asp Leu Leu Thr
    130                 135                 140
```

<210> 601
<211> 131
<212> PRT
<213> Euhalothece sp. KZN 001

<400> 601

```
Met Glu Thr Trp Arg Gln Lys Gly Lys Leu Pro Ala Gly Ile Val Ser
1               5                   10                  15
```

```
Lys Leu Cys Lys Pro Leu Lys Glu Asp Ser Arg Phe Ser Gly Gln Pro
            20                  25                  30

Gly Arg Phe Tyr Thr Ser Ala Thr Lys Leu Val Glu Tyr Ile Tyr Gln
        35                  40                  45

Ser Trp Leu Ala Leu Gln Gln Arg Leu Gln Trp Arg Leu Asn Gly Gln
    50                  55                  60

Gln His Trp Leu Glu Ile Leu Lys Ser Asp Gln Asp Leu Cys Gln Gln
65                  70                  75                  80

Ala Asp Cys Ser Leu Glu Thr Leu Cys His Gln Ala Ser Glu Ile Leu
                85                  90                  95

Ala Ser Phe Gln Pro Ser Ala Ser Asn Lys Lys Arg Asn Arg Lys Ser
            100                 105                 110

Lys Lys Ile Val Leu Glu Lys Val Cys Leu Met Leu Met Thr Met Gln
        115                 120                 125

Lys Ile Val
    130
```

<210> 602
<211> 132
<212> PRT
<213> Anabaenopsis circularis

<400> 602

```
Met Glu Ala Ser Asp Asn Glu Glu Ala Lys Leu Ser Gly Ser Leu Val
1               5                   10                  15

Thr Leu Arg Ser Ala His Leu Leu Trp Gln Gln Gly Glu Gly Lys Gly
            20                  25                  30

Glu Pro Trp Lys Val Asn Lys Leu Val Leu His Cys Thr Tyr Asp Ala
        35                  40                  45
```

Arg Leu Leu Thr Ala Glu Gly Thr Glu Glu Val Arg Gln Val Lys Thr
    50   55   60

Asp Lys Ala Gln Asn Glu Val Asn Glu Ala Glu Ser Asn Glu Asn Leu
65   70   75   80

Asp Asn Glu Gln Gln Lys Arg Leu Asn Lys Asn Lys Ser Ser Leu Ser
                85   90   95

Arg Leu Lys Asn Ser Phe Ala Arg Pro Ser Lys Pro Ala Tyr Gln Gly
            100   105   110

Gln Ser Asn Ile Pro Leu Phe Cys Gln Phe Pro Asp Lys Met Asp Arg
        115   120   125

Arg Lys Glu Lys
    130

<210> 603
<211> 98
<212> PRT
<213> Cyanobacterium sp. IPPAS B-1200

<400> 603

Met Ser Ile Pro Ser Gly Arg Asp Leu Glu Gly Lys Lys Trp Leu Glu
1   5   10   15

Thr Leu Ile Leu Ala Ser Thr Thr Met Pro Ile Asn Glu Ser Glu Ser
            20   25   30

Asn Ser Trp Phe Ser Ala Leu Lys Lys Asn Ser Pro Ser Ile Pro Tyr
        35   40   45

Pro Val Ile Tyr Glu Thr Asn Glu Asp Leu Lys Trp Ser Leu Ser Asp
    50   55   60

Gln Asn Arg Leu His Val Arg Phe Asn Gly Leu Ser Asp His Thr Phe

65 70 75 80

Lys Ile Tyr Cys Asp Ser Arg Gln Leu Pro Tyr Phe Arg Arg Phe Tyr
85 90 95

Lys Ala

<210> 604
<211> 172
<212> PRT
<213> Nodosilinea nodulosa

<400> 604

Met Ser Asn Met Arg Thr Ser Glu Cys Arg Leu Val Ser Ser Tyr Trp
1 5 10 15

Glu Arg Pro Ser Lys Ala Lys Pro Asp Ser Ile Ala Leu Ala Ser Asp
20 25 30

Asp Thr Lys Ala Tyr Leu Trp Ser Leu Ser Val Gly Ser Thr His Leu
35 40 45

Cys Gln Glu Leu Asn Lys Arg Ile Ser Asn His Glu Leu Phe Glu Asp
50 55 60

Trp Val Gln Asn Ala Glu Ile Pro Asp Ala Glu Ile Lys Lys Ile Trp
65 70 75 80

Lys Glu Leu Lys Glu Gly Glu Met Phe Lys His Ile Pro Glu Arg Phe
85 90 95

Cys Arg Ser Gly Leu Leu Thr Ile Gln Asn Ile Tyr Ser Ser Trp Leu
100 105 110

Ser Gly Arg Arg Lys Leu Gln Asp Arg Leu Lys Gly Leu Glu Tyr Trp
115 120 125

```
Leu Ser Ile Val Lys Ser Asp Ile Glu Leu Val Ser Glu Ser Gly Leu
    130                 135                 140

Asp Ile Glu Glu Ile Gln Val Arg Ala Glu Glu Ile Ile Asn Asp Leu
145                 150                 155                 160

Gln Ala Glu Ala Gln Ala Ser Ser Asp Ser Gln Lys
                165                 170
```

<210> 605
<211> 106
<212> PRT
<213> Stanieria sp. NIES-3757

<400> 605

```
Met Glu Leu Ala Gln Gln Asp Arg Val Ser Ala Ile Ala Val Pro Lys
1               5                   10                  15

Ile Glu Asp Ile Arg Glu Ile Thr Gln Ala Glu Ile Lys Ala Lys Ala
            20                  25                  30

Glu Ala Lys Ile Pro Gly Tyr Glu Glu Gly Gln Lys Lys Tyr Ala Leu
        35                  40                  45

Ala Tyr Arg Ile Asn Ile His Asn Trp Ser Tyr Gly Arg Leu Ile Glu
    50                  55                  60

Asn Ile Ser Thr Gln Ala Asn Lys Leu Gly Ile Ala Ile Val Glu Val
65                  70                  75                  80

Lys Gln Pro Ile Arg Gly Ser Pro Thr Gln Lys Ala Gln Ala Met Ala
                85                  90                  95

Ile Ser Ala His Gln Ala Phe Asn Lys Thr
            100                 105
```

<210> 606
<211> 205
<212> PRT

<213> Acaryochloris marina

<400> 606

```
Met Gly Val Ser Leu Tyr Cys Gly Leu Pro Leu Gln Ala Ser Ile Val
1               5                  10                  15


Asn Asn Gln Thr Arg Lys Leu Val Ala Thr Ile Thr Ala Pro Gln Leu
            20                  25                  30


Leu Lys Leu Glu Gly Tyr Gln Asp Lys Leu Lys Pro Phe Lys Arg Ser
        35                  40                  45


Gln Phe Ala Tyr Leu Ile Gly Arg Val His Arg Gln Arg Val Tyr Trp
    50                  55                  60


Arg Lys Ile Lys Lys Lys Glu Phe Ser Lys Gly Arg Leu Arg Arg Ser
65                  70                  75                  80


Lys Arg Leu Glu Asn Leu Gly Lys Lys Cys Asp Gln Leu Ile Ala Tyr
                85                  90                  95


His Leu Ile Gln Trp Ala Gln Thr His Gln Val Gly Asp Ile Val Leu
            100                 105                 110


Pro Ser Pro His Gly Ile Gln Asp His Ile Glu Ala Arg Val Gln Ser
        115                 120                 125


Leu Ala Gln Leu Lys Phe Pro Asn Asn Lys Gln Leu Gln Lys Arg Tyr
    130                 135                 140


Ala Lys Ala Ile Arg Leu Arg Tyr Pro Arg Trp Ser Tyr Thr Arg Leu
145                 150                 155                 160


Ile Gln Cys Ile Ala Asp Cys Ala Glu Arg Arg Glu Met Lys Val Asn
                165                 170                 175


Ile Leu Lys Phe Tyr Lys Asn Ala Gly Pro Phe Glu Gln Ser Val Glu
            180                 185                 190
```

Ile Ala Tyr Ala His Leu Gln Tyr Glu Ala Pro Ser Ser
195 200 205

<210> 607
<211> 83
<212> PRT
<213> Merismopedia glauca

<400> 607

Met Ser Gln Ile Thr Val Gln Cys Arg Leu Val Ala Thr Glu Ala Thr
1 5 10 15

Arg Arg Cys Leu Trp Glu Leu Met Ala Ile Gln Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Gln Gln Ile Ser Leu Gln Asp Asp Phe Glu Thr Trp
35 40 45

Arg Ser Gln Ala Lys Leu Pro Ser Gly Thr Val Glu Arg Ile Cys Gln
50 55 60

Pro Leu Lys Ser Asp Pro Arg Phe Ile Gly Gln Pro Ser Arg Phe Tyr
65 70 75 80

Thr Ser Ala

<210> 608
<211> 86
<212> PRT
<213> Tolypothrix sp. NIES-4075

<400> 608

Met Arg Glu Gln Val Gln Ser Glu Ile Gln Ala Lys Ala Glu Gln Lys
1 5 10 15

Ser Asp Leu Ile Ile Val Gln Lys Lys Tyr Ala Lys Gln Tyr Arg Val
20 25 30

Ser Val His Gln Trp Ser Tyr Gly Arg Leu Ile Ala Asn Ile Gln Thr
        35   40   45

Gln Ala Ala Lys Val Gly Ile Val Ile Glu Glu Ser Lys Gln Pro Ile
    50   55   60

Thr Ala Ser Pro Gln Glu Lys Ala Lys Glu Leu Val Ile Ala Ala Tyr
65   70   75   80

His Ser Arg Lys Ile Asn
                85

<210> 609
<211> 110
<212> PRT
<213> Anabaena sp. WA102

<400> 609

Met Ser Arg Asn Asn Lys Lys Asn Ser Thr Asn Pro Ile Ile Arg Thr
1   5   10   15

Ile Arg Cys His Leu Asn Ala Lys Glu Asp Val Leu Arg Gln Val Trp
            20   25   30

Glu Glu Met Thr Gln Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Glu
        35   40   45

Asp Val Ser Glu Gln Pro Glu Phe Asp Thr Lys Lys Glu Thr Gly Glu
    50   55   60

Ile Ser Lys Lys Glu Ile Thr Glu Leu Arg Lys Ser Leu Thr Lys Asp
65   70   75   80

Ser Asp Leu Glu Lys Gln Ser Gly Arg Phe Arg Ser Ser Ala Asp Ser
                85   90   95

Phe Val Gln Glu Val Tyr Ser Ala Leu Ala Ser Leu Leu Trp

100 105 110

<210> 610
<211> 88
<212> PRT
<213> filamentous cyanobacterium CCP2

<400> 610

Met Arg Glu His Leu Ala Ala Glu Ile Asn Ala Lys Ala Glu Arg Lys
1 5 10 15

Ser Asp Ser Lys Glu Val Gln Asp Lys Tyr Ala Lys Gln Val Arg Ile
20 25 30

Ser Ile His Arg Trp Ser Tyr Asp Arg Leu Leu Ser Thr Ile Ser Ser
35 40 45

Gln Ala Asn Lys Leu Gly Leu Thr Leu Glu Thr Met Ala Gln Pro Pro
50 55 60

His Gly Thr Pro Gln Glu Lys Ala Arg Asp Val Ala Ile Ala Ala Tyr
65 70 75 80

His Ser Arg Gln Val Ser Ser Asn
85

<210> 611
<211> 61
<212> PRT
<213> Anabaena sp. AL93

<400> 611

Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Ser Glu Thr Thr
1 5 10 15

Arg Gln Gln Leu Trp Gln Leu Met Ala Glu Lys Asn Thr Pro Leu Ile
20 25 30

Asn Glu Leu Leu Ser Gln Ile Gly Lys His Pro Glu Phe Glu Thr Trp

```
        35                  40                  45

Arg Gln Lys Gly Lys Gln Pro Thr Tyr Asn Glu Lys Gly
    50                  55                  60
```

<210> 612
<211> 107
<212> PRT
<213> Phormidesmis priestleyi

<400> 612

```
Met Leu Leu Arg Lys Glu Tyr Ile Phe Glu Val Cys Cys Asp Arg Arg
1               5                   10                  15

Gln Leu Gln Thr Phe Gln Val Phe Leu Asn Asp Trp Gln Thr Tyr Ser
            20                  25                  30

Ser Asp Lys Asn Lys Tyr Pro Ile Thr Leu Phe Ala Phe Arg Ser Ala
        35                  40                  45

Ala Leu Ile Trp Arg Gln Ser Thr Glu Asn Gly Ile Ser Lys Leu Gln
    50                  55                  60

Pro Tyr Leu Lys Cys Thr Val Asp His Lys Arg Leu Ser Ala Lys Gly
65                  70                  75                  80

Ala Glu Pro Arg Ala Glu Glu Ile Ala Lys Val Arg Lys Asn Ser Gln
                85                  90                  95

Ile Ile Arg Arg Asn Ser Lys Val Glu Lys Ser
            100                 105
```

<210> 613
<211> 50
<212> PRT
<213> Cyanothece sp. ATCC 51142

<400> 613

```
Met Ser Gln Ile Thr Ile Gln Cys Arg Leu Val Ala Lys Glu Pro Ile
```

1 5 10 15

Arg His Thr Leu Trp Arg Leu Met Thr Asp Leu Asn Thr Pro Phe Ile
20 25 30

Asn Glu Leu Leu Gln Lys Val Ala Gln His Pro Asp Phe Glu Lys Trp
35 40 45

Lys Gln
50

<210> 614
<211> 76
<212> PRT
<213> Anabaena sp. AL93

<400> 614

Met Thr Gln Lys Asn Thr Pro Leu Ile Val Gln Leu Leu Glu Asp Val
1 5 10 15

Ser Glu Gln Pro Glu Phe Asp Thr Lys Lys Glu Thr Gly Glu Ile Ser
20 25 30

Lys Lys Glu Ile Thr Glu Leu Arg Lys Ser Leu Thr Lys Asp Ser Asp
35 40 45

Leu Glu Lys Gln Ser Gly Arg Phe Arg Ser Ser Ala Asp Ser Phe Val
50 55 60

Gln Glu Val Tyr Ser Ala Leu Ala Ser Leu Leu Trp
65 70 75

<210> 615
<211> 78
<212> PRT
<213> Stanieria sp. NIES-3757

<400> 615

Met Arg Val Ala Met Gly Leu Asp Lys Pro Ala Thr Val Ala Ile Val

```
1               5                   10                  15


Asp Gly Asn Thr Gly Lys Val Ile Val Tyr Arg Ser Ile Lys Gln Leu
            20                  25                  30


Leu Gly Glu Asn Tyr Arg Leu Leu Asn Arg Gln Arg Gln Gln Lys Gln
        35                  40                  45


Ala Leu Ser Leu Phe Cys His Phe Pro Lys Thr Phe Val Ile Ser Lys
    50                  55                  60


Val Tyr Asn Pro Tyr Gln Gln Asn Asp Ser Leu Val Ile Tyr
65                  70                  75


<210>  616
<211>  74
<212>  PRT
<213>  Stanieria sp. NIES-3757

<400>  616

Met Gly Leu Asp Lys Pro Ala Thr Val Ala Ile Val Asp Gly Asn Thr
1               5                   10                  15


Gly Lys Val Ile Val Tyr Arg Ser Ile Lys Gln Leu Leu Gly Glu Asn
            20                  25                  30


Tyr Arg Leu Leu Asn Arg Gln Arg Gln Gln Lys Gln Ala Leu Ser Leu
        35                  40                  45


Phe Cys His Phe Pro Lys Thr Phe Val Ile Ser Lys Val Tyr Asn Pro
    50                  55                  60


Tyr Gln Gln Asn Asp Ser Leu Val Ile Tyr
65                  70


<210>  617
<211>  72
<212>  PRT
<213>  Phormidesmis priestleyi
```

<400> 617

Met Ser Glu Leu Leu Leu Phe Asp Thr Tyr Glu Val Thr Glu Asp Ser
1   5   10   15

Leu Ser Arg Arg Ala Val Ile His Leu Leu Lys Asn Gly Gly Glu Val
            20   25   30

Asn Glu Glu Ile Glu Asp Pro Glu Lys Leu Gln Gln Arg Leu Val Thr
        35   40   45

Lys Arg Glu Glu Ile Gln Arg Leu Glu Ala Gln Leu Ala Ser Arg Leu
    50   55   60

Pro Lys Gly Arg Glu Pro Asn Arg
65   70

<210> 618
<211> 74
<212> PRT
<213> Aphanothece hegewaldii

<400> 618

Met Ser Asp Gln Gln Ser Gln Asn His Glu Ile Thr Ile Gln Ser Leu
1   5   10   15

Leu Lys Ala Pro Glu Ala Thr Leu Arg Ile Leu Trp Gln Leu Met Val
            20   25   30

Asn Val Thr Glu Leu Ile Asn Ser Ile Leu His His Ile Asn Thr His
        35   40   45

Pro Asp Phe Asp Thr Trp Leu Thr Glu Trp Glu Leu Pro Ala Ser Ile
    50   55   60

Leu Asn Ser Phe Ile Arg Asn Ala Lys Thr
65   70

<210> 619
<211> 148
<212> PRT
<213> Trichormus azollae

<400> 619

Met Thr Tyr Glu Phe Val Phe Leu Pro Val Gly Asn Ala Asp Ser Ile
1 5 10 15

Ile Met His Pro Asp Gly Ser Ser Thr Val Val Ile Asp Leu His Lys
20 25 30

Ile Pro Leu Leu Leu Asn Trp Phe Glu Asn Lys Lys Gln Thr Asn Ile
35 40 45

Ser Arg Ile Leu Phe Ile Arg His Glu His Arg Tyr Tyr Phe Pro Ser
50 55 60

Leu Glu Asp Leu Val Thr Phe Leu Glu Asn Arg Arg Arg Arg Gly Ile
65 70 75 80

Val Thr Glu Ile Ser Pro Pro Tyr His Val Leu Arg Asn Ala Lys Ala
85 90 95

Gly Ser Ile Met Leu Pro Lys Leu Gly Asp Met Arg Glu Asn Ile Gln
100 105 110

Ser Lys Ile Gln Thr Ile Ala Glu Ala Lys Tyr Pro Gly Ser Val Glu
115 120 125

Ile Gln Arg Lys Tyr Ala Lys Gln Tyr Glu Met Ser Ile Asn Gly Val
130 135 140

Met Ala Asp Leu
145

<210> 620
<211> 61
<212> PRT

<213> Nostoc flagelliforme

<400> 620

Met Ser Asn Tyr Gln Ile His Tyr Trp Ser Tyr Asn Arg Leu Gln Lys
1 5 10 15

Tyr Ile Lys Ser Lys Ala Ala Glu Leu Lys Ile Ser Ile Glu Phe Gly
20 25 30

Ile Gln Pro His Tyr Gly Thr Leu Glu Glu Gln Ala Arg Asp Leu Ala
35 40 45

Phe Cys Ala Tyr Gln Cys Arg Ile Asn Thr Phe Gly Arg
50 55 60

<210> 621
<211> 379
<212> PRT
<213> Archaeoglobus profundus

<400> 621

Met Glu Leu Thr Leu Lys Met Lys Val Arg Glu Lys Thr Lys Trp Lys
1 5 10 15

Ile Gln Ala Leu Arg Asp Ala Met Asp Ser Phe Arg Gln Ala Val Asn
20 25 30

Asp Trp Ile Asp Val Ala Trp Lys His Lys Ile Thr Asp Arg Thr Leu
35 40 45

His Ser Leu Ala Tyr Lys Lys Leu Arg Glu Lys Tyr Pro Asn Leu Tyr
50 55 60

Ser Asn Ser Leu Gln Asp Ala Met Asn Trp Ala Ile Gln Ile Val Lys
65 70 75 80

Thr Glu Leu Lys Val Asn Pro Asp Val Lys Pro Lys Phe Asp Ser Phe
85 90 95

```
Met Ile Ser Phe Lys Asn Val Asp Phe Lys Phe Glu Asn Asp Gly Phe
            100                 105                 110

Val Ile Pro Leu Asn Gly Lys Arg Val Tyr Val Pro Val Tyr Val Pro
        115                 120                 125

Lys Lys Tyr Tyr Lys Trp Leu Val Asn Gly Lys Phe Gly Arg Leu Tyr
    130                 135                 140

Phe Lys Glu Glu Asp Gly Glu Ile Tyr Ala Tyr Leu Thr Val Lys Val
145                 150                 155                 160

Glu Asp Lys Pro Ala Tyr Glu Pro Lys Leu Trp Phe Gly Val Asp Leu
                165                 170                 175

Gly Val Gln Asn Leu Val Val Val Ala Asp Asn Lys Gly Arg Glu Val
            180                 185                 190

Leu Arg Phe Asp Gly Glu Thr Val Asn His Tyr Lys Glu Leu Leu Glu
        195                 200                 205

Lys Glu Arg Ala Arg Arg Gln Arg Arg Gln Met Lys Tyr Leu Asn Asn
    210                 215                 220

Arg Lys Phe Arg Leu Gly Ser Lys His Arg Asn Phe Ser Lys Tyr Ile
225                 230                 235                 240

Asn His Ile Ile Ala Lys Glu Ile Val Arg Lys Ala Lys Glu Tyr Gln
                245                 250                 255

Ala Cys Ile Val Leu Glu Lys Leu Arg Gly Val Lys Arg Arg Ser Ala
            260                 265                 270

Lys Met Pro Lys Trp Val Arg Lys Leu Leu His Arg Trp Ser Tyr His
        275                 280                 285

Asp Leu Ile Gln Lys Ile Lys Tyr Lys Ala Lys Leu Glu Gly Val Pro
```

```
    290                 295                 300

Val Ile Glu Val Ser Pro Arg Asn Thr Ser Lys Thr Cys Ser Glu Cys
305                 310                 315                 320

Gly Tyr Val Tyr Lys Arg Phe Lys Asn Gln Arg Leu Phe His Cys Pro
                325                 330                 335

Asn Cys Gly Leu Ile Ile Asp Arg Asp Leu Asn Ala Ser Thr Asn Ile
            340                 345                 350

Ala Arg Lys Gly Met Lys Glu Phe Asn Lys Arg Ala Phe Leu Pro Ala
        355                 360                 365

Leu Lys Gly Glu Ala Ser Ser Pro Gln Arg Arg
    370                 375
```

<210> 622
<211> 72
<212> PRT
<213> filamentous cyanobacterium CCP2

<400> 622

```
Met Arg Asp Arg Ser Phe Ala Gln His Gly Gly Gln Val Gly Glu Gln
1               5                   10                  15

Glu Glu Asp Pro Glu Ala Phe Ala Gln Met Ile His Arg Lys Gln Lys
            20                  25                  30

Glu Ile Glu Arg Leu Glu Ala Gln Leu Val Ser Arg Leu Pro Lys Gly
        35                  40                  45

Arg Asp Leu Thr Gly Glu Glu Phe Leu Glu Thr Leu Ala Thr Ala Thr
    50                  55                  60

Thr Thr Gln Cys Val Glu Ala Ala
65                  70
```

<210> 623
<211> 82
<212> PRT
<213> Phormidesmis priestleyi

<400> 623

Met Asp Thr Leu Ser Gln Glu Ser Ile Pro Pro Trp Lys Thr His Arg
1   5   10   15

Leu Tyr Leu Gln Cys Ser Ile Asp Ser Asp Leu Leu Thr Ala Glu Gly
            20   25   30

Thr Glu Lys Val Arg Pro Arg Lys Ile Ser Glu Thr Arg Lys Thr Leu
        35   40   45

Asp Asn Ala Arg Lys Lys Glu Gln Glu Leu Leu Val Gln Thr Phe Arg
    50   55   60

Ser Asp Leu Thr Glu Gln Asp Lys Gln Glu Leu Glu Lys Gly Ala Thr
65   70   75   80

Ser Ile

<210> 624
<211> 379
<212> PRT
<213> Archaeoglobus profundus

<400> 624

Met Lys Leu Thr Leu Lys Met Lys Val Arg Glu Lys Thr Lys Trp Lys
1   5   10   15

Ile Gln Ala Leu Arg Arg Ala Met Glu Thr Phe Arg Asp Ala Val Asn
            20   25   30

Asp Trp Ile Asp Val Ala Trp Lys His Lys Ile Ala Asp Arg Thr Leu
        35   40   45

```
His Glu Ile Ala Tyr Lys Glu Leu Arg Gln Lys Tyr Arg Asn Leu Tyr
    50                  55                  60

Ser Asn Ser Leu Gln Asp Ala Met Asn Trp Ala Ile Gln Ile Val Lys
65                  70                  75                  80

Thr Glu Leu Lys Leu Asn Pro Asn Lys Lys Pro Glu Phe Lys Thr Leu
                85                  90                  95

Met Ile Ser Phe Lys Asn Val Asp Phe Lys Phe Glu Asn Asn Gly Phe
            100                 105                 110

Val Ile Pro Leu Asn Gly Lys Arg Val Tyr Val Pro Val Tyr Val Pro
        115                 120                 125

Lys Lys Tyr Tyr Lys Trp Leu Val Asn Gly Lys Phe Gly Arg Leu Tyr
    130                 135                 140

Phe Lys Glu Glu Asp Gly Glu Ile Tyr Ala Tyr Leu Thr Val Lys Val
145                 150                 155                 160

Glu Asp Lys Pro Val Tyr Glu Pro Lys Ser Trp Phe Gly Val Asp Leu
                165                 170                 175

Gly Val His Asn Leu Ala Val Val Ala Asp Glu Arg Gly Arg Lys Ile
            180                 185                 190

Leu Arg Phe Asp Gly Glu Ile Val Asn Arg Tyr Lys Glu Leu Leu Glu
        195                 200                 205

Lys Glu Arg Ala Arg Arg Gln Lys Arg Gln Met Lys Glu Phe Asn Asn
    210                 215                 220

Lys Glu His Lys Tyr Gly Cys Lys His Arg Ser Phe Ser Arg Tyr Val
225                 230                 235                 240

Asn His Val Val Ser Lys Glu Ile Val Arg Lys Ala Lys Glu Tyr Lys
                245                 250                 255
```

```
Ala Cys Ile Val Leu Glu Lys Leu Arg Gly Val Lys Arg Arg Gly Ala
            260                 265                 270

Arg Lys Pro Lys Arg Val Arg Lys Leu Leu His Arg Trp Ser Tyr His
        275                 280                 285

Asp Leu Ile Gln Lys Ile Lys Tyr Lys Ala Lys Leu Glu Gly Val Pro
    290                 295                 300

Val Ile Glu Ile Ser Pro Arg Asn Thr Ser Lys Thr Cys Ser Asn Cys
305                 310                 315                 320

Gly Phe Val Tyr Lys Arg Phe Lys Asp Gln Arg Leu Phe His Cys Pro
                325                 330                 335

Lys Cys Gly Ile Ile Ile Asp Arg Asp Leu Asn Ala Ser Ile Asn Ile
            340                 345                 350

Ala Arg Lys Gly Arg Glu Glu Tyr Lys Lys Arg Ala Phe Leu Ser Ala
        355                 360                 365

Leu Lys Ser Glu Ala Ser Ser Pro Gln Trp Leu
    370                 375
```

<210> 625
<211> 45
<212> PRT
<213> Richelia intracellularis

<400> 625

```
Met Ser Glu Asn Ile Gln Ser Gln Ala Val Lys Thr Gly Ile Leu Ile
1               5                   10                  15

Glu Val Gly Gln Gln Pro Ile Arg Gly Ser Pro Gln Lys Gln Ala Arg
            20                  25                  30

Glu Leu Gly Leu Phe Ala Tyr Gln Tyr Arg Met Ala Thr
```

35 40 45

<210> 626
<211> 226
<212> PRT
<213> Hydrogenivirga sp. 128-5-R1-1

<400> 626

Met Gly Thr Ala Glu Phe Phe Val Gly Val Asp Leu Gly Leu Arg Lys
1 5 10 15

Leu Ala Val Val Ser Thr Ser Asp Gly Arg Ile Asn Lys Phe Phe Asp
20 25 30

Gly Gly Tyr Val Arg Ala Val Ser Glu Lys Tyr Gln Ala Leu Arg Lys
35 40 45

Arg Leu Gln Ser Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Lys
50 55 60

Leu Ser Gln Arg Glu Lys Arg Phe Arg Thr Ala Ile Asn His Lys Val
65 70 75 80

Ala Lys Glu Val Val Glu Leu Val Pro Ala Gly Gly Val Ile Val Leu
85 90 95

Glu Lys Leu Lys Gly Ile Arg Lys Arg Val Lys Val Gly Lys Gln Asn
100 105 110

Arg Arg Trp Ile His Ser Trp Asn Phe Ala Gln Leu Gln Arg Phe Ile
115 120 125

Glu Tyr Lys Ala Lys Ala Lys Gly Ile Lys Val Val Tyr Val Asp Ala
130 135 140

Arg Tyr Thr Ser Gln Lys Cys Ser Lys Cys Gly His Ile Ser Lys Lys
145 150 155 160

```
Asn Arg Lys Gly Gln Ala His Phe Val Cys Glu Arg Ser Gly Tyr Gln
                165                 170                 175

Leu Asn Ala Asp Leu Asn Ala Gly Arg Asn Ile Val Lys Asn Tyr Leu
            180                 185                 190

Ala Ser Leu Glu Gly Lys Ser Gly His Gly Glu Ala Ser Pro Ser Val
        195                 200                 205

Trp Asp Ala Val Asn Arg Ala Asp Val Gly Ser Val Gly Cys Ala Met
    210                 215                 220

His Gly
225
```

<210> 627
<211> 84
<212> PRT
<213> Anabaena sp. WA102

<400> 627

```
Met Ala Gln Phe Ala Pro Gln Asn Pro Ala Glu Thr Gln Pro Ala Lys
1               5                   10                  15

Ser Lys Lys Gly Lys Lys Ser Pro Thr Ser Asp Ser Glu Arg Asn Leu
            20                  25                  30

Ser Lys Asn Leu Phe Asp Thr Tyr Ser Asn Thr Glu Asp Asn Leu Thr
        35                  40                  45

Arg Cys Ala Ile Ser Tyr Leu Leu Lys Asn Gly Cys Lys Ile Ser Asn
    50                  55                  60

Lys Asp Phe Asn Thr Phe Gln His Pro Ser Arg Ser Gly Leu Arg Cys
65                  70                  75                  80

Thr His Lys Ser
```

<210> 628
<211> 406
<212> PRT
<213> Streptomyces sp. MP131-18

<400> 628

Met Phe Cys Val Lys Ile Val Ala Gln Val Lys Leu Leu Pro Ala Ser
1   5   10   15

Ala His Asp Ala Asp Ala Leu Ala Ala Thr Leu Arg Ala Cys Asn Arg
            20   25   30

Ala Ala Asn Thr Ala Ser Glu Val Ala Phe Thr Lys Asp Leu Lys Arg
        35   40   45

Arg Asn Thr Leu Gln Asp Ala Val Tyr His Arg Ile Lys Ala Asp Phe
    50   55   60

Asp Leu Gly Ala Gln Ala Ala Val Arg Thr Ile Lys Lys Val Cys Asp
65   70   75   80

Ala Tyr Ala Ala Leu Lys Gly Asn Ile Lys Ala Gly Asn Leu Gly Pro
                85   90   95

Lys Gly Ser Lys Arg Arg Thr Arg Ala Glu Ser Arg Pro Val Gly Phe
            100   105   110

Arg Asp Asp Ala Ala Gln Pro Phe Asp Asp Arg Ile Leu Thr Trp Asn
        115   120   125

Leu Asp Gln Arg Thr Val Ser Val Trp Thr Val Ala Gly Arg Leu Lys
    130   135   140

Gly Ile Pro Phe Val Cys Ser Pro Glu Ala Met Thr Leu Leu Ala Ser
145   150   155   160

Arg Lys Gly Glu Ser Asp Leu Val Met Arg Asp Gly Thr Phe Phe Leu
                165   170   175

```
Ile Ala Thr Ile Asp Val Pro Glu Pro Leu Val Ser Glu Pro Asp Gly
            180                 185                 190

Ser Leu Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Asp
        195                 200                 205

Gly Gln Ile Met Ala Gly Arg Arg Leu Asn Arg Tyr Arg Lys Arg His
    210                 215                 220

Arg Asp Leu Arg Arg Lys Leu Gln Lys Lys Arg Thr Lys Ala Ala Lys
225                 230                 235                 240

Arg Ala Leu Lys Arg Met Arg Arg Arg Glu Ala Arg His Ala Ala His
                245                 250                 255

Thr Asn His Ile Ile Ala Lys Arg Ile Val Ala Thr Ala Glu Arg Thr
            260                 265                 270

Ser Arg Gly Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Gln Arg Val
        275                 280                 285

Thr Ala Arg Lys Asp Gln Arg Ala Arg Leu His Ser Trp Ala Phe Ala
    290                 295                 300

Gln Leu Gly Thr Phe Val Glu Tyr Lys Ala Arg Arg Ala Gly Val Ala
305                 310                 315                 320

Val Val His Val Gly Pro Arg Asn Thr Ser Arg Gln Cys Ser Glu Cys
                325                 330                 335

Arg His Thr His Arg Thr Asn Arg Val Asp Gln Ala Arg Phe Val Cys
            340                 345                 350

Arg Ser Cys Gly Ile Val Leu His Ala Asp His Asn Gly Ser Arg Asn
        355                 360                 365
```

```
Ile Ala His Arg Gly Glu Ala Val Trp Gln Arg Gly Ala Val Lys Arg
    370                 375                 380

Pro Ser Thr Ala Gln Arg Tyr Thr Gly Arg Arg Gly Pro Thr Arg Gln
385                 390                 395                 400

Pro Val Ala Leu His Leu
                405
```

<210> 629
<211> 403
<212> PRT
<213> Streptomyces sp. MP131-18

<400> 629

```
Met Lys Ile Val Ala Gln Val Lys Leu Leu Pro Ala Ser Ala His Asp
1               5                   10                  15

Ala Asp Ala Leu Ala Ala Thr Leu Arg Ala Cys Asn Arg Ala Ala Asn
            20                  25                  30

Thr Ala Ser Glu Val Ala Phe Thr Lys Asp Leu Lys Arg Arg Asn Thr
        35                  40                  45

Leu Gln Asp Ala Val Tyr His Arg Ile Lys Ala Asp Phe Asp Leu Gly
    50                  55                  60

Ala Gln Ala Ala Val Arg Thr Ile Lys Lys Val Cys Asp Ala Tyr Ala
65                  70                  75                  80

Ala Leu Lys Gly Asn Ile Lys Ala Gly Asn Leu Gly Pro Lys Gly Ser
                85                  90                  95

Lys Arg Arg Thr Arg Ala Glu Ser Arg Pro Val Gly Phe Arg Asp Asp
            100                 105                 110

Ala Ala Gln Pro Phe Asp Asp Arg Ile Leu Thr Trp Asn Leu Asp Gln
        115                 120                 125
```

```
Arg Thr Val Ser Val Trp Thr Val Ala Gly Arg Leu Lys Gly Ile Pro
    130                 135                 140

Phe Val Cys Ser Pro Glu Ala Met Thr Leu Leu Ala Ser Arg Lys Gly
145                 150                 155                 160

Glu Ser Asp Leu Val Met Arg Asp Gly Thr Phe Phe Leu Ile Ala Thr
                165                 170                 175

Ile Asp Val Pro Glu Pro Leu Val Ser Glu Pro Asp Gly Ser Leu Gly
            180                 185                 190

Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Asp Gly Gln Ile
        195                 200                 205

Met Ala Gly Arg Arg Leu Asn Arg Tyr Arg Lys Arg His Arg Asp Leu
    210                 215                 220

Arg Arg Lys Leu Gln Lys Lys Arg Thr Lys Ala Ala Lys Arg Ala Leu
225                 230                 235                 240

Lys Arg Met Arg Arg Arg Glu Ala Arg His Ala Ala His Thr Asn His
                245                 250                 255

Ile Ile Ala Lys Arg Ile Val Ala Thr Ala Glu Arg Thr Ser Arg Gly
            260                 265                 270

Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Gln Arg Val Thr Ala Arg
        275                 280                 285

Lys Asp Gln Arg Ala Arg Leu His Ser Trp Ala Phe Ala Gln Leu Gly
    290                 295                 300

Thr Phe Val Glu Tyr Lys Ala Arg Arg Ala Gly Val Ala Val Val His
305                 310                 315                 320

Val Gly Pro Arg Asn Thr Ser Arg Gln Cys Ser Glu Cys Arg His Thr
```

```
                325                 330                 335

His Arg Thr Asn Arg Val Asp Gln Ala Arg Phe Val Cys Arg Ser Cys
            340                 345                 350

Gly Ile Val Leu His Ala Asp His Asn Gly Ser Arg Asn Ile Ala His
        355                 360                 365

Arg Gly Glu Ala Val Trp Gln Arg Gly Ala Val Lys Arg Pro Ser Thr
    370                 375                 380

Ala Gln Arg Tyr Thr Gly Arg Arg Gly Pro Thr Arg Gln Pro Val Ala
385                 390                 395                 400

Leu His Leu
```

<210> 630
<211> 374
<212> PRT
<213> Mariprofundus ferrinatatus

<400> 630

```
Met Met Arg Thr Ala Ser Ile Lys Leu Asp Val Thr Ala Glu Gln Ser
1               5                   10                  15

Ala Ser Leu Arg Asp Leu Gln Ser Ala Tyr Val Asp Ala Cys Asn Lys
            20                  25                  30

Leu Val Pro Val Ala Ser Asp His Arg Cys Trp Asn Arg Val Ala Leu
        35                  40                  45

His Ala Leu Ala Tyr Thr Leu Leu Arg Ser Thr Thr Pro Leu Gly Ser
    50                  55                  60

Gln Met Val Cys Asn Ala Ile Tyr Ser Val Cys Lys Ala Tyr Lys Ala
65                  70                  75                  80
```

```
Gln Lys Glu Leu Gly Arg Ile Arg Lys Asp Lys Pro Val Pro Ile Ile
                85                  90                  95

Gly Phe Lys Lys Ser Ser Ile His Phe Asp Lys Arg Thr Tyr Thr Ile
            100                 105                 110

Lys Gly Asp Met Val Ser Leu Tyr Thr Leu Gly Gly Arg Ile Ser Val
        115                 120                 125

Pro Met Ile Met Gly Gln His Gln His Glu Met Leu Arg Ser Gly Met
    130                 135                 140

Pro Lys Glu Ala Glu Leu Ile Cys Arg Lys Gly Lys Trp Tyr Phe Asn
145                 150                 155                 160

Leu Val Val Glu Lys Glu Asp Thr Glu Lys Leu Thr Ser Gly Pro Val
                165                 170                 175

Val Gly Val Asp Val Gly Glu Asn Asn Leu Ala Ala Thr Ser Ile Gly
            180                 185                 190

Lys Val Tyr Gly Gly Gly Asp Leu Arg His Arg Arg Asp Lys His Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Arg Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Gln Arg Arg Val Lys His Ile
225                 230                 235                 240

Asn His Glu Thr Ser Lys Ser Ile Val Gln Glu Ala Gln Lys Thr Gly
                245                 250                 255

Ala Ser Lys Ile Thr Met Glu Asp Leu Asn His Ile Arg Asp Asn Ile
            260                 265                 270

Lys Ala Gly Lys Arg Val Arg Thr Arg Leu His Arg Trp Ala Phe Arg
        275                 280                 285
```

```
Gln Leu Gln Thr Phe Ile Gln Tyr Lys Ala Glu Ala Val Gly Ile Thr
    290                 295                 300

Val Glu Phe Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Ser Ala Cys
305                 310                 315                 320

Gly Ser Leu Gly Asn Arg Asp Arg His Arg Phe Glu Cys Leu Cys Gly
                325                 330                 335

Leu Arg Ala His Ala Asp Leu Asn Ala Ser Arg Asn Leu Ala Arg Ile
            340                 345                 350

Gly Ser Gly Ile Pro Leu Ser Lys Ala Phe Val Asn Thr Pro Asp Val
        355                 360                 365

Pro Ser Gly Ile Asp Ala
    370
```

<210> 631
<211> 288
<212> PRT
<213> Thermococcus sp. 2319x1

<400> 631

```
Met Leu Asp Asp His Leu Phe Lys Leu Asp Leu Glu Ala Gly Val Ile
1               5                   10                  15

Lys Leu Ser Ala Pro Gly Gly Arg Ile Pro Leu Lys Phe Tyr Pro Ala
            20                  25                  30

Lys Tyr His Glu Lys Phe Lys Ser Trp Arg Val Gly Gln Ala Trp Leu
        35                  40                  45

Val Lys Thr Pro Lys Gly Val Phe Ile Asn Val Val Phe Ser Lys Glu
    50                  55                  60

Val Glu Val Gly Glu Pro Glu Thr Phe Val Gly Val Asp Leu Asn Glu
```

```
65                  70                  75                  80

Asn Asn Val Thr Leu Ser Leu Pro Asn Gly Gly Phe Val Gln Ile Ile
                85                  90                  95

Thr His Glu Arg Glu Ile Arg Thr Gly Tyr Phe Val Lys Arg Arg Arg
            100                 105                 110

Ile Gln Lys Lys Met Arg Ala Gly Arg Lys Arg Lys Glu Leu Leu Glu
        115                 120                 125

Lys Tyr Gly Glu Arg Glu Arg Asn Arg Leu Asn Asp Leu Tyr His Lys
    130                 135                 140

Leu Ala Asn Lys Ile Val Glu Leu Ala Glu Lys Tyr Gly Gly Ile Ala
145                 150                 155                 160

Leu Glu Asp Leu Thr Glu Ile Arg Asp Ser Ile Arg Tyr Ser Ala Glu
                165                 170                 175

Met Asn Gly Arg Leu His Arg Trp Ser Phe Arg Lys Leu Gln Ser Ile
            180                 185                 190

Ile Glu Tyr Lys Ala Lys Leu Arg Gly Ile Lys Val Val Phe Val Asn
        195                 200                 205

Pro Ala Phe Thr Ser Ser Leu Cys Pro Ile Cys Gly Glu Lys Leu Ser
    210                 215                 220

Pro Asn Gly Cys Arg Val Leu Lys Cys Lys Cys Gly Phe Glu Ala Asp
225                 230                 235                 240

Arg Asp Val Val Gly Ser Trp Asn Ile Arg Leu Lys Ala Leu Lys Met
                245                 250                 255

Trp Gly Val Ser Val Pro Pro Glu Ser Gln Pro Met Lys Leu Gly Gly
            260                 265                 270
```

```
Trp Lys Pro Ala Arg Tyr Glu Ile Asn Thr Leu His Thr Leu Tyr Gly
        275                 280                 285


<210>  632
<211>  349
<212>  PRT
<213>  Vulcanibacillus modesticaldus

<400>  632

Met Glu Gln Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu Gln Glu
1               5                   10                  15


Tyr His Leu Ile Asn Ile Ser Arg Glu Tyr Ile Lys Thr Val Asn Thr
            20                  25                  30


Leu Val Ala Asp Met Val Gln Ala Glu Lys Ile Leu Lys Leu Ser Ser
        35                  40                  45


Lys Asp Val His Val Ser Met Pro Ser Ala Val Lys Asn Gln Ala Ile
    50                  55                  60


Arg Asp Ala Lys Ser Val Tyr Arg Lys Val Lys Lys Leu Lys Arg Val
65                  70                  75                  80


Pro Ile Leu Lys Lys Ser Val Cys Ile Trp Asn Asn Gln Asn Tyr Lys
                85                  90                  95


Ile Lys Glu Ser Val Ile Glu Phe Pro Val Tyr Ile Asn Gly Lys Ser
            100                 105                 110


Lys Arg Ile Ala Val Lys Ala Ile Leu Thr Glu Tyr Gln His Asn Leu
        115                 120                 125


Leu Lys Asn Gln Leu Gly Ile Leu Arg Ile Thr Lys Lys Ser Asn Lys
    130                 135                 140


Trp Ile Ala Gln Ile Ala Val Lys Ile Pro Gly Pro Thr Gln Asn Asn
145                 150                 155                 160
```

```
Ser Asp Ile Val Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val
                165                 170                 175

Ala Val Thr Ser Thr Gly Lys Thr Arg Phe Phe Gly Asn Gly Arg Gln
            180                 185                 190

Asn Lys Tyr Ile Arg Arg Lys Phe Lys Ser Gln Arg Arg Glu Leu Gly
        195                 200                 205

Lys Ser Lys Lys Leu Asn Ala Ile Arg Lys Leu Asn Asp Lys Glu Thr
    210                 215                 220

Leu Trp Met Lys Asp Lys Asp His Lys Ile Ser Arg Thr Leu Val Asp
225                 230                 235                 240

Phe Ala Ile Lys Asn Asn Val Ser Val Ile Arg Leu Glu Lys Leu Ser
                245                 250                 255

Asn Ile Arg Asn Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu
            260                 265                 270

His Thr Trp Ser Phe Tyr Arg Leu Ala Gln Tyr Ile Glu Tyr Lys Ala
        275                 280                 285

Lys Leu Ala Gly Ile Lys Val Glu Tyr Val Asp Pro Lys Tyr Thr Ser
    290                 295                 300

Gln Ile Cys Pro Met Cys Gly Lys Arg Asn His Thr Lys Asp Arg Lys
305                 310                 315                 320

Tyr Gln Cys Ser Cys Gly Phe Lys Thr His Arg Asp Arg Val Ala Gly
                325                 330                 335

Ile Asn Ile Ile Asn Ala Pro Val Ile Asp Gly Val Ala
            340                 345
```

<210> 633
<211> 394
<212> PRT
<213> Thermococcus paralvinellae

<400> 633

Met Ile Ser Tyr Val Tyr Asp Arg Asn Ile Thr Ser Phe Tyr Arg Leu
1 5 10 15

Lys Asn Ala Lys Tyr Lys Glu Leu Arg Asn Arg Tyr Leu Tyr Leu Pro
20 25 30

Ser His Tyr Ile Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile Phe Lys
35 40 45

Ser Tyr Arg Lys Lys Arg Arg Lys Gly Lys Ala Lys Gly Lys Pro Val
50 55 60

Phe Lys Lys Asp Val Ile Met Leu Asp Asp His Leu Phe Lys Leu Asp
65 70 75 80

Leu Glu Asn Gly Ile Ile Arg Leu Ser Thr Pro Asn Gly Arg Ile Ser
85 90 95

Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Asp Trp Arg
100 105 110

Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe Ile Asn
115 120 125

Ile Val Phe Ser Lys Glu Ile Glu Ile Gly Glu Pro Lys Ser Phe Ile
130 135 140

Gly Ile Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Ile Pro Asn Gly
145 150 155 160

Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr Gly Tyr
165 170 175

```
Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Ile Arg Thr Gly Lys Arg
            180                 185                 190

Arg Lys Ala Leu Leu Gln Lys Tyr Gly Glu Arg Glu Lys Asn Arg Leu
        195                 200                 205

Asn Asp Leu Tyr His Lys Ile Ala Asn Val Ile Val Glu Phe Ala Lys
    210                 215                 220

Arg Tyr Gly Gly Ile Thr Leu Glu Asp Leu Thr Glu Ile Arg Glu Ser
225                 230                 235                 240

Ile Met Tyr Ser Ala Lys Met Asn Gly Arg Leu His Arg Trp Ser Phe
                245                 250                 255

Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Asn Gly Ile
            260                 265                 270

Lys Val Val Phe Val Asn Pro Ser Tyr Thr Ser Ser Arg Cys Pro Ile
        275                 280                 285

Cys Gly Asn Lys Leu Ser Pro Lys Gly His Arg Ile Leu Glu Cys Ser
    290                 295                 300

Asn Cys Gly Leu Lys Thr Asn Arg Asp Val Ile Gly Ser Trp Asn Ile
305                 310                 315                 320

Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro Glu Ser
                325                 330                 335

Gln Pro Met Lys Thr Gly Gly Trp Lys Gly Lys Phe Gln Asn Gly Ile
            340                 345                 350

Glu Phe Ser Thr Ile Lys Ala Glu Tyr Phe Phe Asp Asn Pro Pro Ile
        355                 360                 365

Trp His Ser Gln Lys Phe Ser Val His Ala Leu Phe Asp Val Gln Thr
```

370 375 380

Thr Ile Arg Arg Ser Glu Tyr Gly Arg Phe
385 390

<210> 634
<211> 393
<212> PRT
<213> Pyrococcus sp. ST04

<400> 634

Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Asn
1 5 10 15

Pro Pro Arg Glu Leu Asp Asp Leu Phe Ser Thr Tyr His Lys Ile Val
20 25 30

Asn Tyr Leu Ile Thr Tyr Ala Phe Glu Asn Asn Val Thr Ser Phe Tyr
35 40 45

Arg Leu Lys Lys Glu Thr Tyr Lys Asn Leu Arg Lys Glu Tyr Ser Ser
50 55 60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile
65 70 75 80

Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Lys Gly Lys Ala Arg Gly Lys
85 90 95

Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
100 105 110

Leu Asp Leu Glu Lys Arg Val Ile Lys Leu Ser Thr Pro Ser Gly Arg
115 120 125

Ile Ile Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Gly
130 135 140

```
Trp Arg Ile Gly Gln Ala Trp Leu Ile Lys Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Val Asn Val Val Phe Ser Lys Glu Val Glu Val Gly Glu Pro Lys Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Ala Tyr Tyr Leu Lys Arg Arg Arg Val Gln Arg Lys Ile Arg Ala Gly
    210                 215                 220

Arg Arg Arg Glu Glu Leu Leu Glu Lys Tyr Gly Glu Arg Glu Arg Asn
225                 230                 235                 240

Arg Val Asn Asp Leu His His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Glu Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Met Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Lys Val Val Phe Val Asn Pro Ala Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350
```

Asn Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Thr Val Pro Pro
        355   360   365

Glu Ser His Pro Met Lys Met Gly Gly Trp Lys Pro Thr Arg Tyr Glu
    370   375   380

Ile Asn Ala Pro His Thr Thr Asn Gly
385   390

<210> 635
<211> 388
<212> PRT
<213> Thermococcus celer

<400> 635

Met Pro Ser Glu Thr Ile Lys Leu Ala Ala Lys Phe Lys Leu Lys Asn
1   5   10   15

Pro Pro Asn Gly Leu Asp Gly Leu Phe Gln Thr Tyr Arg Glu Ile Val
            20   25   30

Asn Thr Leu Ile Thr His Ala His Glu Asn Asn Ile Thr Ser Phe Tyr
        35   40   45

Arg Leu Lys Lys Glu Thr Tyr Lys Lys Leu Arg Lys Glu Tyr Ser Glu
    50   55   60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65   70   75   80

Tyr Lys Ser Tyr Arg Lys Arg Lys Lys Lys Glu Lys Ala Lys Gly Lys
                85   90   95

Pro Ala Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100   105   110

Leu Asp Leu Lys Gly Glu Val Lys Leu Ser Thr Pro Gly Gly Arg Val

```
        115                 120                 125

Ser Leu Glu Phe Tyr Pro Ala Arg Tyr His Glu Lys Phe Arg Gly Trp
    130                 135                 140

Lys Val Gly Gln Ala Trp Leu Val Lys Thr Ser Lys Gly Val Phe Val
145                 150                 155                 160

Asn Val Val Phe Ser Lys Glu Val Glu Val Gly Glu Ala Lys Ser Phe
                165                 170                 175

Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro Asp
            180                 185                 190

Gly Glu Phe Val Gln Val Ile Thr His Glu Arg Glu Ile Arg Thr Gly
        195                 200                 205

Tyr Tyr Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Lys Ala Gly Lys
    210                 215                 220

Arg Arg Glu Lys Leu Leu Glu Lys Tyr Gly Gly Arg Glu Lys Asn Arg
225                 230                 235                 240

Leu Asn Asp Leu Tyr His Lys Ile Ala Asn Lys Ile Val Glu Leu Ala
                245                 250                 255

Glu Glu Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Asn Ile Arg Glu
            260                 265                 270

Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp Ser
        275                 280                 285

Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg Gly
    290                 295                 300

Val Ser Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Arg Cys Pro
305                 310                 315                 320
```

```
Val Cys Gly Gly Lys Leu Ser Pro Asn Gly Tyr Arg Gly Val Lys Cys
                325                 330                 335


Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn Ile
            340                 345                 350


Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro Glu Ser
        355                 360                 365


His Pro Met Lys Met Gly Gly Trp Lys Val Gly Arg Asn Asp Val Tyr
    370                 375                 380


Lys Ser Tyr Gly
385
```

<210> 636
<211> 380
<212> PRT
<213> Chloracidobacterium thermophilum

<400> 636

```
Met Leu Arg Thr Ala Ser Ile Arg Leu Asn Val Gly Pro Asp Gln Ala
1               5                   10                  15


Ala Ala Leu Ala Ala Leu Gln Ala Ala Tyr Ala Asp Ala Cys Asn Arg
            20                  25                  30


Leu Val Pro Thr Val Val Glu His Arg Cys Trp Asn Arg Val Ala Leu
        35                  40                  45


His His Leu Ala Tyr Ala Arg Leu Arg Lys Glu Thr Pro Leu Gly Ala
    50                  55                  60


Gln Met Val Cys Asn Ala Ile Phe Ser Val Cys Lys Ala Tyr Lys Ala
65                  70                  75                  80


Gln Lys Glu Leu Gly Arg Ile Arg Lys Asp Ala Pro Val Pro Ala Val
                85                  90                  95
```

```
His Phe Asn Arg Ala Ser Val His Phe Asp Lys Arg Thr Tyr Ala Ile
            100                 105                 110

Lys Gly Glu Cys Leu Ser Leu Tyr Thr Leu Ser Gly Arg Ile Ala Val
        115                 120                 125

Pro Met Val Leu Gly Glu His Gln Arg Arg Ile Leu Ala Ser Gly Lys
    130                 135                 140

Ala Lys Glu Ala Glu Leu Val Cys Arg Lys Gly Arg Trp Tyr Phe Asn
145                 150                 155                 160

Leu Val Val Glu Ser Glu Asp Ser Asp Pro Ile Ala Ser Gly Arg Val
                165                 170                 175

Met Gly Val Asp Val Gly Glu Asn His Leu Ala Ala Thr Ser Thr Gly
            180                 185                 190

Lys Val Trp Gly Gly Gly Gln Leu Arg His Lys Arg Asn Gly Tyr Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Arg Arg Arg Ile Thr His Ile
225                 230                 235                 240

Asn His Glu Thr Ser Lys Ala Ile Val Ala Glu Ala Leu Arg Phe Gly
                245                 250                 255

Ala Ser Lys Ile Val Met Glu Asp Leu Thr His Ile Arg Asp Arg Ile
            260                 265                 270

Gln Ala Gly Lys Arg Met Arg Ala Arg Leu His Gly Trp Ala Phe Arg
        275                 280                 285
```

```
Gln Leu Gln Ser Phe Val Glu Tyr Lys Ala Lys Ala Ala Gly Ile Ala
    290                 295                 300

Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ser Cys Cys
305                 310                 315                 320

Gly Ala Leu Gly Arg Arg Ile Lys His Arg Phe Val Cys Asn Lys Cys
                325                 330                 335

Gly Leu Arg Ala His Ala Asp Gly Asn Ala Ser Arg Asn Leu Ala Arg
            340                 345                 350

Ile Gly Ser Gly Ala Pro Leu Pro Arg Ala Ala Val Asn Thr Pro Asp
        355                 360                 365

Val Gly Asp Val Ser His Asn Cys Cys Val Ser Gln
    370                 375                 380
```

<210> 637
<211> 396
<212> PRT
<213> Thermococcus celer

<400> 637

```
Met Pro Asn Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15

Ile Pro Asp Gly Leu Asp Gly Leu Phe Gln Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn Thr Leu Ile Thr His Ala His Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Ala Trp Ile
65                  70                  75                  80
```

```
Tyr Lys Ser Tyr Arg Lys Arg Lys Lys Lys Gly Lys Ala Lys Gly Arg
                85                  90                  95

Pro Val Phe Arg Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Asp Gly Lys Ile Ile Lys Leu Ser Thr Pro Asn Gly Arg
        115                 120                 125

Ile Ser Leu Glu Phe Tyr Pro Ala Arg Tyr His Glu Lys Phe Arg Gly
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Lys Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Val Asn Val Val Phe Ser Thr Glu Val Glu Val Gly Glu Ala Lys Thr
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asp Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Arg Ile Gln Lys Lys Phe Arg Ala Gly
    210                 215                 220

Lys Lys Arg Glu Lys Leu Leu Glu Lys Tyr Gly Gly Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Ile Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Glu Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Asn Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
```

```
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Ser Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Arg Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly Tyr Arg Arg Val Lys
                325                 330                 335

Cys Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350

Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Pro Val Pro Pro Glu
        355                 360                 365

Ser His Pro Met Lys Met Gly Gly Trp Lys Val Ser Arg Asn Asp Val
    370                 375                 380

Tyr Lys Ser Tyr Gly Gln Pro Glu Arg Val Pro Tyr
385                 390                 395
```

<210> 638
<211> 389
<212> PRT
<213> Thermococcus celer

<400> 638

```
Met Pro Asn Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15

Ile Pro Asp Gly Leu Asp Gly Leu Phe Gln Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn Thr Leu Ile Thr His Ala His Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45
```

```
Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80

Tyr Lys Ser Tyr Arg Lys Arg Asn Lys Lys Gly Lys Ala Lys Gly Arg
                85                  90                  95

Pro Val Phe Arg Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Asp Gly Lys Ile Ile Lys Leu Ser Thr Pro Asn Gly Arg
        115                 120                 125

Ile Ser Leu Glu Phe Tyr Pro Ala Arg Tyr His Glu Lys Phe Arg Gly
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Lys Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Val Asn Val Val Phe Ser Thr Glu Val Glu Val Gly Glu Ala Lys Thr
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asp Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Arg Ile Gln Lys Lys Phe Arg Ala Gly
    210                 215                 220

Lys Lys Arg Glu Lys Leu Leu Glu Lys Tyr Gly Gly Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Ile Ala Asn Lys Ile Val Glu Leu
                245                 250                 255
```

```
Ala Glu Glu Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Asn Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Ser Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Arg Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly Tyr Arg Arg Val Lys
                325                 330                 335

Cys Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350

Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Pro Val Pro Pro Glu
        355                 360                 365

Ser His Pro Met Lys Met Gly Gly Trp Lys Val Gly Arg Asn Asp Val
    370                 375                 380

Tyr Lys Ser Tyr Gly
385
```

<210> 639
<211> 419
<212> PRT
<213> Thermococcus nautili

<400> 639

```
Met Arg Thr Ser Val Ala Val Asn Arg Ile Trp Val Gly Gln Arg Pro
1               5                   10                  15

Ile His Pro Thr Asp Ile Pro Leu Gly Ile Ile Asn Thr Asn Tyr Met
```

```
            20                  25                  30

Gln Thr Leu Ile Asn Phe Val Val Val Ile Ile Met Cys Gly Ile
        35                  40                  45

Lys Leu Thr Gln Thr Phe Lys Leu Met Lys Pro Asn Lys Arg Lys Arg
    50                  55                  60

Glu Leu Leu Asp Ala Thr Ile Glu Arg Phe Lys Glu Cys Val Asn Ala
65                  70                  75                  80

Trp Ile Ser Glu Ile Glu Gln Leu Gly Glu Tyr Pro Thr Arg Lys Asn
                85                  90                  95

Val His Ser Phe Ala Tyr Lys Lys Ile Arg Glu Gln Phe Lys Asp Leu
            100                 105                 110

His Ser Asn Val Val Gln Glu Ala Met Asn Arg Ala Ile Glu Val Tyr
        115                 120                 125

Arg Ala Trp Leu Lys Thr Lys Gly Gln Lys Pro Val Phe Thr Ala Asp
    130                 135                 140

Val Val Ser Phe Lys Asn Val Asp Val Lys Ile Asp Arg His Phe Ile
145                 150                 155                 160

Asn Val Pro Leu Ile Asn Lys Glu Arg Val Trp Leu Pro Met His Val
                165                 170                 175

Pro Lys Lys Leu Arg Lys Phe Leu Lys Met Lys His Gly Arg Val Gln
            180                 185                 190

Ile Ser Lys Val Asp Asp Glu Tyr Tyr Ala Gln Ile Ser Phe Glu Val
        195                 200                 205

Pro Glu Pro Lys Pro Tyr Glu Pro Lys Gly Trp Leu Gly Val Asp Ile
    210                 215                 220
```

```
Gly Ile Asn His Ile Val Val Ile Ser Asp Asp Lys Gly Lys Ile Asn
225                 230                 235                 240

Lys Phe Tyr Asp Asn Ala Ile Ala Trp Lys Lys Ser Val Glu Tyr Arg
                245                 250                 255

Arg Ala Arg Leu Gln Phe Leu Lys Asp Lys Arg Thr Lys Lys Gly Ala
            260                 265                 270

Trp Arg Ile Leu Lys Arg Leu Ser His Lys Glu Lys Asn Lys Met Ala
        275                 280                 285

Tyr Ile Asn His Lys Ile Ala Lys Glu Ile Val Glu Leu Ala Lys His
    290                 295                 300

Tyr His Tyr Gly Ile Ala Ile Glu Asn Leu Lys Gly Ile Arg His His
305                 310                 315                 320

Tyr Asn Ala Lys Arg His Arg Lys Arg Leu His Lys Trp Ala Tyr Gly
                325                 330                 335

Asp Leu Ile Asp Lys Ile Val Tyr Lys Ala Lys Leu Asn Gly Val Pro
            340                 345                 350

Val Val Phe Val Asp Pro Arg Asn Thr Ser Arg Thr Cys Ser Lys Cys
        355                 360                 365

Gly Tyr Leu Val Glu Lys Gly Val Lys Gly Arg Trp Phe Arg Cys Pro
    370                 375                 380

Lys Cys Gly Phe Gln Leu Asp Arg Asp Leu Asn Ala Ala Arg Asn Ile
385                 390                 395                 400

Ala Lys Arg Ala Phe Arg Leu Ala Pro Trp Gly Ala Ser Ser Ser Gln
                405                 410                 415

Arg Arg Trp
```

<210> 640
<211> 393
<212> PRT
<213> Thermococcus celericrescens

<400> 640

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Asn
1               5                  10                  15


Pro Pro Glu Glu Leu Asn Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30


Asn Tyr Leu Ile Ser Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Lys
    50                  55                  60


Leu Pro Ser His Tyr His Tyr Thr Ala Thr Gln Met Ala Thr Met Ile
65                  70                  75                  80


Tyr Arg Ser Phe Arg Lys Arg Lys Lys Lys Gly Lys Ala Ser Gly Arg
                85                  90                  95


Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Ile Phe Lys
            100                 105                 110


Leu Asp Leu Gly Ala Gly Ile Ile Lys Leu Ser Thr Pro Ser Gly Arg
        115                 120                 125


Ile Val Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Glu
    130                 135                 140


Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Leu
145                 150                 155                 160
```

```
Ile Asn Val Val Phe Ser Arg Glu Val Asp Val Gly Glu Pro Lys Thr
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Leu Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Lys Ile Gln Arg Lys Leu Arg Thr Gly
    210                 215                 220

Lys Arg Arg Lys Glu Leu Leu Glu Lys Tyr Gly Gln Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Ile Lys Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Glu Lys Leu Ser Pro Lys Gly His Arg Val Leu Lys
                325                 330                 335

Cys Pro Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Ile Gly Ser Trp
            340                 345                 350

Asn Ile Ser Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365
```

```
Glu Ser Pro Thr Met Lys Ala Gly Val Gly Lys Val Ser Arg Asn Asp
    370                 375                 380


Ala Tyr Glu Leu Tyr Lys Ser Tyr Gly
385                 390


<210>  641
<211>  393
<212>  PRT
<213>  Thermococcus sp. 4557

<400>  641

Met Pro Asn Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Gly
1               5                   10                  15


Thr Pro Asp Gly Leu Asp Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30


Asn Phe Leu Ile Thr Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60


Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80


Phe Lys Ser Phe Arg Lys Arg Lys Lys Lys Gly Lys Thr Arg Gly Arg
                85                  90                  95


Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Glu Asn Lys Ile Ile Lys Leu Ser Thr Pro Asn Gly Arg
        115                 120                 125


Ile Gln Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Asp
```

```
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Ile Phe
145                 150                 155                 160

Leu Asn Val Val Phe Ser Arg Glu Val Glu Ile Ser Glu Pro Asn Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Leu Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Gln Lys Ile Gln Ala Gly
    210                 215                 220

Lys Lys Arg Lys Glu Leu Leu Glu Lys Tyr Gly Glu Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Val
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Glu Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Lys Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Ile Cys Gly Glu Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335
```

```
Cys Ser Asn Cys Gly Phe Glu Ala Asn Arg Asp Val Val Gly Ser Trp
            340                 345                 350


Asn Val Arg Leu Arg Ala Leu Lys Met Trp Gly Val Thr Val Pro Pro
        355                 360                 365


Glu Ser Pro Thr Met Lys Thr Gly Val Gly Lys Val Ser Arg Asn Asp
    370                 375                 380


Val Tyr Glu Leu Tyr Thr Ser Tyr Gly
385                 390


<210>  642
<211>  375
<212>  PRT
<213>  Thermococcus nautili

<400>  642

Met Cys Gly Ile Lys Leu Thr Gln Thr Phe Lys Leu Met Lys Pro Asn
1               5                   10                  15


Lys Arg Lys Arg Glu Leu Leu Asp Ala Thr Ile Glu Arg Phe Lys Glu
            20                  25                  30


Cys Val Asn Ala Trp Ile Ser Glu Ile Glu Gln Leu Gly Glu Tyr Pro
        35                  40                  45


Thr Arg Lys Asn Val His Ser Phe Ala Tyr Lys Lys Ile Arg Glu Gln
    50                  55                  60


Phe Lys Asp Leu His Ser Asn Val Val Gln Glu Ala Met Asn Arg Ala
65                  70                  75                  80


Ile Glu Val Tyr Arg Ala Trp Leu Lys Thr Lys Gly Gln Lys Pro Val
                85                  90                  95


Phe Thr Ala Asp Val Val Ser Phe Lys Asn Val Asp Val Lys Ile Asp
            100                 105                 110
```

```
Arg His Phe Ile Asn Val Pro Leu Ile Asn Lys Glu Arg Val Trp Leu
        115                 120                 125

Pro Met His Val Pro Lys Lys Leu Arg Lys Phe Leu Lys Met Lys His
    130                 135                 140

Gly Arg Val Gln Ile Ser Lys Val Asp Asp Glu Tyr Tyr Ala Gln Ile
145                 150                 155                 160

Ser Phe Glu Val Pro Glu Pro Lys Pro Tyr Glu Pro Lys Gly Trp Leu
                165                 170                 175

Gly Val Asp Ile Gly Ile Asn His Ile Val Val Ile Ser Asp Asp Lys
            180                 185                 190

Gly Lys Ile Asn Lys Phe Tyr Asp Asn Ala Ile Ala Trp Lys Lys Ser
        195                 200                 205

Val Glu Tyr Arg Arg Ala Arg Leu Gln Phe Leu Lys Asp Lys Arg Thr
    210                 215                 220

Lys Lys Gly Ala Trp Arg Ile Leu Lys Arg Leu Ser His Lys Glu Lys
225                 230                 235                 240

Asn Lys Met Ala Tyr Ile Asn His Lys Ile Ala Lys Glu Ile Val Glu
                245                 250                 255

Leu Ala Lys His Tyr His Tyr Gly Ile Ala Ile Glu Asn Leu Lys Gly
            260                 265                 270

Ile Arg His His Tyr Asn Ala Lys Arg His Arg Lys Arg Leu His Lys
        275                 280                 285

Trp Ala Tyr Gly Asp Leu Ile Asp Lys Ile Val Tyr Lys Ala Lys Leu
    290                 295                 300
```

```
Asn Gly Val Pro Val Val Phe Val Asp Pro Arg Asn Thr Ser Arg Thr
305                 310                 315                 320


Cys Ser Lys Cys Gly Tyr Leu Val Glu Lys Gly Val Lys Gly Arg Trp
                325                 330                 335


Phe Arg Cys Pro Lys Cys Gly Phe Gln Leu Asp Arg Asp Leu Asn Ala
            340                 345                 350


Ala Arg Asn Ile Ala Lys Arg Ala Phe Arg Leu Ala Pro Trp Gly Ala
        355                 360                 365


Ser Ser Ser Gln Arg Arg Trp
    370                 375


<210>  643
<211>  213
<212>  PRT
<213>  Candidatus Wildermuthbacteria bacterium RIFCSPLOWO2_02_FULL_47_9c

<400>  643

Met Phe Gln Thr Ala Glu Ile Pro Glu Glu Asn Ile Lys Asp Val Glu
1               5                   10                  15


Glu Phe Leu Gly Val Asp Phe Gly Leu Arg His Ile Ala Thr Leu Ser
            20                  25                  30


Thr Gly Glu Lys Met Ser Gly Lys Asp Leu Glu Asn Tyr Arg Ile Lys
        35                  40                  45


Arg Gln Arg Val Arg Ser Ser Leu Gln Ser Lys Cys Thr Thr Asn Ala
    50                  55                  60


Arg Lys Val Leu Lys Arg Leu Ser Gly Lys Glu Arg Thr Thr Ala Arg
65                  70                  75                  80


Ile Val Asn His Thr Ile Ala Lys Thr Ile Val Glu Lys Ala Lys Ala
                85                  90                  95
```

```
Glu Asn Lys Gly Ile Ala Leu Glu Asn Leu Lys Gly Ile Arg Glu Arg
            100                 105                 110

Ser Leu Lys Lys Gly Arg Val Phe Arg Ser Arg Val Gly Arg Trp Asn
        115                 120                 125

Phe Ser Phe Leu Arg Gln Ala Ile Glu Tyr Lys Ala Arg Leu Ala Gly
    130                 135                 140

Ile Pro Val Val Leu Val Asn Pro Arg His Thr Ser Gln Arg Cys Phe
145                 150                 155                 160

Arg Cys Gly Asn Leu Gly Ser Arg Lys Gly Glu Ser Phe Lys Cys Ala
                165                 170                 175

Cys Gly Phe Ile Glu His Ala Asp Val Asn Ala Ala Arg Asn Ile Ala
            180                 185                 190

Phe Leu Ala Leu Pro Val Asn Gln Gly Glu Lys Ser Ala Met Cys Pro
        195                 200                 205

Val Leu Ser His Gly
    210
```

<210> 644
<211> 389
<212> PRT
<213> Streptomyces glauciniger

<400> 644

```
Met Val Thr Ser Val Lys Ile Val Thr Gln Val Lys Leu Leu Pro Glu
1               5                   10                  15

Ala Gly Gln Ala Ala Ala Leu Arg Ser Thr Leu Arg Thr Val Asn Glu
            20                  25                  30

Leu Ala Asn Trp Val Ala Asp Val Ala Phe Ala His Asp Val Pro Arg
        35                  40                  45
```

```
Glu Tyr Glu Leu Arg Lys His Thr Tyr Ala His Leu Lys Ala Gln Gly
    50                  55                  60

Leu Gly Ala Gln Ala Ala Gln His Val Ile Lys Lys Val Arg Asp Ala
65                  70                  75                  80

Tyr Thr Thr Leu His Ala Asn Leu Leu Gly Gly Asn Leu Gly Lys Pro
                85                  90                  95

Gly Ser Lys Arg Arg Ile Lys Ala Glu Ser Lys Pro Ile Ala Phe Arg
            100                 105                 110

Pro Gln Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr
        115                 120                 125

Asp Gln Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg Ile Lys Asn
    130                 135                 140

Val Arg Phe Ala Cys Ser Ala Gly Ala Leu Lys Thr Leu Gln Gln Tyr
145                 150                 155                 160

Arg Lys Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Ile Phe Tyr Leu
                165                 170                 175

Val Ala Val Cys Glu Val Pro Glu Ala Val Pro Tyr Glu Pro Asp Gly
            180                 185                 190

Ile Ile Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Thr
        195                 200                 205

Gly Tyr Gln Ala Ala Gly Arg Arg Leu Asn Arg Tyr Arg Lys Arg Gln
    210                 215                 220

Leu Ala Leu Arg Ser Lys Leu Gln Lys Lys Arg Thr Arg Ser Ala Glu
225                 230                 235                 240
```

```
Arg Arg Leu Lys Glu Arg Arg Ser Arg Glu Ala Arg His Val Lys Asn
                245                 250                 255

Thr Asn His Val Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr
            260                 265                 270

Ser Ala Gly Ile Ala Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val
        275                 280                 285

Arg Leu Arg Lys Pro Gln Arg Val Thr Leu His Ser Trp Ala Phe Ala
    290                 295                 300

Gln Leu Ala Asp Phe Ile Val Tyr Lys Ala Arg Arg Ala Gly Val Pro
305                 310                 315                 320

Leu Val Tyr Val Asp Pro Ala Tyr Thr Ser Gln Met Cys Cys Glu Cys
                325                 330                 335

Gly His Thr Asp Lys Arg Asn Arg Val Asp Gln Gly Leu Phe Ile Cys
            340                 345                 350

Arg Asn Arg Gly Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn
        355                 360                 365

Ile Ala Ala Arg Gly Ala Val Val Trp Thr Ala Gly Arg Glu Ser Arg
    370                 375                 380

Val Pro Ala Thr Pro
385
```

<210> 645
<211> 377
<212> PRT
<213> Lachnospira multipara

<400> 645

```
Met Gln Leu Ser Glu Thr Leu Lys Leu Tyr Met Thr Asn Glu Gln Lys
1               5                   10                  15
```

```
Ala Leu Val Val Met Thr Met Asn Glu Tyr Ile Ser Thr Val Asn Ser
            20                  25                  30

Leu Val Ser Val Ala Ile Ser Gly Ile Ser Ile Ser Lys Tyr Thr Thr
        35                  40                  45

Ala Asp Val Lys Ala Asn Leu Pro Ser Ala Leu Thr Asn Gln Cys Ile
    50                  55                  60

Arg Asp Ala Lys Ser Ile Val Lys Lys His Asn Lys Ala Cys Arg Asp
65                  70                  75                  80

Ala Asp Arg Lys Asn Ala Lys Phe Ala Asn Gln Gly Lys Asp Ile Lys
                85                  90                  95

Ile Val Ala Thr Val Pro Thr Leu Lys Lys Pro Cys Cys Tyr Ile Asn
            100                 105                 110

Asn Gln Asn Phe Lys Ile Asn Gly Asp Tyr Ile Glu Phe Pro Val Met
        115                 120                 125

Val Lys Gly Lys Ser Lys Arg Leu Ser Val Lys Thr Lys Met Thr Asp
    130                 135                 140

Asn Gln Lys Ser Val Phe Ala Asn Ser Lys Leu Gly Thr Met Arg Ile
145                 150                 155                 160

Val Tyr Lys Gly Asn Lys Ile Val Ala Gln Val Val Tyr Glu Thr Val
                165                 170                 175

Glu Pro Thr Tyr Asp Ser Glu Gly Asn Val Met Gly Val Asp Leu Gly
            180                 185                 190

Ile Lys Cys Pro Ala Val Ser Tyr Thr Ser Asp Gly Asn Ile Lys Phe
        195                 200                 205

Tyr Gly Asn Gly Arg Lys Asn Lys Tyr Met Arg Arg His Tyr Lys Tyr
```

```
    210                 215                 220

Leu Arg Lys Lys Leu Gln Lys Ala Lys His Ile Asn Ala Val Lys Arg
225                 230                 235                 240

Ile Asn Asp Lys Glu Gln Arg Ile Met Arg Asp Ile Asp His Lys Ile
                245                 250                 255

Ser His Asp Ile Val Lys Thr Ala Val Thr His Asn Val Lys Thr Ile
            260                 265                 270

Lys Leu Glu Arg Leu Ala Asn Ile Arg Ser Thr Thr Arg Thr Ser Arg
        275                 280                 285

Lys Asn Asn His Ser Leu His Asn Trp Ser Phe Tyr Arg Leu Ala Gln
    290                 295                 300

Phe Ile Glu Tyr Lys Ala Lys Leu Ala Gly Ile Ala Val Glu Tyr Val
305                 310                 315                 320

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Val Cys Gly His Val His
                325                 330                 335

His Ala Asn Asp Arg Ile Tyr Ala Cys Lys Cys Gly Phe His Ile His
            340                 345                 350

Arg Asp Ile Leu Gly Ala Met Asn Ile Cys Asn Ser Thr Glu Tyr Val
        355                 360                 365

Gly Asp Asn Asp Ile Arg His Thr Ala
    370                 375


<210>  646
<211>  351
<212>  PRT
<213>  Streptomyces griseoluteus

<400>  646
```

```
Met Ala Phe Ala Lys Gly Leu Lys Arg Arg Asn Val Leu Gln Lys Glu
1               5                  10                  15

Val Cys Phe Ala Leu Lys Ala Asn Tyr Asp Leu Gly Ala Gln Pro Ala
            20                  25                  30

Val Arg Val Val Lys Lys Val Cys Asp Ala Tyr Ala Thr Leu Lys Ala
        35                  40                  45

Asn Ile Arg Ala Gly Asn Leu Gly Arg Glu Gly Ser Lys Ser Arg Leu
    50                  55                  60

Arg Ala Glu Ser Lys Pro Ile Val Phe Arg Gly Asp Ala Ala Gln Pro
65                  70                  75                  80

Phe Asp Asp Arg Ile Leu Thr Trp Asn Leu Asp Ala Arg Thr Val Ser
                85                  90                  95

Ile Trp Thr Val Ala Gly Arg Ile Lys Tyr Ile Pro Phe Val Cys Ser
            100                 105                 110

Asp Gln Ala Phe Asp Leu Leu Ala Ser Arg Lys Gly Glu Ser Asp Leu
        115                 120                 125

Val Met Arg Asp Gly Val Phe Phe Leu Ile Ala Thr Leu Asp Ile Pro
    130                 135                 140

Glu Pro Glu Val Ser Glu Pro Asp Gly Phe Leu Gly Val Asp Leu Gly
145                 150                 155                 160

Ile Val Asn Ile Ala Thr Thr Ser Asp Gly Glu Ile Met Ala Gly Arg
                165                 170                 175

Gly Leu Asn Arg Tyr Arg Gln Arg His Arg Asp Leu Arg Gln Lys Leu
            180                 185                 190

Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg Val Leu Lys Arg Val Arg
        195                 200                 205
```

```
Arg Arg Glu Ala Arg His Ala Ala Asn Thr Asn His Ile Ile Ala Lys
    210                 215                 220

Gln Leu Val Ala Thr Ala Glu Arg Thr Ser Arg Gly Ile Ala Leu Glu
225                 230                 235                 240

Asp Leu Ser Gly Ile Arg Gln Arg Val Thr Ala Lys Lys Asp Gln Arg
                245                 250                 255

Ala Arg Leu His Ser Trp Ala Phe Ala Gln Leu Gly Gly Phe Val Glu
            260                 265                 270

Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val Phe Val Asp Pro Arg
        275                 280                 285

Asn Thr Ser Arg Gln Cys Ser Glu Cys Arg His Thr His Arg Thr Asn
    290                 295                 300

Arg Val Thr Gln Ala Arg Phe Val Cys Arg Ser Cys Gly Thr Val Lys
305                 310                 315                 320

His Ala Asp His Asn Gly Ser Arg Asn Ile Ala His Arg Ala Asp Ala
                325                 330                 335

Val Trp Lys Arg Gly Ala Val Asn Arg Pro Gly Ser Gly Ala Ser
            340                 345                 350
```

<210> 647
<211> 397
<212> PRT
<213> Desulfurobacterium thermolithotrophum

<400> 647

```
Met Asn Met Lys Leu Gln Arg Thr Leu Lys Leu Val Leu Lys Pro Thr
1               5                   10                  15

Glu Glu Gln Lys Gln Thr Leu Leu Glu Thr Ile Glu Gln Tyr Lys Phe
```

```
            20                  25                  30

Ala Tyr Asn Tyr Thr Cys Lys Val Gly Trp Ser Ala Lys Thr Trp Asn
        35                  40                  45

Gly Ile Glu Leu His Lys Leu Thr Tyr Tyr Thr Val Arg Glu Lys Thr
    50                  55                  60

Ser Leu Pro Ser Gln Leu Val Ile Ser Ala Arg Val Val Ala Thr Glu
65                  70                  75                  80

Ser Leu Lys Ser Ala Ile Lys Arg Lys Lys Lys Gly Leu Lys Ser Lys
                85                  90                  95

Cys Pro Gln Ser Asn Asn Pro Ala Ile Arg Tyr Asp Arg Arg Ser Tyr
            100                 105                 110

Thr Val Trp Leu Glu Arg Glu Glu Val Ser Leu Ala Thr Val Lys Gly
        115                 120                 125

Arg Gln Lys Phe Lys Val Lys Val Pro Asp Tyr Phe Lys Gln Tyr Leu
    130                 135                 140

Asp Trp Arg Val Thr Ser Ala Asn Leu Lys Tyr Asp Lys Arg Leu Lys
145                 150                 155                 160

Lys Phe Phe Leu Asn Ile Thr Cys Glu Lys Glu Phe Pro Asp Val Glu
                165                 170                 175

Pro Val Asn Tyr Phe Val Gly Val Asp Leu Gly Leu Arg Asn Leu Ala
            180                 185                 190

Val Val Ser Thr Pro Asp Gly Lys Ile Asn Lys Phe Phe Asp Gly Gly
        195                 200                 205

His Ile Arg Ala Val Ser Glu Arg Tyr Phe Ala Leu Arg Lys Arg Leu
    210                 215                 220
```

```
Gln Ser Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Thr Leu Ser
225                 230                 235                 240

Gln Lys Glu Lys Arg Phe Arg Thr Ala Ile Asn His Arg Ile Ala Lys
                245                 250                 255

Glu Ile Val Ser Leu Val Pro Ala Gly Gly Val Ile Val Leu Glu Lys
            260                 265                 270

Leu Lys Gly Ile Arg Lys Arg Ile Lys Val Asn Lys Gln Asn Arg Arg
        275                 280                 285

Trp Ile His Ser Trp Asn Phe Ala Gln Leu Gln Gln Phe Ile Glu Tyr
    290                 295                 300

Lys Ala Gln Ala Lys Gly Ile Arg Val Val Tyr Val Asp Ala Arg Tyr
305                 310                 315                 320

Thr Ser Gln Lys Cys Ser Arg Cys Gly His Ile Ser Arg Ser Asn Arg
                325                 330                 335

Ile Asp Gln Ser His Phe Val Cys Lys His Cys Ser Tyr Ser Leu Asn
            340                 345                 350

Ala Asp Leu Asn Ala Ser Arg Asn Ile Val Lys Asn Tyr Leu Ala Ser
        355                 360                 365

Leu Gln Arg Gly Glu Val Gly Thr Gly Ser Gly Ile Ser Leu Pro Val
    370                 375                 380

Gly Arg Cys Gln Pro Ser Gln Cys Ser Gly Ala Thr Cys
385                 390                 395
```

<210> 648
<211> 393
<212> PRT
<213> Desulfurobacterium thermolithotrophum

<400> 648

```
Met Asn Met Lys Leu Gln Arg Thr Leu Lys Leu Val Leu Lys Pro Thr
1               5                  10                  15

Glu Glu Gln Lys Gln Thr Leu Leu Glu Thr Ile Glu Gln Tyr Lys Phe
            20                  25                  30

Ala Tyr Asn Tyr Thr Cys Lys Val Gly Trp Ser Ala Lys Thr Trp Asn
        35                  40                  45

Gly Ile Glu Leu His Lys Leu Thr Tyr Tyr Thr Val Arg Glu Lys Thr
    50                  55                  60

Ser Leu Pro Ser Gln Leu Val Ile Ser Ala Arg Val Val Ala Thr Glu
65                  70                  75                  80

Ser Leu Lys Ser Ala Ile Lys Arg Lys Lys Lys Gly Leu Lys Ser Lys
                85                  90                  95

Cys Pro Gln Ser Asn Asn Pro Ala Ile Arg Tyr Asp Arg Arg Ser Tyr
            100                 105                 110

Thr Val Trp Leu Glu Arg Glu Glu Val Ser Leu Ala Thr Val Lys Gly
        115                 120                 125

Arg Gln Lys Phe Lys Val Lys Val Pro Asp Tyr Phe Lys Gln Tyr Leu
    130                 135                 140

Asp Trp Arg Val Thr Ser Ala Asn Leu Lys Tyr Asp Lys Arg Leu Lys
145                 150                 155                 160

Lys Phe Phe Leu Asn Ile Thr Cys Glu Lys Glu Phe Pro Asp Val Glu
                165                 170                 175

Pro Val Asn Tyr Phe Val Gly Val Asp Leu Gly Leu Arg Asn Leu Ala
            180                 185                 190
```

```
Val Val Ser Thr Pro Asp Gly Lys Ile Asn Lys Phe Phe Asp Gly Gly
        195                 200                 205

His Ile Arg Ala Val Ser Glu Arg Tyr Phe Ala Leu Arg Lys Arg Leu
    210                 215                 220

Gln Ser Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Thr Leu Ser
225                 230                 235                 240

Gln Lys Glu Lys Arg Phe Arg Thr Ala Ile Asn His Arg Ile Ala Lys
                245                 250                 255

Glu Ile Val Ser Leu Val Pro Ala Gly Gly Val Ile Val Leu Glu Lys
            260                 265                 270

Leu Lys Gly Ile Arg Lys Arg Ile Lys Val Asn Lys Gln Asn Arg Arg
        275                 280                 285

Trp Ile His Ser Trp Asn Phe Ala Gln Leu Gln Gln Phe Ile Glu Tyr
    290                 295                 300

Lys Ala Gln Ala Lys Gly Ile Arg Val Val Tyr Val Asp Ala Arg Tyr
305                 310                 315                 320

Thr Ser Gln Lys Cys Ser Arg Cys Gly His Val Ser Arg Ser Asn Arg
                325                 330                 335

Ile Asp Gln Ser His Phe Val Cys Lys His Cys Ser Tyr Ser Leu Asn
            340                 345                 350

Ala Ser Arg Asn Ile Val Lys Asn Tyr Leu Ala Ser Leu Gln Arg Gly
        355                 360                 365

Glu Val Gly Thr Gly Ser Gly Ile Ser Leu Pro Val Gly Arg Cys Gln
    370                 375                 380

Pro Ser Gln Cys Ser Gly Ala Thr Cys
385                 390
```

<210> 649
<211> 397
<212> PRT
<213> Desulfurobacterium thermolithotrophum

<400> 649

```
Met Asn Met Lys Leu Gln Arg Thr Leu Lys Leu Val Leu Lys Pro Thr
1               5                   10                  15


Glu Glu Gln Lys Gln Thr Leu Leu Glu Thr Ile Glu Gln Tyr Lys Phe
            20                  25                  30


Ala Tyr Asn Tyr Thr Cys Lys Val Gly Trp Ser Thr Lys Thr Trp Asn
        35                  40                  45


Gly Ile Glu Leu His Lys Leu Thr Tyr Tyr Thr Val Arg Glu Lys Thr
    50                  55                  60


Ser Leu Pro Ser Gln Leu Val Ile Ser Ala Arg Val Val Ala Thr Glu
65                  70                  75                  80


Ser Leu Lys Ser Ala Ile Lys Arg Lys Lys Lys Gly Leu Lys Ser Lys
                85                  90                  95


Cys Pro Gln Ser Asn Asn Pro Ala Ile Arg Tyr Asp Arg Arg Ser Tyr
            100                 105                 110


Thr Val Trp Leu Glu Arg Glu Glu Ala Ser Leu Ala Thr Val Lys Gly
        115                 120                 125


Arg Gln Lys Phe Lys Val Lys Val Pro Asp Tyr Phe Lys Gln Tyr Leu
    130                 135                 140


Asp Trp Arg Val Thr Ser Ala Asn Leu Lys Tyr Asp Lys Arg Leu Lys
145                 150                 155                 160


Lys Phe Phe Leu Asn Ile Thr Cys Glu Lys Glu Phe Pro Asp Val Glu
```

```
                165                 170                 175

Pro Val Asn Tyr Phe Val Gly Val Asp Leu Gly Leu Arg Asn Leu Ala
            180                 185                 190

Val Val Ser Thr Pro Asp Gly Lys Ile Asn Lys Phe Phe Asp Gly Gly
        195                 200                 205

His Ile Arg Ala Val Ser Glu Arg Tyr Phe Ala Leu Arg Lys Arg Leu
    210                 215                 220

Gln Ser Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Thr Leu Ser
225                 230                 235                 240

Gln Lys Glu Lys Arg Phe Arg Thr Ala Ile Asn His Arg Ile Ala Lys
                245                 250                 255

Glu Ile Val Ser Leu Val Pro Ala Gly Gly Val Ile Val Leu Glu Lys
            260                 265                 270

Leu Lys Gly Ile Arg Lys Arg Ile Lys Val Asn Lys Gln Asn Arg Arg
        275                 280                 285

Trp Ile His Ser Trp Asn Phe Ala Gln Leu Gln Gln Phe Ile Glu Tyr
    290                 295                 300

Lys Ala Gln Ala Lys Gly Ile Arg Val Val Tyr Val Asp Ala Arg Tyr
305                 310                 315                 320

Thr Ser Gln Lys Cys Ser Arg Cys Gly His Ile Ser Arg Ser Asn Arg
                325                 330                 335

Ile Asp Gln Ser His Phe Val Cys Lys His Cys Ser Tyr Ser Leu Asn
            340                 345                 350

Ala Asp Leu Asn Ala Ser Arg Asn Ile Val Lys Asn Tyr Leu Ala Ser
        355                 360                 365
```

```
Leu Gln Arg Gly Glu Val Gly Thr Gly Ser Gly Ile Ser Leu Pro Val
    370                 375                 380


Gly Arg Cys Gln Pro Ser Gln Cys Ser Gly Ala Thr Cys
385                 390                 395


<210>  650
<211>  397
<212>  PRT
<213>  Desulfurobacterium thermolithotrophum

<400>  650

Met Asn Met Lys Leu Gln Arg Thr Leu Lys Leu Val Leu Lys Pro Thr
1               5                   10                  15


Glu Glu Gln Lys Gln Thr Leu Leu Glu Thr Ile Glu Gln Tyr Lys Phe
            20                  25                  30


Ala Tyr Asn Tyr Thr Cys Lys Val Gly Trp Ser Ala Lys Thr Trp Asn
        35                  40                  45


Gly Ile Glu Leu His Lys Leu Thr Tyr Tyr Thr Val Arg Glu Lys Thr
    50                  55                  60


Ser Leu Pro Ser Gln Leu Val Ile Ser Ala Arg Val Val Ala Thr Glu
65                  70                  75                  80


Ser Leu Lys Ser Ala Ile Lys Arg Lys Lys Lys Gly Leu Lys Ser Lys
                85                  90                  95


Cys Pro Gln Ser Asn Asn Pro Ala Ile Arg Tyr Asp Arg Arg Ser Tyr
            100                 105                 110


Thr Val Trp Leu Glu Arg Glu Glu Val Ser Leu Ala Thr Val Lys Gly
        115                 120                 125


Arg Gln Lys Phe Lys Val Lys Val Pro Asp Tyr Phe Lys Gln Tyr Leu
    130                 135                 140
```

```
Asp Trp Arg Val Thr Ser Ala Asn Leu Lys Tyr Asp Lys Arg Leu Lys
145                 150                 155                 160

Lys Phe Phe Leu Asn Ile Thr Cys Glu Lys Glu Phe Pro Asp Val Glu
                165                 170                 175

Pro Val Asn Tyr Phe Val Gly Val Asp Leu Gly Leu Arg Asn Leu Ala
            180                 185                 190

Val Val Ser Thr Pro Asp Gly Lys Ile Asn Lys Phe Phe Asp Gly Gly
        195                 200                 205

His Ile Arg Ala Val Ser Glu Arg Tyr Phe Ala Leu Arg Lys Arg Leu
    210                 215                 220

Gln Ser Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Thr Leu Ser
225                 230                 235                 240

Gln Lys Glu Lys Arg Phe Arg Thr Ala Ile Asn His Arg Ile Ala Lys
                245                 250                 255

Glu Ile Val Ser Leu Val Pro Ala Gly Gly Val Ile Val Leu Glu Lys
            260                 265                 270

Leu Lys Gly Ile Arg Lys Arg Ile Lys Val Asn Lys Gln Asn Arg Arg
        275                 280                 285

Trp Ile His Ser Trp Asn Phe Ala Gln Leu Gln Gln Phe Ile Glu Tyr
    290                 295                 300

Lys Ala Gln Ala Lys Gly Ile Arg Val Val Tyr Val Asp Ala Arg Tyr
305                 310                 315                 320

Thr Ser Gln Lys Cys Ser Arg Cys Gly His Ile Ser Arg Ser Asn Arg
                325                 330                 335
```

```
Ile Asp Gln Ser His Phe Val Cys Lys His Cys Ser Tyr Ser Leu Asn
            340                 345                 350

Ala Asp Leu Asn Ala Ser Arg Asn Ile Val Lys Asn Tyr Leu Ala Ser
        355                 360                 365

Leu Gln Arg Gly Glu Val Gly Thr Gly Ser Gly Ile Ser Leu Pro Val
    370                 375                 380

Gly Arg Cys Gln Pro Ser Gln Cys Ser Gly Ala Thr Trp
385                 390                 395
```

<210> 651
<211> 392
<212> PRT
<213> Thermococcus sp. 40_45

<400> 651

```
Met Ser Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15

Ile Pro Glu Gly Leu Asp Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn Tyr Leu Ile Thr Tyr Ala Tyr Glu Ala Asn Ile Thr Ser Phe Lys
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Glu Leu Arg Glu Lys Tyr Pro Gln
    50                  55                  60

Leu Ser Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile
65                  70                  75                  80

Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95

Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110
```

```
Pro Asp Leu Glu Lys Gly Val Ile Lys Leu Ser Thr Pro Lys Gly Arg
        115                 120                 125

Ile Gln Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Asp
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Ile Lys Thr Pro Lys Gly Ala Phe
145                 150                 155                 160

Ile Asn Ala Val Phe Ser Lys Glu Val Glu Val Arg Glu Ser Lys Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ala Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Lys Thr Gly
    210                 215                 220

Lys Arg Arg Arg Glu Leu Leu Glu Lys Tyr Gly Glu Lys Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Val Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Ile Lys Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
```

305 310 315 320

Pro Ile Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
325 330 335

Cys Arg Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
340 345 350

Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro Glu
355 360 365

Ser His Pro Met Lys Met Gly Gly Trp Lys Val Ser Arg Asn Asp Ile
370 375 380

Tyr Glu Leu Tyr Lys Ser Tyr Gly
385 390

<210> 652
<211> 349
<212> PRT
<213> Streptomyces scabiei

<400> 652

Met Ala Phe Ala Arg Asp Leu Lys Arg Arg Asn Gly Leu Gln Asp Ala
1 5 10 15

Val Tyr His Arg Ile Lys Ala Asp Phe Asp Leu Gly Ala Gln Ala Ala
20 25 30

Val Arg Thr Val Lys Lys Val Cys Asp Ala Tyr Ala Thr Leu Lys Ala
35 40 45

Asn Leu Arg Ala Gly Asn Tyr Gly Pro Glu Gly Ser Lys Arg Arg Ala
50 55 60

Lys Val Glu Ala Lys Pro Ile Arg Phe Arg Glu Gly Ala Ala Gln Pro
65 70 75 80

```
Tyr Asp Asp Arg Ile Leu Thr Trp Asn Leu Asp Ala Arg Thr Val Ser
                85                  90                  95

Val Trp Thr Val Ala Gly Arg Ile Lys Gly Ile Pro Phe Val Cys Ala
            100                 105                 110

Pro Gly Ala Met Arg Leu Leu Ala Ser Arg Lys Gly Glu Ser Asp Leu
        115                 120                 125

Val Met Arg Asp Gly Met Phe Phe Leu Val Ala Thr Ile Asp Ala Ala
    130                 135                 140

Glu Pro Glu Ala Tyr Glu Pro Asp Gly Phe Leu Gly Val Asp Leu Gly
145                 150                 155                 160

Ile Val Asn Ile Ala Thr Thr Ser Asp Gly Glu Ile Met Ala Gly Arg
                165                 170                 175

Gln Val Asn Arg Tyr Arg Gln Arg Lys Arg Asp Leu Arg Thr Arg Leu
            180                 185                 190

Gln Lys Lys Arg Thr Lys Ser Thr Ala Arg Val Leu Lys Arg Gln Arg
        195                 200                 205

Arg Lys Glu Ser Arg Tyr Ala Thr Gln Arg Asn His Ile Ile Ala Lys
    210                 215                 220

Lys Leu Val Ala Thr Ala Glu Arg Thr Ser Arg Gly Ile Gly Leu Glu
225                 230                 235                 240

Asp Leu Ser Gly Ile Arg Gln Arg Val Thr Ala Arg Lys Asp Gln Arg
                245                 250                 255

Ala Arg Leu His Ser Trp Ala Phe Ala Gln Leu Gly Ala Phe Val Glu
            260                 265                 270

Tyr Lys Ala Lys Arg Ala Gly Val Pro Val Val His Val Asp Pro Arg
        275                 280                 285
```

```
Asn Thr Ser Arg Gln Cys Ser Glu Cys Trp His Thr His Arg Thr Asn
    290                 295                 300

Arg Thr Gly Gln Ala Arg Phe Ala Cys Arg Ser Cys Gly Ile Val Leu
305                 310                 315                 320

His Ala Asp His Asn Gly Ser Arg Asn Ile Ala His Arg Ala Asp Ala
                325                 330                 335

Ala Trp Lys Arg Gly Ala Val Asn Arg Pro Ser Thr Ala
            340                 345
```

<210> 653
<211> 389
<212> PRT
<213> Candidatus Korarchaeum cryptofilum

<400> 653

```
Met Pro Leu Glu Thr Val Lys Leu Thr Ala Ser Phe Lys Leu Asp Gly
1               5                   10                  15

Ser Phe Pro Glu Ser Leu Phe Ser Thr Tyr Arg Glu Val Leu Gly Gln
            20                  25                  30

Leu Leu Asp Tyr Ala Trp Glu Lys Gly Val Thr Ser Phe Lys Arg Leu
        35                  40                  45

Lys Ala Glu Lys Tyr Cys Glu Leu Arg Ala Arg Tyr Pro Ser Leu Pro
    50                  55                  60

Ser His Tyr Ile Tyr Thr Ala Cys Gln Met Ala Cys Ser Ile Tyr Lys
65                  70                  75                  80

Ser Phe Arg Lys Leu Lys Arg Arg Gly Ala Thr Lys Ala Glu Lys Pro
                85                  90                  95

Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Ser Leu
```

```
            100                 105                 110

Asp Leu Glu Gly Trp Glu Ala Ser Ile Ala Val Gly Gly Ser Arg Val
        115                 120                 125

Arg Leu Lys Leu Leu His Gly Thr Tyr His Glu Lys Phe Lys Gly Met
    130                 135                 140

Arg Val Gly Gln Ala Trp Leu Val Lys Arg Gly Asn Asp Leu Tyr Leu
145                 150                 155                 160

Lys Ala Val Phe Ser Lys Val Val Glu Val Ala Glu Met Asp Glu Arg
                165                 170                 175

Ala Val Ala Val Asp Val Asn Glu Asn Asn Val Thr Phe Gly Thr Met
            180                 185                 190

Glu Arg Val Val Asn Val Glu Thr Arg Glu Arg Ile Ile Arg Thr Ala
        195                 200                 205

Tyr Phe Leu Lys Arg Arg Arg Leu Gln Ser Lys Pro Arg Leu Asn Glu
    210                 215                 220

Lys Pro Leu Leu Ala Lys Tyr Arg Gly Arg Glu Arg Arg Arg Val Glu
225                 230                 235                 240

Ala Ile Tyr His Glu Val Ala Asn Arg Ile Ile Asp Glu Ala Lys Lys
                245                 250                 255

Val Lys Ala Ser Thr Ile Val Leu Glu Asp Leu Thr Asn Ile Arg Glu
            260                 265                 270

Arg Ile Lys Arg Ser Lys Glu Leu Asn Gly Arg Leu Asn Arg Trp Ser
        275                 280                 285

Phe Arg Lys Leu Gln Arg Ile Val Glu Tyr Lys Ala Lys Leu Ala Gly
    290                 295                 300
```

```
Leu Asn Val Val Tyr Val Glu Ala Arg Gly Thr Ser Ser Leu Cys Pro
305                 310                 315                 320


Ile Cys Gly Glu Arg Leu Ser Pro Asn Gly His Arg Arg Leu Lys Cys
                325                 330                 335


Arg Cys Gly Leu Glu Glu Asp Arg Asp Val Val Ala Val Lys Asn Leu
            340                 345                 350


Leu Arg Lys Tyr Arg Met Asp Val Gly Ala Ser Ser Val His Pro Glu
        355                 360                 365


Gly Pro Pro Met Thr Thr Glu Arg Asp Glu Glu Tyr Glu Gly Gly Arg
    370                 375                 380


Asp Glu Ser Leu Phe
385
```

<210> 654
<211> 377
<212> PRT
<213> Sharpea azabuensis

<400> 654

```
Met Gln Leu Ser Glu Thr Val Lys Leu Tyr Met Thr Gly Glu Gln Lys
1               5                   10                  15


Ser Leu Ile Val Ala Thr Met Thr Glu Tyr Ile Asn Thr Val Asn Ser
            20                  25                  30


Leu Val Ser Asp Ala Ala Asn Gly Ile Ser Ile Ser Lys Tyr Thr Thr
        35                  40                  45


Ala Asp Val Lys Ala Asn Leu Pro Ser Ala Leu Thr Asn Gln Cys Ile
    50                  55                  60


Arg Asp Ala Lys Ser Ile Val Lys Lys Tyr Asn Lys Ala Cys Arg Asp
65                  70                  75                  80
```

```
Ala Asp Arg Lys Asn Asn Lys Leu Ala Lys Gln Gly Lys Asn Ile Thr
                85                  90                  95

Val Thr Ala Thr Leu Pro Val Leu Lys Lys Thr Cys Cys Tyr Val Asn
            100                 105                 110

Asn Gln Asn Phe Lys Ile Asn Gly Asp Tyr Ile Glu Phe Pro Val Met
        115                 120                 125

Val Asn Gly Lys Ser Lys Arg Leu Ser Val Lys Thr Lys Met Ser Asp
    130                 135                 140

Lys Gln Lys Ser Val Phe Ala Asn Ser Lys Leu Gly Thr Met Arg Ile
145                 150                 155                 160

Val Tyr Lys Gly Ser Lys Ile Val Ala Gln Val Val Tyr Glu Thr Ile
                165                 170                 175

Glu Pro Thr Tyr Thr Thr Glu Gly Asn Val Met Gly Val Asp Leu Gly
            180                 185                 190

Val Lys Cys Pro Ala Val Ser Tyr Ile Ser Asp Gly Ser Val Lys Phe
        195                 200                 205

Tyr Gly Asn Gly Arg Lys Asn Lys Tyr Met Arg Arg His Tyr Arg Cys
    210                 215                 220

Leu Arg Lys Lys Leu Gln Lys Ala Lys His Ile Asp Ala Val Lys Arg
225                 230                 235                 240

Ile Asn Asp Lys Glu Gln Arg Ile Met Lys Asp Ile Asp His Lys Leu
                245                 250                 255

Ser His Asp Val Val Glu Thr Ala Val Ala His Asn Val Lys Thr Ile
            260                 265                 270
```

```
Lys Leu Glu Arg Leu Ala Asn Ile Arg Ser Thr Thr Arg Thr Ser Arg
        275                 280                 285

Lys Asn Asn His Ser Leu His Asn Trp Ser Phe Tyr Arg Leu Ala Gln
    290                 295                 300

Phe Ile Glu Tyr Lys Ala Lys Leu Ala Gly Ile Ala Val Glu His Val
305                 310                 315                 320

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Val Cys Gly His Val His
                325                 330                 335

His Ala Asn Asp Arg Asn Tyr Thr Cys Lys Cys Gly Phe His Ile His
            340                 345                 350

Arg Asp Ile Leu Gly Ala Met Asn Ile Cys Asn Ser Thr Glu Tyr Val
        355                 360                 365

Gly Asp Ser Asn Ile Arg His Thr Ala
    370                 375
```

<210> 655
<211> 368
<212> PRT
<213> Dethiobacter alkaliphilus AHT 1

<400> 655

```
Met Ile Thr Met Gln Ile Thr Val Lys Ile Lys Leu Gln Pro Thr Lys
1               5                   10                  15

Lys Gln Ala Asp Leu Ile Ser Ala Thr Lys Asn Glu Tyr Ile Arg Leu
            20                  25                  30

Val Asn Gln Ile Val Ser Glu Tyr Val Glu Ala Asp Glu Asn Leu Lys
        35                  40                  45

Tyr Ser Ser Lys Asp Val Lys Ala Phe Leu Pro Ser Ala Leu Lys Asn
    50                  55                  60
```

```
Gln Ala Ile Gln Asp Ala Arg Ser Ile Phe Val Lys Tyr Lys Lys Gln
65                  70                  75                  80

Arg Ile Ala Asn Asp Arg Leu Glu Pro Glu Asn Gln Arg Glu Ile Lys
                85                  90                  95

Val Pro Ile Leu Lys Lys Pro Val Ser Ile Trp Asn Asn Gln Asn Tyr
            100                 105                 110

Ser Leu Gln Ser Asn Ile Leu Ser Phe Pro Val Trp Leu Asp Gly Lys
        115                 120                 125

Ser Lys Arg Ile Ala Val Asn Ala Val Leu Thr Glu Tyr Gln Leu Asn
    130                 135                 140

Lys Leu Thr Gly Lys Leu Gly Ser Leu Arg Ile Thr Glu Lys Ser Gly
145                 150                 155                 160

Lys Tyr Ile Ala Gln Ile Ala Val Asp Ala Val Glu Glu His Thr Asp
                165                 170                 175

Ala Asp Lys Thr Met Gly Val Asp Val Gly Leu Lys Ile Pro Ala Val
            180                 185                 190

Ala Val Val Glu Gly Gly Lys Thr Lys Phe Phe Gly Asn Gly Arg Gln
        195                 200                 205

Asn Lys Phe Ile Lys Arg Lys His Arg Ser Thr Arg Arg Lys Leu Gly
    210                 215                 220

Gln Leu Lys Lys Leu Ser Ala Ile Arg Lys Arg His Asp Lys Glu Gln
225                 230                 235                 240

Arg Trp Met Lys Asp Gln Asp His Lys Val Ser Arg Gln Ile Ile Asn
                245                 250                 255

Phe Ala Lys Glu His Asn Val Gly Thr Ile His Leu Glu Lys Leu Ser
```

```
            260                 265                 270

Gly Ile Arg Gln Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu
        275                 280                 285

His Asn Trp Ser Phe Tyr Arg Leu Ala Gln Tyr Ile Glu Tyr Lys Ala
    290                 295                 300

Thr Leu Ala Gly Met Lys Val Lys Phe Val Asp Pro Lys His Thr Ser
305                 310                 315                 320

Gln Lys Cys Pro Gln Cys Cys Ala Leu Asn Lys Ala Lys Asp Arg Asn
                325                 330                 335

Tyr Gln Cys Gly Cys Gly Phe Ile Ala His Arg Asp Arg Val Gly Ala
            340                 345                 350

Ile Asn Ile Ile Ser Ala Thr Val Ala Asp Gly His Ser Leu Pro Ala
        355                 360                 365
```

<210> 656
<211> 365
<212> PRT
<213> Dethiobacter alkaliphilus

<400> 656

```
Met Gln Ile Thr Val Lys Ile Lys Leu Gln Pro Thr Lys Lys Gln Ala
1               5                   10                  15

Asp Leu Ile Ser Ala Thr Lys Asn Glu Tyr Ile Arg Leu Val Asn Gln
            20                  25                  30

Ile Val Ser Glu Tyr Val Glu Ala Asp Glu Asn Leu Lys Tyr Ser Ser
        35                  40                  45

Lys Asp Val Lys Ala Phe Leu Pro Ser Ala Leu Lys Asn Gln Ala Ile
    50                  55                  60
```

```
Gln Asp Ala Arg Ser Ile Phe Val Lys Tyr Lys Lys Gln Arg Ile Ala
65                  70                  75                  80

Asn Asp Arg Leu Glu Pro Glu Asn Gln Arg Glu Ile Lys Val Pro Ile
                85                  90                  95

Leu Lys Lys Pro Val Ser Ile Trp Asn Asn Gln Asn Tyr Ser Leu Gln
            100                 105                 110

Ser Asn Ile Leu Ser Phe Pro Val Trp Leu Asp Gly Lys Ser Lys Arg
        115                 120                 125

Ile Ala Val Asn Ala Val Leu Thr Glu Tyr Gln Leu Asn Lys Leu Thr
    130                 135                 140

Gly Lys Leu Gly Ser Leu Arg Ile Thr Glu Lys Ser Gly Lys Tyr Ile
145                 150                 155                 160

Ala Gln Ile Ala Val Asp Ala Val Glu Glu His Thr Asp Ala Asp Lys
                165                 170                 175

Thr Met Gly Val Asp Val Gly Leu Lys Ile Pro Ala Val Ala Val Val
            180                 185                 190

Glu Gly Gly Lys Thr Lys Phe Phe Gly Asn Gly Arg Gln Asn Lys Phe
        195                 200                 205

Ile Lys Arg Lys His Arg Ser Thr Arg Arg Lys Leu Gly Gln Leu Lys
    210                 215                 220

Lys Leu Ser Ala Ile Arg Lys Arg His Asp Lys Glu Gln Arg Trp Met
225                 230                 235                 240

Lys Asp Gln Asp His Lys Val Ser Arg Gln Ile Ile Asn Phe Ala Lys
                245                 250                 255

Glu His Asn Val Gly Thr Ile His Leu Glu Lys Leu Ser Gly Ile Arg
            260                 265                 270
```

```
Gln Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu His Asn Trp
        275                 280                 285

Ser Phe Tyr Arg Leu Ala Gln Tyr Ile Glu Tyr Lys Ala Thr Leu Ala
    290                 295                 300

Gly Met Lys Val Lys Phe Val Asp Pro Lys His Thr Ser Gln Lys Cys
305                 310                 315                 320

Pro Gln Cys Cys Ala Leu Asn Lys Ala Lys Asp Arg Asn Tyr Gln Cys
                325                 330                 335

Gly Cys Gly Phe Ile Ala His Arg Asp Arg Val Gly Ala Ile Asn Ile
            340                 345                 350

Ile Ser Ala Thr Val Ala Asp Gly His Ser Leu Pro Ala
        355                 360                 365
```

<210> 657
<211> 390
<212> PRT
<213> Thermovibrio ammonificans

<400> 657

```
Met Asn Met Lys Leu Gln Arg Thr Leu Lys Leu Val Leu Lys Pro Thr
1               5                   10                  15

Glu Glu Gln Lys Gln Ile Leu Leu Glu Thr Leu Glu Gln Tyr Lys Phe
            20                  25                  30

Ala Tyr Asn Tyr Thr Cys Arg Ile Gly Trp Glu Ala Glu Thr Trp Asn
        35                  40                  45

Gly Val Gln Leu His Lys Leu Thr Tyr Tyr Thr Val Arg Asn Lys Thr
    50                  55                  60

Ser Leu Pro Ser Gln Leu Val Ile Ser Ala Arg Val Val Ala Thr Glu
```

```
65                  70                  75                  80

Ser Leu Lys Ser Ala Ile Lys Arg Lys Lys Lys Gly Leu Lys Ser Arg
                85                  90                  95

Cys Pro Glu Ser Lys Asn Pro Val Ile Arg Tyr Asp Lys Arg Ser Tyr
            100                 105                 110

Thr Val Trp Leu Asn Arg Glu Glu Val Ser Leu Ala Thr Val Gly Gly
        115                 120                 125

Arg Gln Lys Phe Lys Val Lys Ile Pro Asp Tyr Phe Lys Gln Tyr Leu
    130                 135                 140

Asp Trp Lys Val Thr Ser Thr Asn Leu Lys Tyr Asp Lys Lys Leu Lys
145                 150                 155                 160

Lys Phe Phe Leu Asn Ile Thr Val Glu Lys Asp Phe Pro Asp Val Glu
                165                 170                 175

Pro Val Asp Phe Cys Val Gly Val Asp Leu Gly Leu Arg Lys Leu Ala
            180                 185                 190

Val Val Ser Thr Pro Asp Gly Lys Ile Asn Arg Phe Phe Asn Gly Gly
        195                 200                 205

His Ile Arg Thr Val Ser Glu Arg Tyr Phe Ala Leu Arg Lys Arg Leu
    210                 215                 220

Gln Ser Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Lys Leu Ser
225                 230                 235                 240

Gln Lys Glu Lys Arg Phe Arg Thr Ala Val Asn His Lys Ile Ala Lys
                245                 250                 255

Glu Ile Val Ala Leu Val Pro Ala Gly Gly Val Ile Val Leu Glu Lys
            260                 265                 270
```

```
Leu Lys Gly Ile Arg Gln Arg Ile Lys Val Asn Lys Gln Asn Arg Arg
        275                 280                 285


Trp Ile His Ser Trp Asn Phe Ala Gln Leu Gln Gln Phe Ile Glu Tyr
    290                 295                 300


Lys Ala Gln Ala Lys Gly Ile Arg Val Val Tyr Val Asp Ala Arg Tyr
305                 310                 315                 320


Thr Ser Gln Lys Cys Ser Arg Cys Gly Tyr Ile Ser Arg Ser Asn Arg
                325                 330                 335


Ile Asp Gln Ser His Phe Val Cys Lys His Cys Gly Phe Ser Leu Asn
            340                 345                 350


Ala Asp Leu Asn Ala Ser Arg Asn Ile Val Lys Asn Tyr Leu Thr Ser
        355                 360                 365


Leu His Arg Gly Glu Val Arg Thr Gly Ala Gly Ile Ser Ala Pro Val
    370                 375                 380


Gly Arg Cys Gln Pro Ser
385                 390


<210>  658
<211>  388
<212>  PRT
<213>  Thermovibrio ammonificans HB-1

<400>  658

Met Lys Leu Gln Arg Thr Leu Lys Leu Val Leu Lys Pro Thr Glu Glu
1               5                   10                  15


Gln Lys Gln Ile Leu Leu Glu Thr Leu Glu Gln Tyr Lys Phe Ala Tyr
            20                  25                  30


Asn Tyr Thr Cys Arg Ile Gly Trp Glu Ala Glu Thr Trp Asn Gly Val
        35                  40                  45
```

```
Gln Leu His Lys Leu Thr Tyr Tyr Thr Val Arg Asn Lys Thr Ser Leu
    50                  55                  60

Pro Ser Gln Leu Val Ile Ser Ala Arg Val Val Ala Thr Glu Ser Leu
65                  70                  75                  80

Lys Ser Ala Ile Lys Arg Lys Lys Lys Gly Leu Lys Ser Arg Cys Pro
                85                  90                  95

Glu Ser Lys Asn Pro Val Ile Arg Tyr Asp Lys Arg Ser Tyr Thr Val
            100                 105                 110

Trp Leu Asn Arg Glu Glu Val Ser Leu Ala Thr Val Gly Gly Arg Gln
        115                 120                 125

Lys Phe Lys Val Lys Ile Pro Asp Tyr Phe Lys Gln Tyr Leu Asp Trp
    130                 135                 140

Lys Val Thr Ser Thr Asn Leu Lys Tyr Asp Lys Lys Leu Lys Lys Phe
145                 150                 155                 160

Phe Leu Asn Ile Thr Val Glu Lys Asp Phe Pro Asp Val Glu Pro Val
                165                 170                 175

Asp Phe Cys Val Gly Val Asp Leu Gly Leu Arg Lys Leu Ala Val Val
            180                 185                 190

Ser Thr Pro Asp Gly Lys Ile Asn Arg Phe Phe Asn Gly Gly His Ile
        195                 200                 205

Arg Thr Val Ser Glu Arg Tyr Phe Ala Leu Arg Lys Arg Leu Gln Ser
    210                 215                 220

Lys Gly Thr Pro Ser Ala Lys Arg His Leu Lys Lys Leu Ser Gln Lys
225                 230                 235                 240
```

```
Glu Lys Arg Phe Arg Thr Ala Val Asn His Lys Ile Ala Lys Glu Ile
                245                 250                 255

Val Ala Leu Val Pro Ala Gly Gly Val Ile Val Leu Glu Lys Leu Lys
            260                 265                 270

Gly Ile Arg Gln Arg Ile Lys Val Asn Lys Gln Asn Arg Arg Trp Ile
        275                 280                 285

His Ser Trp Asn Phe Ala Gln Leu Gln Gln Phe Ile Glu Tyr Lys Ala
    290                 295                 300

Gln Ala Lys Gly Ile Arg Val Val Tyr Val Asp Ala Arg Tyr Thr Ser
305                 310                 315                 320

Gln Lys Cys Ser Arg Cys Gly Tyr Ile Ser Arg Ser Asn Arg Ile Asp
                325                 330                 335

Gln Ser His Phe Val Cys Lys His Cys Gly Phe Ser Leu Asn Ala Asp
            340                 345                 350

Leu Asn Ala Ser Arg Asn Ile Val Lys Asn Tyr Leu Thr Ser Leu His
        355                 360                 365

Arg Gly Glu Val Arg Thr Gly Ala Gly Ile Ser Ala Pro Val Gly Arg
    370                 375                 380

Cys Gln Pro Ser
385
```

<210> 659
<211> 393
<212> PRT
<213> Thermococcus sibiricus

<400> 659

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15
```

```
Thr Pro Asp Gly Leu Asp Glu Leu Phe Ser Thr Tyr Arg Asp Ile Val
            20                  25                  30

Asn Ser Leu Ile Thr Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Lys
        35                  40                  45

Arg Leu Lys Lys Glu Lys Tyr Glu Glu Leu Arg Lys Asp Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr His Tyr Thr Ala Cys Gln Met Ala Ser Ser Ile
65                  70                  75                  80

Tyr Lys Asn Tyr Arg Lys Arg Lys Arg Arg Gly Lys Ala Asn Gly Arg
                85                  90                  95

Pro Val Phe Lys Lys Asp Ser Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Glu Lys Gly Ile Ile Lys Leu Ser Thr Pro Lys Gly Arg
        115                 120                 125

Ile Thr Leu Glu Phe Tyr Pro Ala Lys His His Gly Lys Phe Arg Gly
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Lys Glu Val Glu Val Lys Glu Pro Glu Asp
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Ile Thr Leu Ser Leu Ser
            180                 185                 190

Asp Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Val Lys Val Gly
```

```
    210                 215                 220

Lys Lys Arg Gln Arg Leu Leu Glu Lys Tyr Gly Glu Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asp Asp Leu Tyr Tyr Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Gly Ile Arg
            260                 265                 270

Glu Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe His Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Lys Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Ile Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350

Asn Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Thr Val Pro Leu
        355                 360                 365

Glu Ser Pro Pro Met Lys Thr Gly Gly Gly Lys Val Ile Arg Tyr Asp
    370                 375                 380

Ser Phe Thr Cys Phe Lys Ser Ser Gly
385                 390


<210>  660
<211>  351
<212>  PRT
```

<213> Paenibacillus forsythiae

<400> 660

```
Met Gln Thr Val Thr Ile Gln Ile Arg Ile Phe Pro Ala His Pro Ser
1               5                  10                  15


Val Leu Val Asp Met Gly Asn Glu Tyr Ile Arg Thr Val Asn Glu Leu
            20                  25                  30


Thr Glu Gln Ala Glu Ala Ser Gly Thr Phe Pro Lys Leu Thr Ser Lys
        35                  40                  45


Thr Val His Ala Asn Leu Pro Ser Ala Val Lys Asn Gln Leu Ile Arg
    50                  55                  60


Asp Ala Lys Ser Leu Phe Gln Lys Ser Lys Lys Asn Lys Lys Arg Pro
65                  70                  75                  80


Ile Leu Lys Lys Arg Val Tyr Tyr Val Asn Asn Gln Asn Tyr Ala Ile
                85                  90                  95


Gly Asp Asp Ser Leu Ser Phe Pro Val Val Met Asp Gly Lys Val Gln
            100                 105                 110


Arg Leu Val Val Pro Ala Leu Leu Ser Asp Arg Glu Arg Asp Met Leu
        115                 120                 125


Ser Asn Ser Lys His Gly Leu Leu Arg Val Val Gln Lys Ser Ala Lys
    130                 135                 140


Trp Phe Val Gln Val Ser Ile Val Arg Pro Thr Glu Gln Ala Ala Gly
145                 150                 155                 160


Asp Gly Ile Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Val
                165                 170                 175


Val Thr Ser Ser Gly Lys Thr Arg Phe Cys Gly Asn Gly Arg Lys Asn
            180                 185                 190
```

```
Lys Phe Ile Arg Arg Lys Tyr Asn Thr His Arg Arg Lys Leu Gly Lys
        195                 200                 205

Leu Lys Lys Gln Ser Ala Ile Arg Lys Gln Arg Asp Lys Glu Ser Arg
    210                 215                 220

Tyr Met Lys Asp Gln Asn His Lys Ile Ser Arg Gln Ile Val Asn Met
225                 230                 235                 240

Ala Ile Gln Glu Lys Val Ser Ile Ile Lys Leu Glu Lys Leu Ala Asp
                245                 250                 255

Ile Arg Lys Thr Thr Arg Thr Ser Arg Lys Asn Ala Lys Asn Leu His
            260                 265                 270

Ser Trp Ser Phe Tyr Gln Leu Gln Thr Phe Ile Thr Tyr Lys Ala Ala
        275                 280                 285

Leu Ala Gly Ile Lys Val Ile Glu Val Asn Pro Ala Tyr Thr Ser Gln
    290                 295                 300

Thr Cys Pro Ser Cys Gly Gln Arg Asn Lys Ala Lys Asp Arg Ala Tyr
305                 310                 315                 320

Gln Cys Asp Cys Gly Tyr Thr Ala His Arg Asp Arg Val Gly Ala Ile
                325                 330                 335

Asn Ile Met His Lys Pro Val Ala Asp Gly Asn Ser Leu Ser Ala
            340                 345                 350
```

<210> 661
<211> 393
<212> PRT
<213> Thermococcus peptonophilus

<400> 661

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Asn
```

```
1               5                   10                  15

Pro Pro Glu Gly Leu Asn Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn Tyr Leu Ile Ser Tyr Ala Phe Glu Asn His Ile Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr His Tyr Thr Ala Thr Gln Met Ala Thr Met Ile
65                  70                  75                  80

Tyr Arg Ser Tyr Arg Lys Arg Lys Lys Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95

Pro Val Phe Lys Lys Glu Ala Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Asp Ala Gly Ile Ile Lys Leu Ser Thr Pro Lys Gly Arg
        115                 120                 125

Ile Glu Leu Glu Phe Cys Ser Ala Lys Tyr His Glu Lys Phe Lys Asp
    130                 135                 140

Trp Lys Ile Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Arg Glu Val Glu Val Arg Glu Pro Glu Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Lys Glu Ile Arg Thr
        195                 200                 205
```

```
Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Arg Ala Gly
    210                 215                 220

Lys Lys Arg Lys Glu Leu Leu Glu Lys Tyr Gly Gln Arg Glu Arg Asn
225                 230                 235                 240

Arg Arg Asp Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Val Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Ile Lys Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Glu Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Pro Lys Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350

Asn Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser Pro Thr Met Lys Thr Gly Val Gly Lys Val Ser Arg Ser Asp
    370                 375                 380

Ala Tyr Glu Leu Tyr Ala Asn Tyr Gly
385                 390
```

<210> 662

<211> 363
<212> PRT
<213> Mesotoga

<400> 662

```
Met Gln Ile Thr Val Lys Ile Lys Leu Glu Pro Thr Arg Glu Gln Asp
1               5                   10                  15


Thr Leu Leu Gln Ala Thr Thr Gln Glu Tyr Ile Arg Leu Val Asn His
            20                  25                  30


Ile Val Ala Asp Phe Val Lys Ser Asp Thr Pro Leu Lys Tyr Thr Ser
        35                  40                  45


Lys Thr Val Val Ala Glu Leu Pro Ser Ala Val Lys Asn Gln Ala Ile
    50                  55                  60


Gln Asp Ala Lys Ser Val Phe Glu Lys Tyr Lys Lys Asn Val Cys Ala
65                  70                  75                  80


Asn Ala Arg Leu Lys Pro Glu Asp Gln Lys Glu Val Arg Val Pro Ile
                85                  90                  95


Leu Lys Lys Pro Val Gly Ile Trp Asn Asn Gln Asn Tyr Ser Leu Lys
            100                 105                 110


Glu Asn Ile Leu Ser Phe Pro Val Leu Ile Ala Asp Lys Ser Lys Arg
        115                 120                 125


Ile Glu Val Lys Ala Val Leu Thr Asp Tyr Gln Arg Glu Arg Leu Asn
    130                 135                 140


Gly Lys Leu Gly Ser Leu Arg Ile Thr Gln Lys Ser Gly Lys Tyr Ile
145                 150                 155                 160


Ala Gln Ile Ala Val Glu Met Asp Glu Glu Gln Ser Lys Thr Ser Asn
                165                 170                 175
```

```
Lys Ile Met Gly Val Asp Leu Gly Leu Lys Asn Pro Ala Val Ala Val
            180                 185                 190

Val Glu Gly Gly Lys Thr Lys Phe Ile Gly Asn Gly Arg Gln Asn Lys
        195                 200                 205

Phe Ile Lys Arg Lys His Arg Ser Val Arg Arg Lys Leu Gly Glu Leu
    210                 215                 220

Lys Lys Leu Lys Ala Ile Lys Lys Arg His Asp Lys Glu Gln Arg Trp
225                 230                 235                 240

Met Lys Asp Gln Asp His Lys Ile Ser Arg Arg Ile Val Asn Ser Ala
                245                 250                 255

Lys Glu Asn His Val Ala Val Ile Arg Met Glu Arg Leu Thr Asn Ile
            260                 265                 270

Arg Asn Thr Ala Lys Thr Ser Arg Lys Asn Glu Lys Asn Leu His Thr
        275                 280                 285

Trp Ser Phe Tyr Arg Leu Ala Lys Tyr Ile Glu Tyr Lys Ala Ile Leu
    290                 295                 300

Ala Gly Ile Lys Ile Glu Tyr Val Asn Pro Glu Tyr Thr Ser Gln Lys
305                 310                 315                 320

Cys Pro Lys Cys Gly Lys Arg Asn Lys Ala Asn Asp Arg Lys Tyr Val
                325                 330                 335

Cys Gly Cys Gly Phe Lys Thr His Arg Asp Arg Leu Gly Ala Ile Asn
            340                 345                 350

Ile Ile Ser Ala Thr Val Ala Asp Gly Val Ala
        355                 360
```

<210> 663
<211> 399

<212> PRT
<213> Methanocaldococcus sp. FS406-22

<400> 663

Met Ser Asn Glu Tyr Leu Glu Thr Ile Lys Leu Thr Ala Arg Phe Lys
1 5 10 15

Ile Lys Gln Thr Pro Asn Glu Ile Val Gly Leu Phe Ser Thr Tyr Lys
20 25 30

Thr Ile Val Asn Glu Leu Leu Asn Tyr Ala Phe Glu Asn Asn Ile Thr
35 40 45

Ser Phe Lys Arg Leu Lys Ser Glu Lys Tyr Lys Glu Leu Arg Glu Lys
50 55 60

Tyr Gln Lys Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Ile Thr
65 70 75 80

Thr Ser Ile Phe Lys Ser Trp Arg Lys Arg His Arg Lys Gly Arg Ala
85 90 95

Ser Lys Lys Pro Asp Phe Lys Gly Ser Val Ile Met Leu Asp Asp His
100 105 110

Leu Phe Arg Leu Asp Leu Asp Asn Gly Leu Ala Arg Ile Ser Thr Pro
115 120 125

Lys Gly Arg Val Glu Val Glu Leu Phe Val Ser Glu Tyr His Lys Lys
130 135 140

Phe Lys Asp Trp Lys Val Gly Gln Ala Trp Ile Val Arg Arg Lys Asp
145 150 155 160

Ala Tyr Tyr Leu Asn Val Val Phe Ser Lys Asn Val Leu Ile Lys Glu
165 170 175

Gly Glu Ser Val Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Ile

```
            180                 185                 190

Ala Thr Thr Asn Gly Ile Ile Gln Ile Ile Thr Asn Glu Arg Thr Val
        195                 200                 205

Arg Thr Ser Tyr Tyr Val Lys Arg Arg Lys Ile Gln Lys Lys Val Glu
    210                 215                 220

Asn Glu Asp Lys Lys Lys Glu Leu Leu Glu Lys Tyr Gly Asn Arg Glu
225                 230                 235                 240

Arg Asn Lys Ile Thr Asp Ile Tyr His Lys Val Val Asn Lys Ile Ile
                245                 250                 255

Glu Ile Ala Lys Ser Val Asn Gly Val Ile Ala Leu Glu Asp Leu Lys
            260                 265                 270

Glu Ile Arg Asn Lys Ile Lys Tyr Ser Lys Lys Leu Asn Gly Arg Leu
        275                 280                 285

His Arg Trp Ser Phe Arg Arg Leu Gln Glu Val Ile Lys Tyr Lys Ala
    290                 295                 300

Lys Leu Asn Gly Ile Lys Val Ile Phe Val Asn Pro His Tyr Thr Ser
305                 310                 315                 320

Ser Arg Cys Pro Ile Cys Gly Gly Lys Met Ser Pro Asn Gly His Arg
                325                 330                 335

Val Leu Lys Cys Glu Asp Cys Gly Cys Ile Leu Asp Arg Asp Val Val
            340                 345                 350

Gly Ser Leu Asn Ile Met Leu Arg Gly Phe Lys Leu Leu Phe Asn Lys
        355                 360                 365

Pro Lys Asp Val Gly Ser Pro Val Pro Pro Glu Ser Pro Leu Leu Gly
    370                 375                 380
```

```
Glu Asp Ser Pro Leu Gln Ile Ile Gln Gln Ile Ile Gln Met Phe
385                 390                 395


<210>  664
<211>  382
<212>  PRT
<213>  Staphylothermus hellenicus

<400>  664

Met Thr Gly Lys Phe Lys Ile Lys Glu Asn Val Glu Ile Asp Arg Leu
1               5                   10                  15


Phe Lys Ile Tyr Arg Glu Ile Val Asn Tyr Leu Ile Asn Tyr Ala Tyr
            20                  25                  30


Glu Asn Asn Ile Thr Ser Phe Tyr Lys Leu Lys Ser Lys Thr Tyr Arg
        35                  40                  45


Asn Leu Arg Glu Lys Tyr Pro Asn Leu Pro Ser His Tyr Ile Tyr Thr
    50                  55                  60


Ala Cys Gln Ile Ala Thr Ser Ile Tyr Arg Ser Tyr Arg Lys Lys Lys
65                  70                  75                  80


Arg Arg Gly Glu Ala Arg Asn Lys Pro Val Phe Lys Lys Asp Ser Ile
                85                  90                  95


Met Leu Asp Asp His Leu Phe Lys Leu Asp Ile Glu Lys Gly Val Leu
            100                 105                 110


Lys Leu Ser Thr Pro Lys Gly Arg Ile Thr Leu Lys Val Tyr Val Ser
        115                 120                 125


Asn Tyr His Met Lys Phe Lys Asp Trp Arg Thr Gly Gln Ala Trp Leu
    130                 135                 140


Val Lys Lys Asp Asn Gly Ile Phe Leu Asn Val Val Phe Ser Arg Glu
145                 150                 155                 160
```

```
Val Glu Ile Gly Glu Pro Lys Asp Phe Ile Gly Val Asp Leu Asn Glu
                165                 170                 175

Asn Asn Val Thr Ile Ala Leu Pro Asn Gly Phe Ala Arg Phe Glu Thr
            180                 185                 190

Arg Glu Arg Glu Ile Arg Thr Ala Tyr Tyr Val Lys Arg Arg Lys Ile
        195                 200                 205

Gln Lys Lys Ile Arg Ala Gly Lys Lys Arg Lys Lys Leu Leu Glu Lys
    210                 215                 220

Tyr Gly Lys Arg Glu Arg Asn Arg Leu Asn Asp Leu Tyr His Lys Leu
225                 230                 235                 240

Ala Asn Lys Ile Val Glu Leu Ala Asp Gly Tyr Gly Ile Ala Leu Glu
                245                 250                 255

Asn Leu Lys Asn Ile Arg Lys Ser Ile Arg Tyr Ser Lys Glu Ile Asn
            260                 265                 270

Gly Arg Leu His Arg Trp Ser Phe Arg Arg Leu Gln Ser Ile Ile Glu
        275                 280                 285

Tyr Lys Ala Lys Leu Lys Gly Ile Lys Val Val Tyr Val Asp Pro Ser
    290                 295                 300

Tyr Thr Ser Ser Leu Cys Pro Ile Cys Arg Gly Lys Leu Ser Pro Asn
305                 310                 315                 320

Gly His Arg Val Leu Lys Cys Met Arg Cys Gly Phe Glu Ala Asp Arg
                325                 330                 335

Asp Ile Ile Gly Ser Leu Asn Ile Arg Leu Lys Ala Leu Lys Met Trp
            340                 345                 350
```

```
Gly Val Ser Val Pro Pro Glu Ser Pro Ser Met Lys Pro Glu Arg Gly
        355                 360                 365


Arg Leu Ala Val Ile Ile Asn Thr Tyr Asn Lys Ser Tyr Gly
    370                 375                 380


<210>  665
<211>  392
<212>  PRT
<213>  Thermococcus sp. 2319x1

<400>  665

Met Leu Ser Gly Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Asn
1               5                   10                  15


Pro Pro Glu Gly Leu Asp Asp Leu Phe Ser Leu Tyr Arg Glu Ile Val
            20                  25                  30


Asn Phe Leu Leu Thr Tyr Ala Tyr Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Lys Glu Leu Arg Gly Lys Tyr Pro Gln
    50                  55                  60


Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile
65                  70                  75                  80


Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Lys Gly Lys Ala Asn Gly Lys
                85                  90                  95


Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Glu Ala Gly Val Ile Lys Phe Ser Thr Pro Ser Gly Arg
        115                 120                 125


Ile Pro Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Glu Ser
    130                 135                 140
```

```
Trp Arg Val Gly Gln Ala Trp Leu Val Lys Thr Pro Glu Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Arg Glu Val Glu Val Gly Glu Pro Glu Thr
                165                 170                 175

Leu Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Gly Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Arg Thr Gly
    210                 215                 220

Lys Lys Arg Lys Glu Leu Leu Glu Lys Tyr Gly Leu Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Arg Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Ile Cys Gly Glu Lys Leu Ser Pro Asn Gly Cys Arg Val Leu Lys
                325                 330                 335

Cys Leu Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
```

```
            340                 345                 350

Asn Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser His Pro Met Lys Pro Glu Gly Gly Ser Leu Pro Val Thr Lys
    370                 375                 380

Leu Thr Pro Tyr Thr Leu Tyr Gly
385                 390
```

<210> 666
<211> 360
<212> PRT
<213> Armatimonadetes bacterium 13_1_40CM_64_14

<400> 666

```
Met Asp His Val Glu Thr Val Arg Leu His Pro Pro Asp Pro Ala Gln
1               5                   10                  15

Leu Ile Ala Trp Leu Glu Arg Phe Asn Ala Ala Ala Asn Trp Leu Ser
            20                  25                  30

Gly Val Ala Phe Arg Glu Arg Leu Trp His Trp Leu Pro Leu Gln Arg
        35                  40                  45

Arg Ala Tyr Arg Glu Val Arg Glu Arg Phe Gln Ile Pro Ala Ala Ala
    50                  55                  60

Thr Val Val Val Ile Arg Lys Val Ala Tyr Ala Tyr Arg Asn Lys Gln
65                  70                  75                  80

Arg Arg Gln His Gln Ala Thr Phe Arg Arg Arg Gly Ala Ile Pro Ile
                85                  90                  95

Tyr Lys His Arg Tyr Lys Arg Asp Gly Thr Val Ser Met Tyr Gly Phe
            100                 105                 110
```

```
Arg Ile Pro Phe Thr Ala Arg Pro Gln Ala Trp Leu Ser Ser Arg His
        115                 120                 125

Gln Ala Val Leu Cys Tyr Arg Arg Gly Lys Phe Ile Leu His Gln Val
    130                 135                 140

Val Glu Val Asp Val Pro Pro Pro Ala Pro Val Gln Asp Tyr Leu Gly
145                 150                 155                 160

Cys Asp Leu Gly Thr Val Asn Leu Leu Thr Asp Ser Glu Ala Glu Ala
                165                 170                 175

Tyr Ser Gly Gln Ala Val Glu Glu Lys Arg Arg Ile Tyr Val His Arg
            180                 185                 190

Arg Ala Arg Leu Gln Lys Arg Gly Thr Arg Ala Ala Arg Arg Lys Leu
        195                 200                 205

Arg Gln Ile Ser Gly Arg Gln Gly Arg Tyr Gln Arg Asp Val Asn His
    210                 215                 220

Arg Ile Ala Lys Arg Val Val Ala Lys Ala Gln Arg Leu Cys Cys Gly
225                 230                 235                 240

Ile Ala Leu Glu Asp Leu Arg Gly Ile Arg Asp Arg Ile Lys Ala Arg
                245                 250                 255

Arg Arg Gln Arg Ala Arg Leu His Asn Trp Ala Phe Gly Gln Leu Arg
            260                 265                 270

Gln Phe Ile Val Tyr Lys Ala Ala Lys Ala Gly Ile Pro Val Val Phe
        275                 280                 285

Val Asp Pro Ala Asn Thr Ser Arg Thr Cys Pro Val Cys Gly His Val
    290                 295                 300

Asp Lys Arg Asn Arg Arg Ser Gln Ala Ala Phe Ser Cys Arg Arg Cys
305                 310                 315                 320
```

```
Gly His Glu Glu Pro Ala Asp Val Ile Ala Ala Arg Asn Val Arg Ala
               325                 330                 335


Trp Ala Arg Gly Asp Ala Pro Met Val Ala Ser Ala Arg Ala Ala Thr
            340                 345                 350


Ser Pro His Pro Thr Ser Arg Gly
        355                 360


<210>  667
<211>  392
<212>  PRT
<213>  Staphylothermus hellenicus DSM 12710

<400>  667

Met Leu Asn Arg Arg Ser Glu Thr Val Lys Met Thr Gly Lys Phe Lys
1               5                   10                  15


Ile Lys Glu Asn Val Glu Ile Asp Arg Leu Phe Lys Ile Tyr Arg Glu
            20                  25                  30


Ile Val Asn Tyr Leu Ile Asn Tyr Ala Tyr Glu Asn Asn Ile Thr Ser
        35                  40                  45


Phe Tyr Lys Leu Lys Ser Lys Thr Tyr Arg Asn Leu Arg Glu Lys Tyr
    50                  55                  60


Pro Asn Leu Pro Ser His Tyr Ile Tyr Thr Ala Cys Gln Ile Ala Thr
65                  70                  75                  80


Ser Ile Tyr Arg Ser Tyr Arg Lys Lys Lys Arg Arg Gly Glu Ala Arg
                85                  90                  95


Asn Lys Pro Val Phe Lys Lys Asp Ser Ile Met Leu Asp Asp His Leu
            100                 105                 110


Phe Lys Leu Asp Ile Glu Lys Gly Val Leu Lys Leu Ser Thr Pro Lys
```

```
        115                 120                 125

Gly Arg Ile Thr Leu Lys Val Tyr Val Ser Asn Tyr His Met Lys Phe
    130                 135                 140

Lys Asp Trp Arg Thr Gly Gln Ala Trp Leu Val Lys Lys Asp Asn Gly
145                 150                 155                 160

Ile Phe Leu Asn Val Val Phe Ser Arg Glu Val Glu Ile Gly Glu Pro
                165                 170                 175

Lys Asp Phe Ile Gly Val Asp Leu Asn Glu Asn Asn Val Thr Ile Ala
            180                 185                 190

Leu Pro Asn Gly Phe Ala Arg Phe Glu Thr Arg Glu Arg Glu Ile Arg
        195                 200                 205

Thr Ala Tyr Tyr Val Lys Arg Arg Lys Ile Gln Lys Lys Ile Arg Ala
    210                 215                 220

Gly Lys Lys Arg Lys Lys Leu Leu Glu Lys Tyr Gly Lys Arg Glu Arg
225                 230                 235                 240

Asn Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu
                245                 250                 255

Leu Ala Asp Gly Tyr Gly Ile Ala Leu Glu Asn Leu Lys Asn Ile Arg
            260                 265                 270

Lys Ser Ile Arg Tyr Ser Lys Glu Ile Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Arg Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Ile Lys Val Val Tyr Val Asp Pro Ser Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320
```

```
Pro Ile Cys Arg Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Met Arg Cys Gly Phe Glu Ala Asp Arg Asp Ile Ile Gly Ser Leu
            340                 345                 350

Asn Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser Pro Ser Met Lys Pro Glu Arg Gly Arg Leu Ala Val Ile Ile
    370                 375                 380

Asn Thr Tyr Asn Lys Ser Tyr Gly
385                 390
```

<210> 668
<211> 257
<212> PRT
<213> Haloterrigena salina

<400> 668

```
Met Gly Thr Leu His Tyr Asp Glu Gln Glu Asp Asp Phe Tyr Leu His
1               5                   10                  15

Ile Val Ile Gln Lys Glu Val Glu Glu Arg Glu Gly Asp Arg Ile Leu
            20                  25                  30

Gly Val Asp Leu Asn Leu Lys Asn Val Ala Val Thr Ser Thr Gly Ser
        35                  40                  45

Phe Tyr Asp Gly Gly Lys Leu Leu Trp Gly Gln Asn His Tyr Phe Arg
    50                  55                  60

Val Arg Arg Ser Leu Gln Asp Lys Gly Thr Arg Ser Ala Lys Gln Ala
65                  70                  75                  80

Leu Ala Arg Leu Ser Gly Arg Glu Asn Arg Phe Val Leu Asp Arg Leu
                85                  90                  95
```

```
His Thr Ile Ser Arg Arg Ile Val Glu Glu Ala Arg His Tyr Asp Cys
            100                 105                 110

Ser Tyr Ile Ala Val Glu Asp Leu Thr His Ile Arg Glu Arg Met Asp
        115                 120                 125

Ala Ser Asp Asp Gln Leu Lys Arg Gln Met His Gln Trp Ala Phe Arg
    130                 135                 140

Glu Leu Gln Glu Met Ile Gln Trp Lys Ala Thr Glu Tyr Gly Ile Arg
145                 150                 155                 160

Val Glu Ser Val Asn Pro Ala Phe Ser Ser Gln Thr Cys Ser Lys Cys
                165                 170                 175

Gly His Gln Ser Ser Thr Asn Arg Asn Ser Asp Gly Trp Phe Glu Cys
            180                 185                 190

Asn Glu Cys Gly Tyr Glu Ile Asp Gly Asp Tyr Asn Ala Ser Lys Asn
        195                 200                 205

Ile Gly Met Arg Leu Leu Ser Leu Pro Glu Gly Lys Arg Pro Ser Gly
    210                 215                 220

Leu Gly Asp Gly His Leu Ala Leu Lys Ser Gly Thr Val Thr Leu Asn
225                 230                 235                 240

Gly Asp Tyr Thr Ala Tyr Asp Thr Val Ser Ala Glu Gly Glu Ser His
                245                 250                 255

Ala
```

<210> 669
<211> 392
<212> PRT
<213> Thermococcus sp. PK

<400> 669

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Thr
1               5                  10                  15


Glu Pro Glu Gly Leu Glu Asp Leu Phe Ser Leu Tyr Gln Glu Ile Val
            20                  25                  30


Asn Phe Leu Ile Thr Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Glu Gln Tyr Pro Glu
    50                  55                  60


Leu Pro Ser His Tyr Ile Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile
65                  70                  75                  80


Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Arg Gly Lys Ala Asn Gly Lys
                85                  90                  95


Pro Thr Phe Lys Lys Lys Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Glu Gly Gly Phe Ile Lys Leu Ser Thr Pro Ser Gly Arg
        115                 120                 125


Leu Glu Leu Glu Phe Tyr Arg Ala Lys Tyr His Glu Lys Phe Arg Glu
    130                 135                 140


Trp Lys Ile Gly Gln Ala Trp Leu Val Lys Asn Pro Lys Gly Val Phe
145                 150                 155                 160


Leu His Val Val Phe Ser Lys Glu Val Glu Val Arg Glu Ser Lys Ala
                165                 170                 175


Val Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190
```

```
Asp Gly Asn Phe Ile Gln Ile Ile Thr His Glu Lys Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Arg Lys Leu Arg Ala Gly
    210                 215                 220

Lys Lys Arg Glu Glu Leu Leu Glu Lys Tyr Gly Arg Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Thr Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Arg Leu Gln Ala Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Ser Val Val Phe Val Asp Pro Ala Tyr Ser Ser Ser Leu Cys
305                 310                 315                 320

Pro Ile Cys Gly Gly Lys Leu Val Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350

Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro Glu
        355                 360                 365

Ser Pro Pro Met Lys Thr Gly Gly Gly Lys Pro Thr Arg Tyr Glu Ile
    370                 375                 380

Asn Ala Leu His Ala Leu Tyr Trp
```

385 390

<210> 670
<211> 385
<212> PRT
<213> Streptomyces sp. CB01883

<400> 670

Met Lys Ile Val Thr Gln Val Lys Leu Val Pro Glu Thr Asp Gln Ala
1 5 10 15

Ala Ala Leu Arg Ser Thr Leu Arg Thr Val Asn Asp Leu Ala Thr Trp
20 25 30

Val Ser Asp Val Ala Phe Val Asn Asp Val Pro Arg Glu Tyr Asp Leu
35 40 45

Arg Arg His Thr Tyr Ala His Leu Lys Ser Glu Gly Leu Gly Ala Gln
50 55 60

Ala Ala Gln His Val Ile Lys Lys Val Arg Asp Ala Tyr Thr Thr Leu
65 70 75 80

His Ala Asn Leu Arg Ala Gly Asn Leu Gly Lys Pro Gly Ser Lys Arg
85 90 95

Arg Arg Lys Ala Glu Ser Lys Pro Ile Thr Phe Arg Pro Glu Ala Ala
100 105 110

Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Thr Gln Thr
115 120 125

Val Ser Ile Trp Thr Thr Ala Gly Arg Ile Lys Asn Val Arg Phe Ala
130 135 140

Cys Ser Ala Asp Ala Phe Lys Val Leu Gln His Tyr Arg Lys Gly Glu
145 150 155 160

```
Ser Asp Leu Ile Glu Arg Asp Gly Ile Phe Tyr Leu Thr Ala Thr Cys
                165                 170                 175

Glu Ile Pro Glu Ala Glu Thr Tyr Glu Pro Asp Arg Phe Ile Gly Val
            180                 185                 190

Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Thr Gly Tyr Gln Ala
        195                 200                 205

Ala Gly Arg Gly Leu Asn Arg Tyr Arg Lys Arg Gln Leu Ala Leu Arg
    210                 215                 220

Ser Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg Arg Leu Lys
225                 230                 235                 240

Glu Arg Ser Arg Arg Glu Gln Arg His Val Lys Asn Thr Asn His Ile
                245                 250                 255

Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser Ala Gly Ile
            260                 265                 270

Cys Leu Glu Gln Leu Lys Gly Ile Arg Gln Arg Val Arg Leu Arg Lys
        275                 280                 285

Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln Leu Gly Asp
    290                 295                 300

Phe Ile Val Tyr Lys Ala Lys Arg Ala Gly Val Pro Leu Val Phe Val
305                 310                 315                 320

Asp Pro Ser Tyr Thr Ser Gln Thr Cys Ala Glu Cys Gly His Val Asp
                325                 330                 335

Lys Arg Asn Arg Val Asp Gln Arg Leu Phe Ile Cys Arg Lys Cys Gly
            340                 345                 350

Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile Ala Thr Arg
        355                 360                 365
```

Gly Glu Thr Val Trp Asn Ala Gly Arg Glu Ser Arg Val Pro Ala Thr
370 375 380

Pro
385

<210> 671
<211> 358
<212> PRT
<213> Gracilibacillus timonensis

<400> 671

Met Ser Gln Thr Ile Thr Ile Lys Val Lys Leu Ile Pro Thr Lys Glu
1 5 10 15

Gln Ala Ser Ile Leu Ser Glu Met Ser Lys Thr Tyr Ile Ser Val Ile
20 25 30

Asn Thr Leu Val Ser Glu Met Val Asp Glu Lys Lys Ser Thr Lys Lys
35 40 45

Ser Ser Lys Asp Ile Ser Val Ser Leu Pro Ser Ala Val Lys Asn Gln
50 55 60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Gly Lys Lys Ser Lys
65 70 75 80

Tyr Lys Val Ile Pro Ile Leu Lys Lys Thr Val Cys Val Trp Asn Asn
85 90 95

Gln Asn Tyr Ser Phe Asp Ser Thr His Ile Ser Met Pro Ile Met Met
100 105 110

Asp Gly Lys Ala Lys Lys Ile Pro Ile Arg Ala Leu Phe Met Asp Lys
115 120 125

Asp Asn Arg Asn Met Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg

```
    130                 135                 140

Ile Thr Lys Lys Ala Asn Lys Trp Met Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Val Gln Gly Thr Gly Leu Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Lys Arg Lys Phe Arg Ser
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Arg Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Ser Lys Asp Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Gln Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Asp His Arg Val Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Thr Cys Phe Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Thr Cys Lys Cys Gly Phe Lys Lys His
                325                 330                 335
```

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340   345   350

Gly Asn Ser Gln Ser Ala
        355

<210> 672
<211> 404
<212> PRT
<213> Pyrococcus furiosus

<400> 672

Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1   5   10   15

Ile Pro Asn Gly Leu Asp Val Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20   25   30

Asn Phe Leu Ile Ser Tyr Ala Tyr Glu Asn Asn Ile Thr Ser Phe Tyr
        35   40   45

Arg Leu Lys Lys Glu Thr Tyr Lys Asn Leu Arg Lys Glu Tyr Pro Glu
    50   55   60

Leu Pro Ser His Tyr His Tyr Thr Ala Ile Asp Met Ala Thr Lys Ile
65   70   75   80

Tyr Arg Gly Tyr Arg Lys Arg Arg Gly Lys Ala Lys Gly Lys Pro Val
                85   90   95

Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys Leu Asp
            100   105   110

Phe Glu Lys Arg Ile Val Lys Leu Ser Thr Pro Ser Gly Arg Ile Glu
        115   120   125

Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Gly Trp Lys
    130   135   140

```
Val Gly Gln Ala Trp Leu Val Lys Thr Pro Lys Gly Leu Phe Ile Asn
145                 150                 155                 160

Val Val Phe Ser Arg Glu Val Glu Ile Arg Glu Pro Glu Asn Phe Ile
                165                 170                 175

Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Cys Leu Pro Lys Gly
            180                 185                 190

Glu Phe Ile Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr Gly Tyr
        195                 200                 205

Phe Val Lys Arg Arg Lys Ile Gln Lys Asn Leu Arg Val Gly Lys Lys
    210                 215                 220

Arg Glu Glu Leu Leu Glu Lys Tyr Gly Ser Arg Glu Arg Asn Arg Val
225                 230                 235                 240

Asp Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu Ala Glu
                245                 250                 255

Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg Asp Ser
            260                 265                 270

Ile Arg Tyr Ser Ala Glu Leu Asn Gly Arg Leu His Arg Trp Ser Phe
        275                 280                 285

Arg Lys Leu Gln Arg Ile Ile Glu Tyr Lys Ala Lys Leu Arg Gly Ile
    290                 295                 300

Lys Val Ile Phe Val Asn Pro Ala Tyr Thr Ser Thr Leu Cys Pro Ile
305                 310                 315                 320

Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys Cys Lys
                325                 330                 335
```

```
Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn Val Arg
            340                 345                 350


Leu Lys Ala Leu Lys Met Trp Gly Val Thr Val Pro Pro Glu Ser His
        355                 360                 365


Pro Met Lys Lys Gly Gly Trp Lys Val Ser Arg Ile Asp Ile Thr Gln
    370                 375                 380


Ile Thr Ala Asp Gln Asn Gly Tyr Phe Met Arg Arg Leu Arg Arg Ala
385                 390                 395                 400


Leu Leu Leu Gln
```

<210> 673
<211> 408
<212> PRT
<213> Haloterrigena salina JCM 13891

<400> 673

```
Met Glu Val Gln Arg Thr Val Arg Val Lys Leu Asp Val Pro Asp Glu
1               5                   10                  15


Arg Arg Asp His Leu His Gln Thr Ile Glu Gln Phe Asp Thr Ala Val
            20                  25                  30


Asn Tyr Ser Ile Glu Asn Gly Arg Asn Asp Asp Gly Tyr Phe Ile Thr
        35                  40                  45


Ala Lys Thr Asn Ile His Asp Gln Val Tyr His Asp Leu Arg Asp Val
    50                  55                  60


Thr Asp Leu Pro Ala Asn Leu Cys Val Arg Ala Tyr Ser Lys Ala Val
65                  70                  75                  80


Glu Met Ile Lys Ser Thr Val Ala Asp Trp Lys Asn Gly Asn Ser Arg
                85                  90                  95
```

```
Pro Val Pro Ser Phe Asp Gln Pro Ile Val Val Tyr Asp Lys Arg Ile
            100                 105                 110

Leu Thr Ile Asn Glu Arg Ser Ala Thr Leu Ser Thr Val Glu Ser Arg
        115                 120                 125

Val Glu Val Gly Phe Asp Ile Gly Glu Tyr Gln Ala Asp Tyr Leu Asp
    130                 135                 140

Asp Asp Asp Tyr Glu Lys Arg Met Gly Thr Leu His Tyr Asp Glu Gln
145                 150                 155                 160

Glu Asp Asp Phe Tyr Leu His Ile Val Ile Gln Lys Glu Val Glu Glu
                165                 170                 175

Arg Glu Gly Asp Arg Ile Leu Gly Val Asp Leu Asn Leu Lys Asn Val
            180                 185                 190

Ala Val Thr Ser Thr Gly Ser Phe Tyr Asp Gly Gly Lys Leu Leu Trp
        195                 200                 205

Gly Gln Asn His Tyr Phe Arg Val Arg Arg Ser Leu Gln Asp Lys Gly
    210                 215                 220

Thr Arg Ser Ala Lys Gln Ala Leu Ala Arg Leu Ser Gly Arg Glu Asn
225                 230                 235                 240

Arg Phe Val Leu Asp Arg Leu His Thr Ile Ser Arg Arg Ile Val Glu
                245                 250                 255

Glu Ala Arg His Tyr Asp Cys Ser Tyr Ile Ala Val Glu Asp Leu Thr
            260                 265                 270

His Ile Arg Glu Arg Met Asp Ala Ser Asp Asp Gln Leu Lys Arg Gln
        275                 280                 285

Met His Gln Trp Ala Phe Arg Glu Leu Gln Glu Met Ile Gln Trp Lys
```

```
    290                 295                 300

Ala Thr Glu Tyr Gly Ile Arg Val Glu Ser Val Asn Pro Ala Phe Ser
305                 310                 315                 320

Ser Gln Thr Cys Ser Lys Cys Gly His Gln Ser Ser Thr Asn Arg Asn
                325                 330                 335

Ser Asp Gly Trp Phe Glu Cys Asn Glu Cys Gly Tyr Glu Ile Asp Gly
            340                 345                 350

Asp Tyr Asn Ala Ser Lys Asn Ile Gly Met Arg Leu Leu Ser Leu Pro
        355                 360                 365

Glu Gly Lys Arg Pro Ser Gly Leu Gly Asp Gly His Leu Ala Leu Lys
    370                 375                 380

Ser Gly Thr Val Thr Leu Asn Gly Asp Tyr Thr Ala Tyr Asp Thr Val
385                 390                 395                 400

Ser Ala Glu Gly Glu Ser His Ala
                405
```

<210> 674
<211> 388
<212> PRT
<213> Streptomyces diastatochromogenes

<400> 674

```
Met Leu Leu Val Lys Val Val Thr Gln Val Lys Leu Ile Pro Asp Ala
1               5                   10                  15

Ala Gln Ala Pro Ala Ile Ala Ala Thr Leu Tyr Thr Phe Asn Ser Glu
            20                  25                  30

Ala Asn Trp Val Ser Glu Val Ala Phe Met Asn Gly Val Pro Arg Glu
        35                  40                  45
```

```
Tyr Ala Leu Arg Lys Leu Ala Tyr Ala Gln Leu Lys Glu Arg Gly Leu
    50                  55                  60

Gly Ala Gln Val Ala Gln His Val Ile Lys Lys Val Arg Asp Ala Tyr
65                  70                  75                  80

Thr Thr Leu His Ala Gly Leu Arg Ala Gly Asn Leu Gly Arg Pro Gly
                85                  90                  95

Ser Lys Arg Arg Arg Lys Ala Glu Ala Lys Pro Val Val Phe Arg Pro
            100                 105                 110

Glu Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp
        115                 120                 125

Ala Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Lys Asn Val
    130                 135                 140

Arg Phe Ala Cys Ser Ala Asp Ala Leu Lys Met Leu Gln Gln Tyr Arg
145                 150                 155                 160

Lys Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Val
                165                 170                 175

Ala Val Cys Glu Val Pro Glu Ala Glu Arg Tyr Glu Pro Asp Gly Phe
            180                 185                 190

Ile Gly Val Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Thr Gly
        195                 200                 205

Tyr Gln Ala Ala Gly Arg Gly Leu Asn Arg Tyr Arg Lys Arg Gln Leu
    210                 215                 220

Ala Leu Arg Ala Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg
225                 230                 235                 240

Arg Leu Lys Glu Arg Ser Arg Arg Glu Ala Arg His Val Lys Asn Thr
                245                 250                 255
```

```
Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser
            260                 265                 270

Ala Gly Ile Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg
        275                 280                 285

Leu Arg Lys Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln
    290                 295                 300

Leu Gly Asp Phe Ile Val Tyr Lys Ala Arg Arg Ala Gly Val Pro Val
305                 310                 315                 320

Val Tyr Val Asp Pro Ala Tyr Thr Ser Gln Gln Cys Cys Glu Cys Gly
                325                 330                 335

His Ile Asp Lys Lys Asn Arg Ala Ser Gln Ala Leu Phe Thr Cys Arg
            340                 345                 350

Asn Cys Gly Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile
        355                 360                 365

Ala Arg Lys Gly Asp Ala Val Trp Ile Ala Gly Arg Glu Ser Arg Val
    370                 375                 380

Pro Ala Thr Pro
385
```

<210> 675
<211> 401
<212> PRT
<213> Methanotorris formicicus

<400> 675

```
Met Ser Asn Glu Tyr Leu Glu Thr Val Lys Leu Thr Ala Arg Phe Lys
1               5                   10                  15

Ile Lys Glu Ile Pro Asn Glu Leu Thr Asn Ile Phe Pro Thr Tyr Lys
```

```
            20                  25                  30

Thr Ile Val Asn Asn Leu Leu Asn Tyr Ala Phe Lys Asn Asn Ile Thr
        35                  40                  45

Ser Phe Lys Arg Leu Lys Ser Glu Lys Tyr Lys Asp Leu Arg Gly Lys
    50                  55                  60

Tyr Lys Lys Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala
65                  70                  75                  80

Thr Ser Ile Phe Lys Ser Trp Arg Lys Arg His Arg Lys Gly Lys Ala
                85                  90                  95

Ser Lys Lys Pro Asp Phe Lys Gly Ser Val Ile Met Leu Asp Asp His
            100                 105                 110

Leu Phe Lys Leu Asp Leu Asp Lys Gly Leu Ala Arg Ile Ser Thr Pro
        115                 120                 125

Tyr Gly Arg Val Glu Val Glu Leu Tyr Ser Ser Asp Tyr His Lys Lys
    130                 135                 140

Phe Lys Asp Trp Lys Val Gly Gln Ala Trp Ile Val Arg Lys Lys Asn
145                 150                 155                 160

Asp Tyr Tyr Leu Asn Val Val Phe Ser Lys Asn Ile Leu Ile Lys Glu
                165                 170                 175

Gly Glu Asn Val Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Ile
            180                 185                 190

Ala Thr Asp Glu Asn Ile Ile Gln Ile Ile Thr Asn Glu Arg Thr Ile
        195                 200                 205

Arg Thr Ser Tyr Tyr Val Lys Arg Arg Lys Ile Gln Glu Lys Ile Arg
    210                 215                 220
```

```
Leu Gly Asp Lys Lys Lys Glu Leu Leu Glu Lys Tyr Gly Glu Arg Glu
225                 230                 235                 240

Arg Asn Lys Ile Val Asp Ile Tyr His Lys Val Ala Asn Lys Ile Ile
                245                 250                 255

Glu Ile Ala Lys Lys Val Gly Gly Val Ile Ala Leu Glu Asn Leu Lys
            260                 265                 270

Glu Ile Arg Glu Lys Val Asn Tyr Phe Lys Lys Leu Asn Gly Arg Leu
        275                 280                 285

His Arg Trp Ser Phe Arg Lys Leu Gln Glu Phe Ile Lys Tyr Lys Ala
    290                 295                 300

Lys Leu Asn Gly Val Arg Val Val Phe Val Asn Pro His Tyr Thr Ser
305                 310                 315                 320

Ser Arg Cys Pro Ile Cys Gly Gly Arg Met Ser Pro Asn Gly His Arg
                325                 330                 335

Val Leu Lys Cys Glu Cys Cys Gly Cys Ile Ala Asp Arg Asp Val Val
            340                 345                 350

Gly Ser Leu Asn Ile Met Ile Arg Gly Phe Lys Ala Ile Lys Pro Lys
        355                 360                 365

Asp Val Gly Ser Ser Val Pro Pro Glu Ser Tyr Pro Met Lys Leu Gly
    370                 375                 380

Gly Trp Lys Val Ile Arg Tyr Ala Cys Phe Asn Cys Phe Lys Ile Ser
385                 390                 395                 400

Gly
```

<210> 676

<211> 388
<212> PRT
<213> Actinobacteria bacterium OK006

<400> 676

Met Leu Leu Val Lys Val Val Thr Gln Val Lys Leu Ile Pro Asp Ala
1 5 10 15

Ala Gln Ala Pro Ala Ile Ala Ala Thr Leu Tyr Thr Phe Asn Ser Glu
20 25 30

Ala Asn Trp Val Ser Glu Val Ala Phe Met Asn Gly Val Pro Arg Glu
35 40 45

Tyr Ala Leu Arg Lys Leu Ala Tyr Ala Gln Leu Lys Glu Arg Gly Leu
50 55 60

Gly Ala Gln Val Ala Gln His Val Ile Lys Lys Val Arg Asp Ala Tyr
65 70 75 80

Thr Thr Leu His Ala Gly Leu Arg Ala Gly Asn Leu Gly Arg Pro Gly
85 90 95

Ser Lys Arg Arg Arg Lys Ala Glu Ala Lys Pro Val Val Phe Arg Pro
100 105 110

Glu Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp
115 120 125

Ala Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Lys Asn Val
130 135 140

Arg Phe Ala Cys Ser Ala Asp Ala Leu Lys Met Leu Gln Gln Tyr Arg
145 150 155 160

Lys Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Val
165 170 175

```
Ala Val Cys Glu Val Pro Glu Ala Glu Arg Tyr Glu Pro Asp Gly Phe
            180                 185                 190

Ile Gly Val Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Thr Gly
        195                 200                 205

Tyr Gln Ala Ala Gly Arg Gly Leu Ser Arg Tyr Arg Lys Arg Gln Leu
    210                 215                 220

Ala Leu Arg Ala Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg
225                 230                 235                 240

Arg Leu Lys Glu Arg Ser Arg Arg Glu Ala Arg His Val Lys Asn Thr
                245                 250                 255

Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser
            260                 265                 270

Ala Gly Ile Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg
        275                 280                 285

Leu Arg Lys Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln
    290                 295                 300

Leu Gly Asp Phe Ile Val Tyr Lys Ala Arg Arg Ala Gly Val Pro Val
305                 310                 315                 320

Val Tyr Val Asp Pro Ala Tyr Thr Ser Gln Gln Cys Cys Glu Cys Gly
                325                 330                 335

His Ile Asp Lys Lys Asn Arg Ala Ser Gln Ala Leu Phe Thr Cys Arg
            340                 345                 350

Asn Cys Gly Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile
        355                 360                 365

Ala Arg Lys Gly Asp Ala Val Trp Ile Ala Gly Arg Glu Ser Arg Val
    370                 375                 380
```

Pro Ala Thr Pro
385

<210> 677
<211> 385
<212> PRT
<213> Actinobacteria bacterium OK006

<400> 677

Met Lys Val Val Thr Gln Val Lys Leu Ile Pro Asp Ala Ala Gln Ala
1   5   10   15

Pro Ala Ile Ala Ala Thr Leu Tyr Thr Phe Asn Ser Glu Ala Asn Trp
            20   25   30

Val Ser Glu Val Ala Phe Met Asn Gly Val Pro Arg Glu Tyr Ala Leu
        35   40   45

Arg Lys Leu Ala Tyr Ala Gln Leu Lys Glu Arg Gly Leu Gly Ala Gln
    50   55   60

Val Ala Gln His Val Ile Lys Lys Val Arg Asp Ala Tyr Thr Thr Leu
65   70   75   80

His Ala Gly Leu Arg Ala Gly Asn Leu Gly Arg Pro Gly Ser Lys Arg
                85   90   95

Arg Arg Lys Ala Glu Ala Lys Pro Val Val Phe Arg Pro Glu Ala Ala
            100   105   110

Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Ala Gln Thr
        115   120   125

Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Lys Asn Val Arg Phe Ala
    130   135   140

Cys Ser Ala Asp Ala Leu Lys Met Leu Gln Gln Tyr Arg Lys Gly Glu

```
145                 150                 155                 160

Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Val Ala Val Cys
                165                 170                 175

Glu Val Pro Glu Ala Glu Arg Tyr Glu Pro Asp Gly Phe Ile Gly Val
            180                 185                 190

Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Thr Gly Tyr Gln Ala
        195                 200                 205

Ala Gly Arg Gly Leu Ser Arg Tyr Arg Lys Arg Gln Leu Ala Leu Arg
    210                 215                 220

Ala Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg Arg Leu Lys
225                 230                 235                 240

Glu Arg Ser Arg Arg Glu Ala Arg His Val Lys Asn Thr Asn His Ile
                245                 250                 255

Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser Ala Gly Ile
            260                 265                 270

Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg Leu Arg Lys
        275                 280                 285

Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln Leu Gly Asp
    290                 295                 300

Phe Ile Val Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val Tyr Val
305                 310                 315                 320

Asp Pro Ala Tyr Thr Ser Gln Gln Cys Cys Glu Cys Gly His Ile Asp
                325                 330                 335

Lys Lys Asn Arg Ala Ser Gln Ala Leu Phe Thr Cys Arg Asn Cys Gly
            340                 345                 350
```

Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile Ala Arg Lys
        355   360   365

Gly Asp Ala Val Trp Ile Ala Gly Arg Glu Ser Arg Val Pro Ala Thr
    370   375   380

Pro
385

<210> 678
<211> 397
<212> PRT
<213> Thermococcus litoralis

<400> 678

Met Pro Ile Glu Thr Ile Lys Leu Thr Ala Lys Leu Lys Leu Lys Glu
1   5   10   15

Ile Pro Asn Gly Leu Asp Ala Leu Phe Pro Thr Tyr Arg Glu Ile Val
            20   25   30

Asn Phe Leu Ile Ser Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35   40   45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50   55   60

Leu Pro Ser His Tyr His Tyr Thr Ala Thr Gln Met Ala Thr Met Ile
65   70   75   80

Tyr Lys Ser Tyr Arg Lys Arg Lys Lys Lys Gly Lys Ala Asn Gly Lys
                85   90   95

Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100   105   110

Leu Asn Leu Glu Ala Gly Val Val Lys Leu Ser Thr Pro Ser Gly Arg
        115   120   125

```
Ile Glu Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Gly Asp
    130                 135                 140

Trp Lys Ile Gly Gln Ala Trp Leu Val Arg Thr Gln Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Arg Glu Val Glu Val Arg Glu Pro Glu Thr
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Leu Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Arg Ala Gly
    210                 215                 220

Lys Lys Arg Glu Glu Leu Leu Glu Lys Tyr Gly Arg Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asp Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Arg Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320
```

```
Pro Val Cys Gly Gly Asn Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335


Cys Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350


Ile Ser Leu Arg Ala Leu Lys Met Trp Gly Val Thr Val Pro Pro Glu
        355                 360                 365


Ser Gln Pro Met Lys Met Gly Gly Trp Lys Val Ser Arg Ala Asp Val
    370                 375                 380


Tyr Glu Leu Tyr Lys Leu Arg Leu Thr Arg Thr Asp Val
385                 390                 395


<210>  679
<211>  388
<212>  PRT
<213>  Streptomyces hokutonensis

<400>  679

Met Ile Val Val Lys Ile Val Thr Gln Val Lys Leu Met Pro Glu Ala
1               5                   10                  15


Gln Gln Ala Ala Ala Leu Ser Ala Thr Leu Arg Thr Val Asn Asp Leu
            20                  25                  30


Ala Cys Trp Val Ser Ala Val Ala Phe Ala His Gly Val Pro Arg Glu
        35                  40                  45


Tyr Glu Leu Arg Lys His Thr Tyr Pro Arg Leu Lys Ala Glu Gly Leu
    50                  55                  60


Gly Ala Gln Ser Ala Gln His Thr Ile Lys Lys Val Arg Asp Ala Tyr
65                  70                  75                  80


Thr Thr Leu Arg Ala Asn Ile Arg Ala Gly Asn Leu Gly Lys Pro Lys
                85                  90                  95
```

```
Ser Lys Arg Arg Arg Lys Ala Glu Ser Lys Pro Ile Thr Phe Arg Pro
            100                 105                 110

Asp Ala Ala Gln Pro Tyr Asp Asp Arg Cys Met Ser Trp Gln Tyr Asp
        115                 120                 125

Gln Arg Thr Val Ser Ile Trp Thr Thr Glu Gly Arg Leu Lys Ala Val
    130                 135                 140

Arg Phe Val Cys Ser Ala Asp Ala Leu Lys Val Leu Gln Gln Tyr Arg
145                 150                 155                 160

Lys Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Val
                165                 170                 175

Ala Thr Cys Glu Val Pro Glu Ala Glu Thr Tyr Glu Pro Asp Gly Phe
            180                 185                 190

Ile Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Thr Gly
        195                 200                 205

Tyr Gln Ala Ala Gly Arg Ala Leu Asn Arg Tyr Arg Lys Arg Gln Leu
    210                 215                 220

Ala Leu Arg Ala Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg
225                 230                 235                 240

Arg Leu Lys Glu Arg Ser Arg Arg Glu Ala Arg His Val Lys Asn Thr
                245                 250                 255

Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser
            260                 265                 270

Ala Gly Ile Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg
        275                 280                 285

Leu Arg Lys Pro Gln Arg Val Ala Leu His Ser Trp Ser Phe Ala Gln
```

```
    290                 295                 300

Leu Gly Gly Phe Ile Val Tyr Lys Ala Lys Arg Ala Gly Val Pro Leu
305                 310                 315                 320

Val Phe Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ala Glu Cys Gly
                325                 330                 335

His Val Asp Lys Arg Asn Arg Ile Asp Gln Gly Leu Phe Ile Cys Arg
            340                 345                 350

Gly Cys Gly Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile
        355                 360                 365

Ala Thr Arg Gly Glu Ile Val Trp Asn Ala Gly Arg Glu Ser Arg Val
    370                 375                 380

Pro Ala Thr Arg
385
```

<210> 680
<211> 275
<212> PRT
<213> Halorubrum sp. Eb13

<400> 680

```
Thr Ser Asn Lys Leu Ser Asn Ser Asp Pro Arg Ala Val Ile Gly Phe
1               5                   10                  15

Asn Lys Ala Val Arg Thr Val Trp Ala Gly Glu Glu Trp Glu Leu His
            20                  25                  30

Phe Val Cys Lys Val Glu Ile Asp Val Ala Glu Ala Pro Gly Glu Lys
        35                  40                  45

Thr Val Gly Val Asp Leu Gly Ile Asn Asn Phe Ala Ala Leu Ala Tyr
    50                  55                  60
```

```
Glu Asp Gly His Ser Asp Leu Tyr Pro Leu Asn Cys Leu Lys Gln Asp
65                  70                  75                  80

Asp Tyr Tyr Phe Ser Lys Arg Ile Ala Arg Cys Asp Asp Ser Asn Ser
                85                  90                  95

Glu Gln Ala Thr Gln Leu Asn Gln Lys Lys Ser Ala Arg Arg Thr His
            100                 105                 110

Tyr Phe His Thr Leu Ser Lys His Ile Val Gln Arg Cys Val Glu Glu
        115                 120                 125

Gly Val Gly Thr Ile Val Val Gly Asp Leu Ser Gly Ile Arg Glu Asp
    130                 135                 140

Asp Asp Thr Asp Glu Ser Lys Asn Trp Gly Lys His Gly Asn Leu Asp
145                 150                 155                 160

Leu His Ser Trp Ala Phe Asp Arg Phe Thr Asp Leu Leu Glu Tyr Lys
                165                 170                 175

Ala Glu Met Glu Gly Ile Val Val Glu Glu Val Ser Glu Glu Asp Thr
            180                 185                 190

Ser Lys Ser Cys Ser Cys Cys Gly Arg Lys Arg Asp Ala Asn Arg Ala
        195                 200                 205

Glu Arg Gly Leu Tyr Val Cys Asp Asp Cys Gly Thr Val Ala Asn Ala
    210                 215                 220

Asp Val Asn Asp Ala Glu Asn Ile Arg Gln Lys Val Ser Pro Ser Ser
225                 230                 235                 240

Pro Asn Leu Ser Val Asn Gly Ser Asn Gly Trp Leu Ala Gln Pro Ser
                245                 250                 255

Thr Phe Leu Phe Asp Lys Glu Ala Gly Ala Phe Ala Pro Gln Glu Arg
            260                 265                 270
```

Val Thr Ser
        275

<210> 681
<211> 348
<212> PRT
<213> Bacillus sp. OV322

<400> 681

Met Leu Pro Thr Lys Glu Gln Ile Gln Leu Leu Lys Gln Ser Ser His
1   5   10   15

Glu Tyr Ile Lys Val Ile Asn Thr Leu Val Ile Glu Met Val Glu Ala
            20   25   30

Lys Lys Ser Thr Lys Lys Thr Thr Lys Asp Val Pro Ala Ile Leu Pro
        35   40   45

Ser Ala Val Lys Asn Gln Ala Ile Lys Asp Ala Lys Ser Val Phe Gln
    50   55   60

Lys Val Lys Lys Ala Lys Tyr Gln Ile Val Pro Val Leu Lys Lys Pro
65   70   75   80

Val Cys Val Trp Asn Asn Gln Asn Tyr Ser Phe Asp Phe Thr His Ile
                85   90   95

Ser Ile Ala Phe Ile Val Asn Gly Lys Ser Thr Arg Leu Lys Val Arg
            100   105   110

Ala Leu Leu Val Asp Lys Asp Asn Arg Asn Phe Asp Leu Leu Lys His
        115   120   125

Lys Leu Gly Thr Leu Arg Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala
    130   135   140

Gln Ile Ser Val Thr Ile Pro Leu Asp Glu Lys Pro Gly Thr Lys Ile

```
145                 150                 155                 160

Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Ala Val Thr Asp
                165                 170                 175

Asp Glu Lys Val Arg Phe Phe Gly Asn Gly Lys Gln Asn Lys Tyr Met
            180                 185                 190

Lys Arg Lys Phe Arg Thr Ala Arg Lys Lys Leu Gly Ile Lys Lys Lys
        195                 200                 205

Leu Ser Ala Ile Arg Gln Leu Asp Asp Lys Glu Gln Lys Trp Met Lys
    210                 215                 220

Asp Gln Asp His Lys Val Ser Arg Ala Ile Val Asp Phe Ala Lys Asp
225                 230                 235                 240

His Asn Ile Ser Val Ile Arg Leu Glu Gln Leu Thr Asn Ile Arg Gln
                245                 250                 255

Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu His Thr Trp Ser
            260                 265                 270

Phe Tyr Arg Leu Ala Gln Phe Ile Glu Tyr Lys Ala Ala Leu Val Gly
        275                 280                 285

Ile Arg Val Glu Tyr Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro
    290                 295                 300

Thr Cys Thr Glu Lys Asn Lys Ala Lys Asp Arg Lys Tyr Val Cys Asn
305                 310                 315                 320

Cys Gly Phe Asn Lys His Arg Asp Leu Val Gly Ala Met Asn Ile Arg
                325                 330                 335

Tyr Ala Pro Val Val Asp Gly Asp Ser Gln Pro Ala
            340                 345
```

<210> 682
<211> 309
<212> PRT
<213> Streptomyces sp. NRRL F-5122

<400> 682

Met Ala Phe Asp Arg Asp Leu Lys Arg Arg Asn Gly Leu Gln Glu Ala
1 5 10 15

Val Tyr His Arg Ile Lys Ala Asp Phe Asp Leu Gly Ala Gln Ala Ala
20 25 30

Val Arg Thr Ile Lys Lys Val Cys Asp Ala Tyr Ala Thr Leu Lys Ala
35 40 45

Asn Ile Lys Ala Gly Asn Leu Gly Pro Glu Gly Gly Lys Arg Arg Ile
50 55 60

Arg Ala Glu Asn Arg Pro Val Arg Phe Arg Glu Gly Ala Ala Gln Pro
65 70 75 80

Tyr Asp Asp Arg Met Leu Thr Trp Asn Leu Asp Glu Arg Thr Val Ser
85 90 95

Ile Trp Thr Val Ala Gly Arg Leu Lys Gly Ile Ala Phe Val Cys Ser
100 105 110

Pro Glu Ala Met Lys Leu Leu Ala Ser Arg Lys Gly Glu Ser Asp Leu
115 120 125

Val Met Arg Asp Gly Met Phe Phe Leu Thr Ala Thr Val Asp Val Pro
130 135 140

Glu Pro Ala Pro Tyr Glu Pro Thr Gly Phe Leu Gly Val Asp Leu Gly
145 150 155 160

Ile Val Asn Ile Ala Thr Thr Ser Asp Gly Gln Ile Met Ser Gly Arg
165 170 175

```
Gln Val Asn Arg Tyr Arg Lys Arg His Arg Asp Leu Arg Thr Thr Leu
            180                 185                 190

Gln Lys Lys Arg Thr Lys Ser Ala Thr Arg Arg Leu Lys Ser Ile Arg
        195                 200                 205

Arg Arg Glu Ser Arg Tyr Ala Thr Gln Arg Asn His Ile Ile Ala Lys
    210                 215                 220

Lys Leu Val His Thr Ala Glu Arg Thr Leu Arg Gly Ile Gly Leu Glu
225                 230                 235                 240

Asp Leu Ser Gly Ile Arg Gln Arg Val Thr Ala Arg Lys Asp Gln Arg
                245                 250                 255

Ala Arg Leu His Ser Trp Ala Phe Ala Gln Leu Gly Ala Phe Ile Glu
            260                 265                 270

Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val His Val Asp Pro Arg
        275                 280                 285

Asn Thr Ser Arg Gln Cys Ser Glu Cys Trp His Thr His Arg Ser Asn
    290                 295                 300

Arg Ile Asp Gln Ala
305
```

<210> 683
<211> 318
<212> PRT
<213> Paenibacillus riograndensis

<400> 683

```
Met Ser Gln Thr Leu Thr Ile Lys Ile Lys Leu Leu Pro Thr Arg Glu
1               5                   10                  15

Gln Ala Ser Met Val Lys Asn Gln Ala Ile Lys Asp Ala Lys Ser Val
```

```
            20                  25                  30

Phe Lys Lys Ala Lys Lys Ser Lys Phe Thr Ile Val Pro Val Leu Lys
        35                  40                  45

Lys Pro Val Cys Ile Trp Asn Asn Gln Asn Tyr Ser Phe Asp Phe Thr
    50                  55                  60

His Ile Ser Met Pro Leu Met Met Asn Gly Lys Val Ala Lys Thr Pro
65                  70                  75                  80

Ile Arg Ala Leu Leu Ile Asp Lys Asp Asn Arg Asn Leu Gly Leu Leu
                85                  90                  95

Lys His Lys Ser Gly Thr Leu Arg Ile Thr Gln Lys Ser Glu Lys Trp
            100                 105                 110

Ile Ala Gln Ile Ser Val Thr Val Pro Thr Ser Glu Lys Thr Gly Thr
        115                 120                 125

Lys Ile Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Ala Val
    130                 135                 140

Thr Asp Asp Asp Gln Thr Cys Phe Phe Gly Asn Glu Arg Gln Asn Lys
145                 150                 155                 160

Tyr Ile Arg Arg Lys Phe Gln Ser Lys Arg Lys Lys Leu Gly Gln Arg
                165                 170                 175

Lys Lys Leu Asn Ala Ile Val Lys Leu Asp Asp Lys Glu Gln Arg Tyr
            180                 185                 190

Met Lys Asp Gln Asp His Lys Ile Ser Arg Ala Ile Val Gln Phe Ala
        195                 200                 205

Val Glu His Gln Ile Ser Val Ile Arg Leu Glu Gln Leu Ala Asn Ile
    210                 215                 220
```

```
Arg Gln Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Ser Ile His Met
225                 230                 235                 240


Trp Ser Phe Tyr Arg Leu Ser Gln Phe Ile Glu Tyr Lys Ala Lys Leu
                245                 250                 255


Ala Gly Val Lys Val Glu Tyr Val Asn Pro Ala His Thr Ser Arg Thr
            260                 265                 270


Cys Pro Lys Cys Ser Glu Lys Asn Lys Ala Gln Asp Arg Lys Tyr Ile
        275                 280                 285


Cys Ser Cys Gly Phe Glu Thr His Arg Asp Arg Val Gly Ala Met Asn
    290                 295                 300


Ile Arg Tyr Ala Pro Val Ile Asp Gly Asn Ser Gln Ser Ala
305                 310                 315


<210>  684
<211>  426
<212>  PRT
<213>  Halorubrum tropicale


<220>
<221>  misc_feature
<222>  (260)..(260)
<223>  Xaa can be any naturally occurring amino acid

<400>  684

Met Ala Lys Gln Val Val Thr Arg Thr His Thr Ala Ser Ile Gln Asn
1               5                   10                  15


Gln Ser Arg Val Gln Asp Asp Leu Asp Ser Leu Gly Phe Ala Ala Ser
            20                  25                  30


Lys Leu Trp Asn Val Gly Arg Trp Thr Cys Ser Arg Ile Trp Asp Glu
        35                  40                  45
```

```
Ile Asp His Ile Pro Asn His Thr Glu Leu Thr Thr Tyr Leu Lys Thr
    50                  55                  60

His Glu Arg Tyr Ala Asp Leu His Ser Gln Ser Ser Gln Arg Val Leu
65                  70                  75                  80

Gln Glu Leu Ala Glu Ala Phe Asn Gly Trp Tyr Gly Lys Arg Arg Asn
                85                  90                  95

Gly Asp Thr Arg Ala Asn Pro Pro Gly Tyr Arg Lys His Gly Asp Glu
            100                 105                 110

His Pro Arg Ser Thr Val Met Phe Lys Ala Ala Gly Phe Lys Leu Asp
        115                 120                 125

Thr Gln Tyr Asn Arg Val Arg Leu Ser Lys Gly Ser Asn Leu Lys Glu
    130                 135                 140

Tyr Trp Ser Asp Phe Ile Leu Cys Lys Tyr Gln Thr Arg Pro Asp Ile
145                 150                 155                 160

Asp Leu Ser Thr Val Glu Asn Val Gln Gln Val Arg Ala Val Trp Thr
                165                 170                 175

Gly Glu Lys Trp Glu Leu His Phe Val Cys Lys Val Glu Val Glu Val
            180                 185                 190

Ala Glu Ala Pro Gly Glu Lys Ala Val Gly Val Asp Leu Gly Ile Asn
        195                 200                 205

Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly His Ser Glu Leu Tyr Pro
    210                 215                 220

Leu Asn Cys Leu Lys Gln Asp Asx Tyr Tyr Phe Ser Lys Arg Ile Ala
225                 230                 235                 240

Arg Cys Asp Asp Ser Asn Ser Glu Gln Ala Thr Arg Leu Asn Gln Lys
                245                 250                 255
```

```
Lys Ser Ala Xaa Arg Thr His Tyr Phe His Thr Leu Ser Lys His Ile
            260                 265                 270

Val Glu Arg Cys Val Glu Gln Gly Val Gly Thr Ile Val Val Gly Asp
        275                 280                 285

Leu Ser Gly Ile Arg Glu Glu Asp Asp Ser Asp Glu Ser Lys Asn Trp
    290                 295                 300

Gly Lys His Gly Asn Leu Asp Leu His Ser Trp Ala Phe Asp Arg Phe
305                 310                 315                 320

Thr Asp Leu Leu Glu Tyr Lys Ala Glu Met Glu Gly Ile Thr Val Glu
                325                 330                 335

Glu Val Ser Glu Glu Asp Thr Ser Lys Ser Cys Ser Cys Cys Gly Arg
            340                 345                 350

Lys Arg Asp Ala Asn Arg Val Glu Arg Gly Leu Tyr Val Cys Asp Glu
        355                 360                 365

Cys Gly Thr Val Ala Asn Ala Asp Met Asn Gly Ala Glu Asn Ile Arg
    370                 375                 380

Gln Lys Val Ser Pro Ser Pro Ala Met Asp Gly Gly Asp Arg Ser Asn
385                 390                 395                 400

Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu Phe Asp Lys Glu Thr Gly
                405                 410                 415

Ala Phe Ala Pro Gln Glu Arg Ala Thr Trp
            420                 425
```

<210> 685
<211> 360
<212> PRT
<213> Bacillus pseudomycoides

<400> 685

```
Met Ser Gln Thr Ile Thr Val Lys Val Lys Leu Val Pro Thr Lys Glu
1               5                  10                  15

Gln Val Lys Leu Leu Glu Glu Ser Gly His Glu Tyr Ile Lys Val Ile
            20                  25                  30

Asn Ala Leu Val Ser Glu Met Val Glu Ala Lys Lys Ser Thr Lys Lys
        35                  40                  45

Ser Thr Lys Asp Ile Glu Ala Asn Ile Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Ser Thr Lys Val Lys Lys Ser
65                  70                  75                  80

Lys Tyr Lys Ile Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn
                85                  90                  95

Asn Gln Asn Tyr Ser Phe Asp Phe Ala His Ile Ser Ile Pro Phe Met
            100                 105                 110

Val Lys Gly Lys Ser Thr Arg Leu Lys Ile Arg Ala Leu Leu Ala Asp
        115                 120                 125

Lys Asn Asn Arg Asn Phe Asp Leu Leu Lys His His Lys Leu Gly Thr
    130                 135                 140

Leu Arg Ile Met Lys Lys Ser His Lys Trp Val Ala Gln Ile Ser Val
145                 150                 155                 160

Thr Ile Pro Thr Asn Glu Asn Thr Gly Thr Gln Ile Met Gly Val Asp
                165                 170                 175

Leu Gly Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Lys Val
            180                 185                 190
```

```
Arg Phe Phe Gly Asn Gly Arg Gln Asn Lys Tyr Ile Lys Arg Lys Phe
        195                 200                 205

Arg Ser Val Arg Lys Lys Leu Gly Glu Gln Lys Lys Leu Asn Ala Ile
    210                 215                 220

Arg Asn Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His
225                 230                 235                 240

Lys Val Ser Arg Ala Ile Ile Asn Phe Ala Lys Glu Asn Asn Ile Ser
                245                 250                 255

Val Ile Arg Leu Glu Gln Leu Thr Asn Ile Arg Gln Thr Ala Arg Thr
            260                 265                 270

Ser Arg Lys Asn Glu Lys Asn Leu His Ser Trp Ser Phe Tyr Arg Leu
        275                 280                 285

Ser Gln Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu
    290                 295                 300

Phe Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Val Cys Ser Glu
305                 310                 315                 320

Gln Asn Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu
                325                 330                 335

Lys His Arg Asp Ile Val Gly Ala Met Asn Ile Arg Tyr Val Thr Val
            340                 345                 350

Ile Asp Gly Asn Ser Gln Ser Ala
        355                 360
```

<210> 686
<211> 393
<212> PRT
<213> Thermococcus litoralis DSM 5473

<220>
<221> misc_feature
<222> (175)..(178)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (208)..(208)
<223> Xaa can be any naturally occurring amino acid

<400> 686

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15


Ile Pro Asn Gly Leu Asp Val Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30


Asn Tyr Leu Ile Gly Tyr Ala Phe Glu Asn Asn Val Thr Ser Phe Tyr
        35                  40                  45


Lys Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Asp
    50                  55                  60


Leu Pro Ser His Tyr His Tyr Thr Ala Thr Gln Met Ala Thr Met Ile
65                  70                  75                  80


Tyr Lys Ser Tyr Arg Lys Arg Arg Lys Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95


Pro Val Phe Lys Lys Asp Ala Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Lys Ala Gly Val Ile Lys Leu Ser Thr Pro Met Gly Lys
        115                 120                 125


Ile Lys Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Gly Asp
    130                 135                 140


Trp Lys Ile Gly Gln Ala Trp Leu Val Arg Thr Gln Lys Gly Val Phe
```

```
145                 150                 155                 160

Ile Asn Val Val Phe Ser Arg Glu Val Glu Val Arg Glu Pro Xaa Xaa
                165                 170                 175

Xaa Xaa Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Lys Asp Ile Arg Xaa
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Arg Thr Gly
    210                 215                 220

Lys Lys Arg Glu Glu Leu Leu Glu Lys Tyr Gly Arg Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Arg Val Val Phe Val Asn Pro Ala Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Lys Gly His Arg Val Leu Lys
                325                 330                 335

Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Ile Gly Ser Trp
            340                 345                 350
```

Asn Ile Ser Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355   360   365

Glu Ser Gln Pro Met Lys Met Gly Gly Trp Lys Val Ile Arg Tyr Asp
    370   375   380

Ser Phe Met Cys Phe Lys Ser Gly Gly
385   390

<210> 687
<211> 355
<212> PRT
<213> Nitrosopumilales archaeon CG_4_9_14_0_8_um_filter_34_10

<400> 687

Met Ile Leu Thr Tyr Asn Ile Lys His Glu Arg Asp Phe Ser Ser Glu
1   5   10   15

Leu Ile Gln Ala Lys Lys Ile Ala Asp Phe Ala Ile Arg Thr Lys Ser
            20   25   30

Asn Ser Ser Lys Asp Val Arg His Leu Gly Leu Lys Ser Ala Ile Ala
        35   40   45

Asn Gln Ile Leu Arg Lys Tyr Arg Lys Ser Gly Ile Lys Lys Thr Ser
    50   55   60

Ser Val Asn Leu Thr Val Pro Gly Gln Ser Val Lys Phe Asp Asn Thr
65   70   75   80

Glu Lys Leu Ala Lys Ile Ser Cys Leu Asn Leu Glu Leu Asp Cys Met
                85   90   95

Tyr Leu Pro Glu Phe Lys Lys Ile Arg Gln Ile Glu Ile Gly Lys Thr
            100   105   110

Leu Ala His Val Ser Val Glu Ile Ser Glu Pro Glu Thr Arg Ala Ser
        115   120   125

```
Glu Lys Phe Ile Gly Ile Asp Cys Asn Thr Thr Gly His Ala Ala Val
    130                 135                 140

Ile Ala Ile Pro His Thr Gly Lys Ile His Lys Leu Gly Lys Ser Ala
145                 150                 155                 160

Ile His Thr His Thr Lys Tyr Lys Gln Ile Arg Lys Lys Leu Gln Lys
                165                 170                 175

Lys Gly Lys Phe Ser Leu Leu Lys Lys Ile Lys Asp Lys Glu Ser His
            180                 185                 190

Ile Leu Lys Asn Ile Asn His His Ile Ser Lys Lys Ile Ile Gln Ile
        195                 200                 205

Ala Val Ser Glu Lys Ser Gly Ile Arg Phe Glu Asp Leu Lys Gly Ile
    210                 215                 220

Arg Lys Asn Lys Lys Tyr Ser Arg Lys Phe Arg Tyr Ser Leu Asn Ser
225                 230                 235                 240

Trp Ser Tyr Tyr Gln Leu Gln Gln Phe Thr Gln Tyr Lys Ala Lys Lys
                245                 250                 255

Gln Gly Ile Glu Val Ala Tyr Val Ala Pro Ala Tyr Thr Ser Gln Thr
            260                 265                 270

Cys Ser Arg Cys Gly Ser Leu Gly Asp Arg Asp Gly Lys Lys Phe Gln
        275                 280                 285

Cys Val Cys Gly His Ala Asp His Ala Asp Val Asn Ala Ser Phe Asn
    290                 295                 300

Ile Gly Lys Pro Val Ser His Cys Leu Ile Asp Pro Thr Arg Ile Lys
305                 310                 315                 320
```

Ser Lys Ser Gln Leu His Lys Glu Ser Asp Leu Cys Lys Gly Ser Thr
325 330 335

Asp Thr Pro Gln Thr Ala Met Ser Glu Met Met Ile Thr Val Glu Pro
340 345 350

Met Lys Leu
355

<210> 688
<211> 371
<212> PRT
<213> Halobacillus hunanensis

<400> 688

Met Ala Thr Lys Thr Ile Leu Val Lys Leu Lys His Val Thr Lys Lys
1 5 10 15

Lys His Lys Gln Phe Met Asp Glu Gln Ala Val Tyr Ala Ser Cys Val
20 25 30

Asn His Cys Val Glu Arg Leu Leu Asn Gly Glu Lys Leu Ser Ser Glu
35 40 45

Asn Ile Ser Phe Pro Leu Lys Ser Ala Ile Arg Asn Glu Gly Ile Arg
50 55 60

Arg Ala Arg Lys Ala Val Ser Asp Phe Lys Lys Gly Leu Ala Lys Thr
65 70 75 80

Ile Pro Val Phe Arg Asn Ser Leu Thr Ile Lys Ile Asn Asn Gln Asn
85 90 95

Trp Asn Thr Val Asp Gln Asn Gly Arg Trp Tyr Ile Ala Phe Thr Ser
100 105 110

Asn Gln Gly Lys Lys Ala Leu Pro Val Val Glu Thr Lys Asp Val Gln
115 120 125

```
Ser Tyr Phe Pro Phe Leu Thr Thr Lys Thr Arg Glu Phe Arg Gly Thr
    130                 135                 140

Ile Glu Leu Leu Arg Lys Gly Arg Arg Trp Tyr Val Ala Ile Pro Ile
145                 150                 155                 160

Gln Val Ser Ser Asp Leu Asp Leu Glu Asn Ser His Pro Ser Val Thr
                165                 170                 175

Lys Pro Leu Met Asp Tyr Thr Ser Ile Gly Val Asp Leu Gly Leu Arg
            180                 185                 190

His Leu Val Val Leu Ser Glu Pro Thr Ser Gly Lys Arg Gln Phe Phe
        195                 200                 205

Ser Gly Lys Glu Val Gly Tyr Lys Arg Arg His Phe Arg Ser Leu Arg
    210                 215                 220

Arg Ser Leu Gly Lys Lys Lys Ala Gln Arg Ala Met Glu Arg Val Gly
225                 230                 235                 240

Gln Lys Glu Ser Arg Trp Met Lys Asp Tyr Asn Arg Lys Leu Ala Lys
                245                 250                 255

Asp Ile Val Thr Phe Ala Gln Gln Phe Glu Lys Pro Met Ile Lys Leu
            260                 265                 270

Glu Gln Leu Asp Asn Ile Arg Lys Thr Cys Arg Ser Met Asn Arg Ala
        275                 280                 285

Asp Lys Thr Ile His Ser Trp Ala Phe Tyr Gln Leu Lys Gln Cys Ile
    290                 295                 300

Lys Glu Arg Ala Ala Thr Phe Asn Ile Pro Val Val Asp Ile Asp Pro
305                 310                 315                 320

His Gln Thr Ser Gln Thr Cys Phe Ala Cys Lys His Ala Glu Arg Ser
```

```
                325                 330                 335

Asn Arg Lys Arg Asp Phe Phe Thr Cys Lys Lys Cys Gly His Lys Ala
            340                 345                 350

His Ala Asp Leu Asn Ala Ser Arg Asn Ile Ala Thr Ser Thr Asn Leu
        355                 360                 365

Ala Ala Ser
    370
```

<210> 689
<211> 407
<212> PRT
<213> Halomonas sp. GFAJ-1

<400> 689

```
Met Thr Val Ala Tyr Thr His Trp Pro Thr Val Gly Ala Ser Gln Gly
1               5                   10                  15

Asn Gln Ala Val Lys Ile Ile Glu Ala Leu Ile His Pro Thr Ala Lys
            20                  25                  30

Arg Pro Gln Val Arg Tyr Thr Tyr Phe Ala Asn Arg Tyr Tyr Lys Phe
        35                  40                  45

Pro Ser Tyr Leu Arg Arg Val Ala Ile Met Asp Ala Val Gly Gln Val
    50                  55                  60

Arg Ser Phe Val Thr Arg Phe Asp Gln Trp Arg Cys Gly Gln Arg Lys
65                  70                  75                  80

His Pro His Ala Lys Pro Pro Arg Leu Thr Ser Ser Thr Lys Thr Phe
                85                  90                  95

Pro Ser Leu Tyr Gly Ser Gln Cys Ala Lys Ile Asn Ala Asp Ala Thr
            100                 105                 110
```

```
His Ala Phe Ile Lys Val Arg Trp Gln Asn Asp Trp Ile Trp Met Arg
        115                 120                 125

Phe Gly Leu Lys Gly Thr Cys Arg Phe Arg Gly Lys Gly Lys Ala Lys
    130                 135                 140

Ser Pro Leu Leu Thr Thr Asn Gly Arg Gln Trp Gln Leu Ser Leu Pro
145                 150                 155                 160

Glu Gln Phe Glu Pro Pro Lys Pro Val Lys Gly Ala Pro Asp Arg Val
                165                 170                 175

Leu Ala Val Asp Val Gly Ile Asn Thr Ala Ala Thr Trp Ala Val Val
            180                 185                 190

Asp Thr Gln Gly Thr Val His Ala Arg Gly Phe Ile Ser Arg Thr Asp
        195                 200                 205

Lys Asp Arg Glu Tyr Arg Leu Met Ala Arg Ile Arg Gln Thr Ala Lys
    210                 215                 220

Lys His Thr Arg His Gly Ser Arg Leu Pro Pro Gly Phe Cys Arg Arg
225                 230                 235                 240

Asp His Gln Arg Leu Ser His Leu Ala Asp Asn Gln Ala His Gln Ile
                245                 250                 255

Ser Arg Gln Leu Val Asn Leu Ala Val Asp His His Cys Gln Ala Ile
            260                 265                 270

Ala Val Glu Asn Leu Lys Gly Trp Arg Pro Lys Ala Gly Gln Lys Arg
        275                 280                 285

Thr Pro Met Lys Ala Arg Phe His Arg Trp Phe His Arg Gln Leu Val
    290                 295                 300

Ala Arg Ile Gly Ser Lys Ala Val Glu Val Gly Leu Arg Cys Val Ala
305                 310                 315                 320
```

```
Val Tyr Ala Arg Gly Thr Ser Arg His Ala Phe Asp Gly Ser Gly Gln
                325                 330                 335


Val Lys Arg Asp Lys Ser Asn Tyr Ser Gln Cys Thr Phe Arg Ser Gly
            340                 345                 350


Lys Arg Tyr His Ala Asp Leu Asn Ala Ala Tyr Asn Ile Ala Ala Arg
        355                 360                 365


Gly His Val Val Phe Gln Gly Gly Gln Arg Lys Pro Thr Ala Arg Val
    370                 375                 380


Arg Ser Gln Met Ser Thr His Ile Pro Arg Thr Pro Val Thr Leu Ser
385                 390                 395                 400


Thr Leu Trp Pro Gln Ser Ala
                405
```

<210> 690
<211> 380
<212> PRT
<213> Thermoactinospora rubra

<400> 690

```
Met Arg Leu Val Val Gln Val Lys Pro Leu Pro Thr Pro Glu Gln Ala
1               5                   10                  15


Ala Ala Leu Glu Ala Thr Leu His Thr Val Asn Arg Ala Ala Thr Leu
            20                  25                  30


Val Ala Arg Ile Ala His Gln Gln Arg Cys Phe Arg Asn Phe Asp Leu
        35                  40                  45


Arg Lys His Ala Tyr Ala Arg Ile Lys Ala Glu Phe Gly Leu Ala Ala
    50                  55                  60


Gln Ala Ala Gln His Val Ile Lys Lys Val Ala Asp Ala Tyr Arg Thr
```

```
65                  70                  75                  80

Leu His Ala Asn Leu Ala Val Gly Asn Leu Gly Lys Pro Gly Ser Arg
                85                  90                  95

Arg Arg Arg Ala Ala Glu Thr Arg Pro Ile Val Phe Arg Ser Arg Ala
            100                 105                 110

Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln His Ala Thr Arg
        115                 120                 125

Thr Val Ser Ile Trp Thr Val Ala Gly Arg Leu Lys Ala Val Ala Phe
    130                 135                 140

Thr Gly Ser Ala Arg Gln Leu Ala Leu Leu Ala Glu His Arg Arg Gly
145                 150                 155                 160

Glu Ser Asp Leu Ile Trp Arg Glu Gly Ala Trp Tyr Leu Tyr Ala Thr
                165                 170                 175

Val Glu Val Pro Asp Arg Pro Val Ala Ala Pro Asp Gly Phe Ala Gly
            180                 185                 190

Val Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Asp Gly Ile Arg
        195                 200                 205

His Ser Gly Lys His Leu Asn Ala Leu Arg His Arg His Arg Glu Leu
    210                 215                 220

Arg Arg Arg Leu Gln Ala Lys Lys Thr Lys Ser Ala Lys Arg Leu Leu
225                 230                 235                 240

Lys Arg Arg Arg Arg Lys Glu Ala Arg Leu Ala Ala Gln Val Asp His
                245                 250                 255

Ala Ile Ala Lys Gln Ile Val Thr Glu Ala Glu Arg Thr Gly Arg Gly
            260                 265                 270
```

```
Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Glu Arg Val Arg Leu Arg
        275                 280                 285

Lys Pro Gln Arg Val Thr Leu His Ser Trp Ser Phe His Gln Leu Gly
    290                 295                 300

Ala Phe Ile Thr Ser Lys Ala Ala Arg Ala Gly Val Ala Val Ile Phe
305                 310                 315                 320

Val Lys Ala Ala Tyr Thr Ser Gln Glu Cys Ser Ala Cys His His Ile
                325                 330                 335

Asp Lys Arg Asn Arg Pro Asp Gln Ala Thr Phe Ser Cys Thr Ser Cys
            340                 345                 350

Gly Phe Ala Glu His Ala Asp Val Asn Ala Ala Arg Thr Ile Ala Ser
        355                 360                 365

Arg Gly Glu Thr Gly Trp Ala Val Ser His Ala Ala
    370                 375                 380
```

<210> 691
<211> 391
<212> PRT
<213> Sutterella wadsworthensis

<400> 691

```
Met Ser Val Arg Lys Pro Ser Gly Ile Thr Leu Lys Gly Leu Asn Ile
1               5                   10                  15

Ser Lys Gly Ala Gly Lys Leu Val Arg Arg Lys Val Asp Val Arg Thr
            20                  25                  30

Val Cys Ile Ala Leu Glu Val Asp Ala Asp Ala Ser Glu Lys Met His
        35                  40                  45

Gln Thr Arg Arg Leu Tyr Gly Gln Ala Cys Asn Leu Leu Val Pro Ile
    50                  55                  60
```

```
Val Val Ser Asp Thr Asp Arg Lys Lys Arg Leu Trp Gln Arg Tyr Asn
65                  70                  75                  80

Leu His Lys Ala Ala Tyr Pro Met Val Arg Thr Lys Met Ser Val Leu
                85                  90                  95

Gly Ala Gln Leu Ala Cys Asn Val Met Arg Ser Val Ser Ser Met Tyr
            100                 105                 110

Gln Ser Trp Ile Ser Asn His Pro Asn Phe Ser Lys Asp Lys Lys Met
        115                 120                 125

Val Leu Pro Ser Ile Ser Phe Arg Asn Pro Val Val His Leu Asp Lys
    130                 135                 140

Asn Thr Ile Arg Phe Phe Asn Asn Tyr Thr Glu Ala Ser Val Tyr Thr
145                 150                 155                 160

Val Asn Gly Arg Val Gly Val Arg Leu Arg Pro Gly Lys Phe Gln Leu
                165                 170                 175

Ser Gln Leu Ala Gly Phe Leu Ala Glu Glu Leu Ala Gly Thr Ser Lys
            180                 185                 190

Glu Asn Arg Ile Tyr Arg Leu Gly Glu Cys Asn Leu Val Trp Lys Cys
        195                 200                 205

Gly Ile Lys Gly Thr Pro Ser Arg Trp Glu Leu His Ile Ala Ile Glu
    210                 215                 220

Lys Lys Leu Lys Glu Val Ser Leu Asp Asn Leu Ser Leu Asn Gln Val
225                 230                 235                 240

Met Gly Val Asp Val Gly Glu Asn Asn Ala Ala Ala Leu Ser Thr Gly
                245                 250                 255
```

```
Arg Ile Phe Lys Ala Gly Lys Met Lys Asp Asp Arg Asp Lys Tyr Leu
            260                 265                 270

Ser Ser Arg Ala Arg Phe Gln Arg Asn Gly Ser Arg Ser Ala Arg Gln
        275                 280                 285

Ala Leu Arg Lys Ala Ser Gly Arg Glu Lys Arg His Val Glu Gln Ile
    290                 295                 300

Asn Asp Glu Ile Ser Lys Ser Ile Ile Glu Asp Ala Ala Glu Arg Asn
305                 310                 315                 320

Ile Arg Leu Ile Val Leu Glu Asp Leu Thr Asn Ile Arg Glu Arg Ile
                325                 330                 335

Lys Ala Gly Leu Lys Val Arg Ala Arg Leu His Arg Trp Pro Phe Arg
            340                 345                 350

Glu Leu Gln Gln Lys Ile Val Asp Lys Ala Cys Arg Ala Gly Ile Glu
        355                 360                 365

Val Ile Phe Ala Asp Pro Arg Tyr Thr Ser Gln Thr Cys Pro His Cys
    370                 375                 380

Asn Ala Ile Gly Arg Ser Ala
385                 390
```

<210> 692
<211> 393
<212> PRT
<213> Pyrococcus kukulkanii

<400> 692

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Lys
1               5                   10                  15

Thr Pro Lys Gly Leu Asp Asp Leu Phe Ser Ala Tyr Arg Glu Ile Val
            20                  25                  30
```

```
Asn Phe Leu Ile Thr Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Gly Thr Tyr Lys Glu Leu Arg Lys Lys Tyr Pro Gln
    50                  55                  60

Leu Pro Ser His Tyr Ile Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile
65                  70                  75                  80

Phe Lys Ser Tyr Arg Lys Arg Lys Arg Lys Gly Lys Ala Asn Glu Lys
                85                  90                  95

Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Arg
            100                 105                 110

Leu Asp Leu Glu Lys Gly Val Ile Lys Leu Ser Thr Pro Lys Gly Trp
        115                 120                 125

Leu Asn Leu Lys Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Asp
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Lys Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Lys Glu Val Glu Ile Arg Glu Pro Lys Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ala Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Val Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Arg Ile Gln Lys Lys Ile Arg Thr Gly
    210                 215                 220

Lys Arg Arg Lys Glu Leu Leu Gln Lys Tyr Gly Glu Arg Glu Lys Asn
```

225 230 235 240

Arg Leu Asn Asp Leu Tyr His Lys Ile Ala Asn Ile Ile Val Gly Phe
245 250 255

Ala Glu Arg Tyr Gly Gly Ile Ala Leu Glu Asp Leu Ser Gly Ile Arg
260 265 270

Gly Ser Ile Arg Tyr Ser Val Glu Leu Asn Gly Arg Leu His Arg Trp
275 280 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
290 295 300

Gly Val Arg Val Val Phe Val Asn Pro Ala His Thr Ser Ser Leu Cys
305 310 315 320

Pro Ile Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
325 330 335

Cys Lys Lys Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
340 345 350

Asn Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
355 360 365

Glu Ser Pro Pro Met Lys Thr Gly Gly Gly Lys Pro Thr Arg Tyr Glu
370 375 380

Ile Asn Thr Leu His Thr Leu Asn Gly
385 390

<210> 693
<211> 165
<212> PRT
<213> Sharpea azabuensis

<400> 693

```
Arg Lys Asn Lys Tyr Met Arg Arg His Tyr Arg Cys Leu Arg Lys Lys
1               5                   10                  15

Leu Gln Lys Ala Lys His Ile Asp Ala Val Lys Arg Ile Asn Asp Lys
            20                  25                  30

Glu Gln Arg Ile Met Lys Asp Ile Asp His Lys Leu Ser His Asp Val
        35                  40                  45

Val Glu Thr Ala Val Ala His Asn Val Lys Thr Ile Lys Leu Glu Arg
    50                  55                  60

Leu Ala Asn Ile Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn His
65                  70                  75                  80

Ser Leu His Asn Trp Ser Phe Tyr Arg Leu Ala Gln Phe Ile Glu Tyr
                85                  90                  95

Lys Ala Lys Leu Ala Gly Ile Ala Val Glu His Val Asn Pro Ala Tyr
            100                 105                 110

Thr Ser Gln Thr Cys Pro Val Cys Ser His Val His His Ala Asn Asp
        115                 120                 125

Arg Asn Tyr Thr Cys Lys Cys Gly Phe His Ile His Arg Asp Ile Leu
    130                 135                 140

Gly Ala Met Asn Ile Cys Asn Ser Thr Glu Tyr Val Gly Asp Ser Asn
145                 150                 155                 160

Ile Arg His Thr Ala
                165
```

<210> 694
<211> 427
<212> PRT
<213> Sutterella sp. KLE1602

<400> 694

```
Met Ser Val Arg Lys Pro Ser Gly Ile Thr Leu Lys Gly Leu Asn Ile
1               5                  10                  15

Ser Lys Gly Ala Gly Lys Leu Val Arg Arg Lys Val Asp Val Arg Thr
            20                  25                  30

Val Cys Ile Ala Leu Glu Val Asp Ala Asp Ala Ser Glu Lys Met His
        35                  40                  45

Gln Thr Arg Arg Leu Tyr Gly Gln Ala Cys Asn Leu Leu Val Pro Ile
    50                  55                  60

Val Val Ser Asp Thr Asp Arg Lys Lys Arg Leu Trp Gln Arg Tyr Asn
65                  70                  75                  80

Leu His Lys Ala Ala Tyr Pro Met Val Arg Thr Lys Met Ser Val Leu
                85                  90                  95

Gly Ala Gln Leu Ala Cys Asn Val Met Arg Ser Val Ser Ser Met Tyr
            100                 105                 110

Gln Ser Trp Ile Ser Asn His Pro Asn Phe Ser Lys Asp Lys Lys Met
        115                 120                 125

Val Leu Pro Ser Ile Ser Phe Arg Asn Pro Val Val His Leu Asp Lys
    130                 135                 140

Asn Thr Ile Arg Phe Phe Asn Asn Tyr Thr Glu Ala Ser Val Tyr Thr
145                 150                 155                 160

Val Asn Gly Arg Val Gly Val Arg Leu Arg Pro Gly Lys Phe Gln Leu
                165                 170                 175

Ser Gln Leu Ala Gly Phe Leu Ala Glu Glu Leu Ala Gly Thr Ser Lys
            180                 185                 190

Glu Asn Arg Ile Tyr Arg Leu Gly Glu Cys Asn Leu Val Trp Lys Cys
```

```
        195                 200                 205

Gly Ile Lys Gly Thr Pro Ser Arg Trp Glu Leu His Ile Ala Ile Glu
    210                 215                 220

Lys Lys Leu Glu Glu Val Ser Leu Asp Asn Leu Ser Leu Asn Gln Val
225                 230                 235                 240

Met Gly Val Asp Val Gly Glu Asn Asn Ala Ala Ala Leu Ser Thr Gly
                245                 250                 255

Arg Ile Phe Lys Ala Gly Lys Met Lys Asp Asp Arg Asp Lys Tyr Leu
            260                 265                 270

Ser Ser Arg Ala Arg Phe Gln Arg Asn Gly Ser Arg Ser Ala Arg Gln
        275                 280                 285

Ala Leu Arg Lys Ala Ser Gly Arg Glu Lys Arg His Val Glu Gln Ile
    290                 295                 300

Asn Asp Glu Ile Ser Lys Ser Ile Ile Glu Asp Ala Ala Glu Arg Asn
305                 310                 315                 320

Ile Arg Leu Ile Val Leu Glu Asp Leu Thr Asp Ile Arg Glu Arg Ile
                325                 330                 335

Lys Ala Gly Gln Lys Val Arg Ala Arg Leu His Arg Trp Pro Phe Arg
            340                 345                 350

Glu Leu Gln Gln Lys Ile Val Asp Lys Ala Cys Arg Ala Gly Ile Glu
        355                 360                 365

Val Ile Phe Val Asp Pro Arg Tyr Thr Ser Gln Thr Cys Pro His Cys
    370                 375                 380

Asn Ala Ile Gly Thr Arg Gln Lys His Arg Phe Val Cys Lys Asn Cys
385                 390                 395                 400
```

```
Gly Tyr Arg Ala His Ser Asp Leu Asn Gly Gly Arg Asn Leu Gln Arg
                405                 410                 415


Leu Gly Cys Leu Leu Ile Thr Gln Gly Leu Val
            420                 425


<210>  695
<211>  361
<212>  PRT
<213>  Armatimonadetes bacterium 13_1_40CM_64_14

<400>  695

Met Asn Gln Val Glu Thr Val Arg Leu His Pro Pro Asp Pro Ala Gln
1               5                   10                  15


Leu Ile Ala Trp Leu Glu Arg Phe Asn Ala Ala Thr Asn Trp Leu Ser
            20                  25                  30


Gly Val Ala Phe Arg Glu Arg Leu Trp His Trp Leu Pro Leu Gln Arg
        35                  40                  45


Arg Ala Tyr Arg Glu Val Arg Glu Arg Phe Gln Leu Pro Ser Ala Ala
    50                  55                  60


Thr Val Val Val Ile Arg Lys Val Ala Tyr Ala Tyr Arg Asn Thr Gln
65                  70                  75                  80


Arg Arg Gln His Gln Ala Thr Phe Arg Arg Arg Gly Ala Ile Pro Val
                85                  90                  95


Tyr Arg His Gln Tyr Lys Arg Asp Gly Thr Val Ser Leu Tyr Gly Phe
            100                 105                 110


Arg Ile Pro Phe Thr Ala Arg Pro Arg Val Glu Leu Ser Ser Arg His
        115                 120                 125


Gln Ala Val Leu Cys Tyr Arg Arg Gly Lys Phe Val Leu His Gln Val
    130                 135                 140
```

```
Val Glu Val Asp Val Pro Ala Pro Ala Pro Val Gln Asp Tyr Leu Gly
145                 150                 155                 160

Cys Asp Leu Gly Thr Thr Asn Leu Leu Thr Asp Ser Glu Glu Glu Ala
                165                 170                 175

Tyr Ser Gly Arg Ala Val Glu Glu Lys Arg Arg Ile Tyr Val His Arg
            180                 185                 190

Arg Ala Arg Leu Gln Lys Arg Gly Thr Arg Ala Ala Arg Arg Lys Leu
        195                 200                 205

Arg Lys Ile Ser Gly Arg Gln Arg Arg Tyr Gln Arg Asp Val Asn His
    210                 215                 220

Gly Ile Ala Lys Arg Val Val Ala Lys Ala Gln Arg Leu Cys Cys Gly
225                 230                 235                 240

Ile Ala Leu Glu Asp Leu Arg Gly Ile Arg Asp Arg Ile Lys Ala Arg
                245                 250                 255

Arg Arg Gln Arg Ala Arg Leu His Asn Trp Ala Phe Gly Gln Leu Arg
            260                 265                 270

Gln Phe Ile Val Tyr Lys Ala Ala Gln Ala Gly Val Pro Val Val Phe
        275                 280                 285

Val Asp Pro Ala Asn Thr Ser Arg Thr Cys Pro Val Cys Gly His Val
    290                 295                 300

Asp Lys Arg Asn Arg Arg Ser Gln Ala Glu Phe Asn Cys Arg Arg Cys
305                 310                 315                 320

Gly His Ala Gly Pro Ala Asp Val Ile Ala Ala Arg Asn Ile Arg Ala
                325                 330                 335
```

Trp Ala Arg Gly Asp Ala Pro Met Val Ala Ser Ala Arg Ala Ala Thr
340 345 350

Ser Pro Pro Pro Tyr Val Glu Gly Gly
355 360

<210> 696
<211> 374
<212> PRT
<213> Methylobacter sp.

<400> 696

Met Lys Arg Thr Ile Ser Ile Lys Leu Asp Pro Thr Thr Glu Gln Ser
1 5 10 15

Ala Leu Leu Asp Ala Leu Gln Ala Glu Phe Ala Arg Ala Cys Asn Ile
20 25 30

Val Val Gly Phe Ser Ala Pro Val Lys Cys Ser Asn Arg Val Ala Leu
35 40 45

His His Leu Cys Tyr Tyr Gln Val Arg Glu Gln Val Pro Ala Leu Gly
50 55 60

Ser Gln Met Val Cys Asn Ala Ile Ala Asn Val Ala Gln Ser Tyr Lys
65 70 75 80

Ser Leu Val Ala Asn Glu Pro Lys Leu Arg Lys Glu Glu Trp Pro Val
85 90 95

Ile Asn Phe Arg Gln Thr Ala Ser Val His Phe Asp Lys Arg Thr Tyr
100 105 110

Ser Phe Lys Asn Asp Thr Leu Ser Leu Phe Thr Leu Asp Gly Arg Ile
115 120 125

Ala Val Asn Tyr Ile Phe Gly Lys His Gln Ala Asn Leu Leu Asn Ser
130 135 140

```
Gly Leu Thr Lys Glu Ala Glu Leu Leu Lys Arg Lys Gly Gln Trp Tyr
145                 150                 155                 160

Phe Asn Leu Val Ile Asp Ile Pro Asp Ala Ala Pro Ser Thr Gly Asn
                165                 170                 175

Gly Ser Met Gly Val Asp Val Gly Glu Asn Asn Ile Ala Ala Thr Ser
            180                 185                 190

Thr Gly Lys Val Phe Gly Gly Gly Glu Leu Arg His Lys Arg Asp Lys
        195                 200                 205

Phe Leu Ala His Arg Lys Arg Leu Gln Arg Asn Gly Ser Asn Ser Ala
    210                 215                 220

Lys Gln Leu Leu Lys Lys Ile Ser Gly Lys Glu Val Ala His Val Lys
225                 230                 235                 240

His Val Asn His Glu Ile Ser Lys Ala Ile Val Gln Glu Ala Ile Ala
                245                 250                 255

Ala Asn Ala Ser Glu Ile Arg Leu Glu Asp Leu Thr Asn Ile Arg Asp
            260                 265                 270

Asn Ile Lys Ala Gly Arg Arg Val Arg Thr Arg Leu His Arg Trp Ser
        275                 280                 285

Phe Arg Gln Leu Gln Asp Phe Val Ala Tyr Lys Ala Gln Ala Val Gly
    290                 295                 300

Ile Glu Ile Lys Tyr Ile Asn Pro Ala Tyr Thr Ser Lys Ser Cys Ser
305                 310                 315                 320

Val Cys Asp Ala Ile Gly Thr Arg Val Lys His Lys Phe Ser Cys Lys
                325                 330                 335

Asn Cys Gly His Leu Ser His Ser Asp Val Asn Ala Ala Ser Asn Ile
```

```
            340                 345                 350

Ala Lys Phe Asp Arg Leu Phe Ser Pro Ser Arg Gly Val Val Ser Arg
        355                 360                 365

Pro Asn Val Glu Arg Phe
    370
```

<210> 697
<211> 295
<212> PRT
<213> Thermoactinospora rubra

<400> 697

```
Met Leu Lys Leu Ala Pro Asp Ala Glu Gln Ala Gln Ser Leu Leu Ala
1               5                   10                  15

Thr Met Arg Ala Cys Asn Ala Ala Ala Asn Arg Ala Ala Glu Val Ala
            20                  25                  30

Tyr Asp Gln Arg Ile Leu Thr Phe Lys Gly Arg Asp Trp Val Ser Ile
        35                  40                  45

Leu Thr Leu Thr Gly Arg Ile Leu Val Pro Val Ala Tyr Gln Gly Arg
    50                  55                  60

Trp Leu Ser Ala Ser Gly Thr Thr Met Arg Gly Gln Ala Asp Leu Val
65                  70                  75                  80

Cys Arg Asp Gly Thr Leu Tyr Leu Ala Val Val Ile Asp Val Pro Glu
                85                  90                  95

Pro Pro Lys Asp Gly Glu Pro Asp Gly Trp Leu Gly Val Asp Leu Gly
            100                 105                 110

Ile Val Asn Leu Ala Thr Asp Ser Thr Gly Gln Ala His Ser Gly Lys
        115                 120                 125
```

```
Ala Val Arg Ala Val Arg Tyr Arg Asn Leu Met Leu Arg Arg Arg Leu
    130                 135                 140

Gln Gln Lys Ala Thr Lys Ser Ala Lys Arg Leu Leu Lys Lys Arg Arg
145                 150                 155                 160

Arg Ala Glu Ala Arg Phe Ala Arg Asn Thr Asn His Val Ile Ser Lys
                165                 170                 175

His Leu Val Gly Lys Ala Gln Asp Thr Arg Ser Gly Ile Ala Leu Glu
            180                 185                 190

Asp Leu Gln Gly Ile Arg Asp Arg Val Thr Val Thr Arg Ala Gln Arg
        195                 200                 205

Ala Asp Leu His Ser Trp Gly Phe His Gln Leu Arg Ala Phe Ile Thr
    210                 215                 220

Tyr Lys Ala Ala Ile Ala Gly Val Pro Val Arg Leu Val Asp Pro Arg
225                 230                 235                 240

Asn Thr Ser Arg Thr Cys Pro Ala Cys Gly His Cys Ala Lys Arg Asn
                245                 250                 255

Arg Pro His Arg Asp Ser Phe Leu Cys Val Ala Cys Gly Phe Ala Gly
            260                 265                 270

Pro Ala Asp His Ile Ala Ala Ile Asn Ile Gly Arg Arg Ala Val Ser
        275                 280                 285

His Ala Ala Asp Asp Ala Ala
    290                 295
```

<210> 698
<211> 393
<212> PRT
<213> Thermococcus eurythermalis

<400> 698

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Gly
1               5                  10                  15

Thr Pro Asp Gly Leu Asp Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn Phe Leu Ile Thr His Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Gly Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr Leu Tyr Thr Gly Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80

Phe Lys Ser Phe Arg Lys Arg Lys Lys Lys Gly Lys Ala Arg Gly Arg
                85                  90                  95

Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Glu Asn Lys Thr Val Lys Leu Ser Thr Pro Ser Gly Arg
        115                 120                 125

Ile Gln Leu Glu Phe Tyr Pro Ala Arg Tyr His Glu Lys Phe Lys Asp
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Ser Lys Gly Val Phe
145                 150                 155                 160

Leu Asn Val Val Phe Ser Lys Glu Val Glu Val Lys Glu Pro Lys Ala
                165                 170                 175

Phe Val Gly Met Asp Leu Asn Glu Asn Asn Ile Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Leu Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
```

```
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Arg Lys Ile Arg Ser Gly
    210                 215                 220

Lys Arg Arg Lys Lys Leu Leu Glu Lys Tyr Gly Glu Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Val
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Glu Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Lys Val Val Phe Val Asn Pro Ala His Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Ile Gly Ser Trp
            340                 345                 350

Asn Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser Pro Thr Met Lys Thr Gly Val Gly Lys Val Ser Arg Asn Asp
    370                 375                 380

Val Tyr Glu Leu Tyr Thr Ser Tyr Gly
385                 390
```

<210> 699
<211> 358
<212> PRT
<213> Exiguobacterium sp. U13-1

<400> 699

```
Met Ser Gln Val Val Thr Val Glu Val Arg Ile Tyr Ala Thr Arg Arg
1               5                   10                  15


Gln Asp Ala Ile Leu Lys Arg Met Gly Lys Thr Tyr Ile Gln Thr Ala
            20                  25                  30


Asn Arg Val Val Ala Asn Met Val Ala Ser Glu Asp Gly Lys Arg Trp
        35                  40                  45


Ser Ser Lys Asp Ile Asp Thr Pro Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Leu Ala Gly Asp Ala Val Gly Ile Tyr Lys Lys Ala Arg Lys Glu Glu
65                  70                  75                  80


Phe Lys Arg Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile Ser Phe Pro Val Trp Met
            100                 105                 110


Asp Gly Lys Ser Val Lys Met Arg Phe Arg Ala Pro Met Val Asp Lys
        115                 120                 125


Asp Asn Arg Asn Thr Arg Leu Leu Ala Asn Lys Leu Gly Thr Leu Arg
    130                 135                 140


Val Thr Lys Lys Gly Arg Lys Trp Ile Ala Gln Ile Ser Val His Val
145                 150                 155                 160


Pro Thr Val Pro Arg Thr Gly Val Arg Met Met Gly Val Asp Leu Gly
                165                 170                 175
```

```
Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Thr Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met Lys Arg Lys Phe Arg Ala
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Pro Arg Ala Ile Lys Arg
    210                 215                 220

Arg Asn Gln Lys Glu Gln Arg Trp Met Arg Asp Lys Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asp Phe Ala Arg Gln Lys Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Asn Gln Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ala Ser
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys Ser Val Arg Asn
305                 310                 315                 320

Lys Val Arg Asp Arg Val Tyr Thr Cys Ala Cys Gly Phe Lys Gly His
                325                 330                 335

Arg Asp Ala Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Met Asp
            340                 345                 350

Gly Asn Ser Pro Ser Ala
        355
```

<210> 700
<211> 398
<212> PRT
<213> Sutterella sp. KLE1602

<400> 700

```
Met Arg Thr Val Cys Ile Ala Leu Glu Val Asp Ala Asp Ala Ser Glu
1               5                  10                  15


Lys Met His Gln Thr Arg Arg Leu Tyr Gly Gln Ala Cys Asn Leu Leu
            20                  25                  30


Val Pro Ile Val Val Ser Asp Thr Asp Arg Lys Lys Arg Leu Trp Gln
        35                  40                  45


Arg Tyr Asn Leu His Lys Ala Ala Tyr Pro Met Val Arg Thr Lys Met
    50                  55                  60


Ser Val Leu Gly Ala Gln Leu Ala Cys Asn Val Met Arg Ser Val Ser
65                  70                  75                  80


Ser Met Tyr Gln Ser Trp Ile Ser Asn His Pro Asn Phe Ser Lys Asp
                85                  90                  95


Lys Lys Met Val Leu Pro Ser Ile Ser Phe Arg Asn Pro Val Val His
            100                 105                 110


Leu Asp Lys Asn Thr Ile Arg Phe Phe Asn Asn Tyr Thr Glu Ala Ser
        115                 120                 125


Val Tyr Thr Val Asn Gly Arg Val Gly Val Arg Leu Arg Pro Gly Lys
    130                 135                 140


Phe Gln Leu Ser Gln Leu Ala Gly Phe Leu Ala Glu Glu Leu Ala Gly
145                 150                 155                 160


Thr Ser Lys Glu Asn Arg Ile Tyr Arg Leu Gly Glu Cys Asn Leu Val
                165                 170                 175
```

```
Trp Lys Cys Gly Ile Lys Gly Thr Pro Ser Arg Trp Glu Leu His Ile
            180                 185                 190

Ala Ile Glu Lys Lys Leu Glu Glu Val Ser Leu Asp Asn Leu Ser Leu
        195                 200                 205

Asn Gln Val Met Gly Val Asp Val Gly Glu Asn Asn Ala Ala Ala Leu
    210                 215                 220

Ser Thr Gly Arg Ile Phe Lys Ala Gly Lys Met Lys Asp Asp Arg Asp
225                 230                 235                 240

Lys Tyr Leu Ser Ser Arg Ala Arg Phe Gln Arg Asn Gly Ser Arg Ser
                245                 250                 255

Ala Arg Gln Ala Leu Arg Lys Ala Ser Gly Arg Glu Lys Arg His Val
            260                 265                 270

Glu Gln Ile Asn Asp Glu Ile Ser Lys Ser Ile Ile Glu Asp Ala Ala
        275                 280                 285

Glu Arg Asn Ile Arg Leu Ile Val Leu Glu Asp Leu Thr Asp Ile Arg
    290                 295                 300

Glu Arg Ile Lys Ala Gly Gln Lys Val Arg Ala Arg Leu His Arg Trp
305                 310                 315                 320

Pro Phe Arg Glu Leu Gln Gln Lys Ile Val Asp Lys Ala Cys Arg Ala
                325                 330                 335

Gly Ile Glu Val Ile Phe Val Asp Pro Arg Tyr Thr Ser Gln Thr Cys
            340                 345                 350

Pro His Cys Asn Ala Ile Gly Thr Arg Gln Lys His Arg Phe Val Cys
        355                 360                 365

Lys Asn Cys Gly Tyr Arg Ala His Ser Asp Leu Asn Gly Gly Arg Asn
```

370 375 380

Leu Gln Arg Leu Gly Cys Leu Leu Ile Thr Gln Gly Leu Val
385 390 395

<210> 701
<211> 129
<212> PRT
<213> Sharpea azabuensis

<400> 701

Met Lys Asp Ile Asp His Lys Leu Ser His Asp Val Val Glu Thr Ala
1 5 10 15

Val Ala His Asn Val Lys Thr Ile Lys Leu Glu Arg Leu Ala Asn Ile
20 25 30

Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn His Ser Leu His Asn
35 40 45

Trp Ser Phe Tyr Arg Leu Ala Gln Phe Ile Glu Tyr Lys Ala Lys Leu
50 55 60

Ala Gly Ile Ala Val Glu His Val Asn Pro Ala Tyr Thr Ser Gln Thr
65 70 75 80

Cys Pro Val Cys Gly His Val His His Ala Asn Asp Arg Asn Tyr Thr
85 90 95

Cys Lys Cys Gly Phe His Ile His Arg Asp Ile Leu Gly Ala Met Asn
100 105 110

Ile Cys Asn Ser Thr Glu Tyr Val Gly Asp Ser Asn Ile Arg His Thr
115 120 125

Ala

<210> 702
<211> 132
<212> PRT
<213> Sharpea azabuensis

<400> 702

Gln Arg Ile Met Lys Asp Ile Asp His Lys Leu Ser His Asp Val Val
1 5 10 15

Glu Thr Ala Val Ala His Asn Val Lys Thr Ile Lys Leu Glu Arg Leu
20 25 30

Ala Asn Ile Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn His Ser
35 40 45

Leu His Asn Trp Ser Phe Tyr Arg Leu Ala Gln Phe Ile Glu Tyr Lys
50 55 60

Ala Lys Leu Ala Gly Ile Ala Val Glu His Val Asn Pro Ala Tyr Thr
65 70 75 80

Ser Gln Thr Cys Pro Val Cys Gly His Val His His Ala Asn Asp Arg
85 90 95

Asn Tyr Thr Cys Lys Cys Gly Phe His Ile His Arg Asp Ile Leu Gly
100 105 110

Ala Met Asn Ile Cys Asn Ser Thr Glu Tyr Val Gly Asp Ser Asn Ile
115 120 125

Arg His Thr Ala
130

<210> 703
<211> 208
<212> PRT
<213> Peptococcaceae bacterium CEB3

<400> 703

```
Met Gly Val Asp Leu Gly Leu Ile Asp Leu Ala Val Ala Ser Ile Leu
1               5                  10                  15

Gly Ser Thr Leu Phe Phe Ser Gly Ala Glu Leu Ala Tyr Ile Arg Arg
            20                  25                  30

His Tyr Ala Glu Leu Arg Lys Lys Leu Gln Lys Lys Gly Ala His Lys
        35                  40                  45

Ala Leu Arg Lys Leu Gly Asn Lys Glu His Arg Trp Ile Met Ala Ile
    50                  55                  60

Asn His Thr Ile Ser Arg Arg Ile Ile Glu Phe Ala Lys Ala His Gly
65                  70                  75                  80

Val Ser Val Ile Arg Leu Glu Asp Leu Arg Gly Ala Arg Trp Thr Lys
                85                  90                  95

Ser Gln Arg Lys Lys Gln Arg Lys Asp Ala Gly Arg Ser Leu His Ser
            100                 105                 110

Trp Ala Phe Phe Gln Leu Arg Gln Phe Ile Glu Tyr Lys Ala Ala Leu
        115                 120                 125

Ala Gly Ile Glu Val Glu Leu Val Asn Pro Glu Leu Thr Ser Leu Thr
    130                 135                 140

Cys Ser Arg Cys Gly Glu Val Arg Thr Ser Arg Pro Ala Gly Arg Trp
145                 150                 155                 160

Tyr Thr Cys Pro Arg Cys Gly Lys Val Lys His Ile Asp Ala Asn Ala
                165                 170                 175

Ala Asp Asn Ile Ala Gln Ala Ile Ser Gly Leu Ser Glu Glu Lys Arg
            180                 185                 190

Ala Lys Thr Ile Leu Lys Pro Lys Thr Arg Arg Arg Thr Thr Ala Ala
        195                 200                 205
```

<210> 704
<211> 266
<212> PRT
<213> Streptomyces sp. CB01635

<400> 704

Met Gly Glu Arg Thr Val Ser Ile Trp Thr Val Thr Gly Arg Met Lys
1 5 10 15

His Ile Ala Phe Thr Gly Ser Pro Val His Leu Ala Val Leu Glu Ala
20 25 30

Tyr Arg Lys Gly Glu Ser Asp Leu Leu Tyr Arg Asp Gly Arg Trp Tyr
35 40 45

Leu Ile Ala Thr Cys Glu Val Ala Glu Ala Glu Leu Asp Ala His Pro
50 55 60

Ala Ser Phe Val Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr
65 70 75 80

Ser Thr Gly Ala Arg His Ser Gly Arg Arg Leu Asn Arg Arg Arg Glu
85 90 95

Ala Asp Arg Thr Leu Arg Ala Lys Leu Gln Arg Lys Gly Thr Lys Ser
100 105 110

Ala Lys Arg Arg Ala Lys Lys His Ala Gly Lys Glu Ala Arg Arg Ala
115 120 125

Arg Asp Ile Asn His Lys Ile Ser Lys His Ile Val Ala Glu Ala Gln
130 135 140

Arg Thr Gly Arg Gly Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Glu
145 150 155 160

Arg Ala Arg Leu Arg Lys Pro Gln Arg Val Thr Leu His Ser Trp Ser

```
                165                 170                 175

Phe His Gln Leu Gly Ala Phe Ile Ala Tyr Lys Ala Lys Arg Ala Gly
            180                 185                 190

Val Pro Leu Val His Val Asp Pro Ala Tyr Thr Ser Gln Glu Cys Ser
        195                 200                 205

Gln Cys His His Ile Asp Arg Arg Asn Arg Pro Ser Gln Ala Arg Phe
    210                 215                 220

Ala Cys Gln Val Cys Gly Phe Val Glu His Ala Asp Pro Asn Ser Ser
225                 230                 235                 240

His Asn Ile Ala Ala Arg Gly Trp Trp Thr Trp Val Arg Gly Ala Glu
                245                 250                 255

Ser Gln Ala Pro Ala Leu Thr Leu Ile Ala
            260                 265
```

<210> 705
<211> 443
<212> PRT
<213> Halomonas sp. GFAJ-1

<400> 705

```
Met Leu Ile Ile Arg Ser Asp Thr Leu Thr Leu Gln Val Thr Ser Ala
1               5                   10                  15

Asp Gln Arg Gln Ala Leu Ala Asn Thr Leu Ala Leu Tyr Arg Arg Leu
            20                  25                  30

Val Arg Asp Leu Met Thr Val Ala Tyr Thr His Trp Pro Thr Val Gly
        35                  40                  45

Ala Ser Gln Gly Asn Gln Ala Val Lys Ile Ile Glu Ala Leu Ile His
    50                  55                  60
```

```
Pro Thr Ala Lys Arg Pro Gln Val Arg Tyr Thr Tyr Phe Ala Asn Arg
65                  70                  75                  80

Tyr Tyr Lys Phe Pro Ser Tyr Leu Arg Arg Val Ala Ile Met Asp Ala
                85                  90                  95

Val Gly Gln Val Arg Ser Phe Val Thr Arg Phe Asp Gln Trp Arg Cys
            100                 105                 110

Gly Gln Arg Lys His Pro His Ala Lys Pro Pro Arg Leu Thr Ser Ser
        115                 120                 125

Thr Lys Thr Phe Pro Ser Leu Tyr Gly Ser Gln Cys Ala Lys Ile Asn
    130                 135                 140

Ala Asp Ala Thr His Ala Phe Ile Lys Val Arg Trp Gln Asn Asp Trp
145                 150                 155                 160

Ile Trp Met Arg Phe Gly Leu Lys Gly Thr Cys Arg Phe Arg Gly Lys
                165                 170                 175

Gly Lys Ala Lys Ser Pro Leu Leu Thr Thr Asn Gly Arg Gln Trp Gln
            180                 185                 190

Leu Ser Leu Pro Glu Gln Phe Glu Pro Pro Lys Pro Val Lys Gly Ala
        195                 200                 205

Pro Asp Arg Val Leu Ala Val Asp Val Gly Ile Asn Thr Ala Ala Thr
    210                 215                 220

Trp Ala Val Val Asp Thr Gln Gly Thr Val His Ala Arg Gly Phe Ile
225                 230                 235                 240

Ser Arg Thr Asp Lys Asp Arg Glu Tyr Arg Leu Met Ala Arg Ile Arg
                245                 250                 255

Gln Thr Ala Lys Lys His Thr Arg His Gly Ser Arg Leu Pro Pro Gly
            260                 265                 270
```

```
Phe Cys Arg Arg Asp His Gln Arg Leu Ser His Leu Ala Asp Asn Gln
        275                 280                 285

Ala His Gln Ile Ser Arg Gln Leu Val Asn Leu Ala Val Asp His His
    290                 295                 300

Cys Gln Ala Ile Ala Val Glu Asn Leu Lys Gly Trp Arg Pro Lys Ala
305                 310                 315                 320

Gly Gln Lys Arg Thr Pro Met Lys Ala Arg Phe His Arg Trp Phe His
                325                 330                 335

Arg Gln Leu Val Ala Arg Ile Gly Ser Lys Ala Val Glu Val Gly Leu
            340                 345                 350

Arg Cys Val Ala Val Tyr Ala Arg Gly Thr Ser Arg His Ala Phe Asp
        355                 360                 365

Gly Ser Gly Gln Val Lys Arg Asp Lys Ser Asn Tyr Ser Gln Cys Thr
    370                 375                 380

Phe Arg Ser Gly Lys Arg Tyr His Ala Asp Leu Asn Ala Ala Tyr Asn
385                 390                 395                 400

Ile Ala Ala Arg Gly His Val Val Phe Gln Gly Gly Gln Arg Lys Pro
                405                 410                 415

Thr Ala Arg Val Arg Ser Gln Met Ser Thr His Ile Pro Arg Thr Pro
            420                 425                 430

Val Thr Leu Ser Thr Leu Trp Pro Gln Ser Ala
        435                 440
```

<210> 706
<211> 379
<212> PRT
<213> Actinomadura sp. CNU-125

<400> 706

```
Met Lys Leu Val Val Gln Val Lys Leu Leu Pro Asp Val Ala Thr Glu
1               5                  10                  15

Ala Ala Leu Arg Glu Thr Leu Gln Leu Cys Asn Gln Ala Ala Asp His
            20                  25                  30

Val Ser Arg Arg Ala His Gln Ser Asn Val Lys Thr Lys Ala Ala Leu
        35                  40                  45

Gln Arg Leu Val Tyr Arg Glu Val Lys Gly Met Gly Leu Ser Ala Gln
    50                  55                  60

Pro Ala Ile His Cys Val Arg Lys Val Ala Glu Ala Tyr Ala Ala Ser
65                  70                  75                  80

Ala Asp Glu Pro Ser Thr Ala Arg His Gly Arg Arg Pro Pro Arg Pro
                85                  90                  95

Leu Arg Ala Pro Val Arg Phe Arg Lys Asp Ala Ala Gln Pro Phe Asp
            100                 105                 110

Asp Arg Cys Leu Ser Trp Arg Leu Asp Ala Cys Thr Val Ser Ile Trp
        115                 120                 125

Thr Val Arg Gly Arg Met Lys Asn Ile Arg Phe Ala Cys Ser Thr Glu
    130                 135                 140

Gln Leu Ser Leu Leu Arg His His Arg Arg Gly Glu Ser Asp Leu Val
145                 150                 155                 160

Trp Arg Asn Asp Ser Phe Tyr Leu Tyr Ala Thr Cys Glu Val Pro Glu
                165                 170                 175

Ala Asp Glu Tyr Arg Pro Asp Gly Phe Leu Gly Val Asp Leu Gly Ile
            180                 185                 190
```

```
Ala Asn Ile Ala Thr Ala Ser Asp Gly His Arg His Ser Gly Arg Gln
        195                 200                 205

Leu Asn Gln Thr Arg His Arg Asn Arg Arg Leu Arg Ser Lys Leu Gln
    210                 215                 220

Lys Lys Gly Thr Lys Ser Ala Lys Arg Leu Leu Arg Lys Leu Ser Ser
225                 230                 235                 240

Arg Glu Ala Arg Phe Ala Ala Asp Thr Asn His Arg Ile Ser Ala His
                245                 250                 255

Val Val Thr Glu Ala Gln Arg Thr Ser Arg Gly Ile Ala Leu Glu Asp
            260                 265                 270

Leu Thr Gly Ile Arg Glu Arg Val Arg Leu Arg Lys Pro Gln Arg Val
        275                 280                 285

Thr Leu His Ser Trp Ser Tyr Ala Gln Leu Gly Ser Phe Ile Ala Tyr
    290                 295                 300

Lys Ala Lys Arg Ala Gly Val Pro Val Val Tyr Val Asp Pro Arg His
305                 310                 315                 320

Thr Ser Gln Gly Cys Ser Ala Cys Gly His Val Asp Lys Arg Asn Arg
                325                 330                 335

Pro Ser Gln Ala Ala Phe Arg Cys Thr Ser Cys Gly Phe Ala Glu His
            340                 345                 350

Ala Asp Val Asn Ala Ala Arg Asn Ile Ala Ala Arg Gly Ala Ala Ser
        355                 360                 365

Trp Ala Val Ser His Ala Ala Asp Asp Ala Asp
    370                 375
```

<210> 707

<211> 346
<212> PRT
<213> Paenibacillus beijingensis

<400> 707

```
Met Gln Thr Val Thr Val Gln Ile Arg Ile Phe Pro Asn Asp Val Ser
1               5                  10                  15


Leu Leu Lys Glu Met Gly Asn Glu Tyr Ile Gln Thr Val Asn Arg Leu
            20                  25                  30


Thr Glu Gln Ala Glu Thr Ala Gly Val Phe Pro Lys Leu Thr Ser Lys
        35                  40                  45


Asp Val Glu Ala Asn Leu Pro Ser Ala Ile Arg Asn Gln Ala Ile Arg
    50                  55                  60


Asp Ala Arg Ser Ile His Lys Lys Thr Lys Lys Gln Gly Lys Arg Pro
65                  70                  75                  80


Ile Leu Lys Gln Arg Ala Tyr Tyr Val Asn Asn Gln Asn Tyr Thr Ile
                85                  90                  95


Gly Gln Asn Thr Val Ser Phe Pro Val Met Ala Asp Gly Lys Val Arg
            100                 105                 110


Arg Leu Thr Val Ser Ala Arg Ile Glu Glu Arg Glu Gln His Val Leu
        115                 120                 125


Asp Ser Gly Lys Ser Gly Leu Leu Lys Ile Val Glu Lys Ser Gly Lys
    130                 135                 140


Trp Tyr Val His Leu Ser Ile Glu Leu Gln Val Lys Glu Ala Ala Gly
145                 150                 155                 160


Asp Ile Thr Met Gly Ile Asp Leu Gly Leu Lys Val Pro Ala Val Val
                165                 170                 175
```

```
Val Thr Ser Thr Gly Lys Thr Arg Phe Val Gly Asn Gly Arg Gln Asn
            180                 185                 190

Lys Tyr Ile Arg Arg Lys Tyr Asn Ser Arg Arg Arg Lys Met Gly Lys
        195                 200                 205

Leu Lys Lys Leu Ser Ala Ile Arg Lys Gln Gln Asn Lys Glu His Arg
    210                 215                 220

Tyr Ile Thr Asp Gln Asn His Lys Ile Ser Arg Thr Ile Val Asn Leu
225                 230                 235                 240

Ala Ile Glu Glu Gln Val Ser Val Ile Lys Val Glu Lys Leu Thr Ser
                245                 250                 255

Ile Arg Gln Thr Thr Arg Thr Ser Arg Lys Asn Ala Lys Asn Leu His
            260                 265                 270

Asn Trp Ser Phe Tyr Gln Leu Gln Lys Phe Ile Ala Tyr Lys Ala Ala
        275                 280                 285

Leu Ala Gly Ile Lys Val Met Glu Val Asn Pro Ala Tyr Thr Ser Gln
    290                 295                 300

Thr Cys Pro Ala Cys Gly Lys Arg Asn Lys Ala Thr Asp Arg Thr Tyr
305                 310                 315                 320

Arg Cys Leu Cys Gly Phe His Ser His Arg Asp Arg Val Gly Ala Val
                325                 330                 335

Asn Ile Met Arg Gln Pro Val Thr Asp Gly
            340                 345
```

<210> 708
<211> 373
<212> PRT
<213> Geobacter sp. DSM 2909

<400> 708

```
Met Lys Arg Thr Ile Ser Ile Lys Leu Val Thr Ser Pro Glu Gln Glu
1               5                   10                  15

Ala Arg Leu Leu Leu Leu Gln Thr Glu Leu Ala Arg Ala Cys Asn His
            20                  25                  30

Leu Ala Gly Ala Ala Ala Val Asn Arg Cys Ser Asn Arg Val Lys Leu
        35                  40                  45

His His Arg Val Tyr Tyr Thr Val Arg Glu Ala Met Pro Ala Leu Gly
    50                  55                  60

Ser Gln Met Thr Cys Asn Ala Val Ala Ala Val Val Arg Ser Tyr Lys
65                  70                  75                  80

Ser Leu Val Ser Asn Asn Pro Gly Leu Arg Lys Thr Asp Trp Pro Leu
                85                  90                  95

Ile Thr Phe Lys Ser Ser Gly Ser Val His Phe Asp Lys Arg Thr Tyr
            100                 105                 110

Ser Ile Lys Gly Lys Ala Ile Ser Leu Phe Thr Thr Glu Gly Arg Ile
        115                 120                 125

Ile Val Pro Met Lys Leu Gly Glu Phe Gln Gly Lys Tyr Leu Asp Ile
    130                 135                 140

Gly Met Pro Lys Glu Ala Glu Leu Val Cys Arg Lys Gly Arg Tyr Tyr
145                 150                 155                 160

Phe Asn Leu Val Leu Asp Phe Pro Asp Pro Pro Lys Arg Thr Thr Gly
                165                 170                 175

Pro Val Ala Gly Val Asp Leu Gly Glu Asn Thr Ile Ala Ala Ile Ser
            180                 185                 190

Thr Gly Lys Ile Phe Gly Gly Gly Lys Leu Arg His Asp Arg Asp Lys
```

```
        195                 200                 205

His Leu Thr Leu Arg Ser Arg Leu Gln Arg Asn Gly Ser Gln Ser Ala
    210                 215                 220

Arg Gln Leu Leu Lys Lys Val Ser Gly Arg Glu Ala Arg His Val Arg
225                 230                 235                 240

His Val Asn His Glu Val Ser Lys Ala Ile Ile Ala Glu Ala Val Gly
                245                 250                 255

Asn Glu Cys Gly Ala Ile Thr Met Glu Asp Leu Thr Asn Ile Arg Lys
            260                 265                 270

Arg Ile Lys Ala Gly Lys Arg Met Arg Ser Arg Leu His Arg Trp Ala
        275                 280                 285

Trp Ala Gln Leu Gln Ala Phe Ile Ala Tyr Lys Ala Glu Ala Ala Gly
    290                 295                 300

Ile Arg Val Glu Phe Ala Asn Pro Ala Tyr Thr Ser Gln Thr Cys Ser
305                 310                 315                 320

Val Cys Gly Cys Met Gly Thr Arg Glu Arg His Arg Phe Ser Cys Thr
                325                 330                 335

Cys Gly Asn Leu Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala
            340                 345                 350

Arg Leu Gly Ala Thr Ala Val Ala Pro Thr Gly Ala Val Asn Arg Pro
        355                 360                 365

Tyr Val Gly Thr Ala
    370
```

<210> 709
<211> 426
<212> PRT

<213> Halorubrum chaoviator

<400> 709

```
Met Ala Lys Gln Val Val Thr Arg Thr Tyr Thr Ala Ser Ile Arg Asn
1               5                  10                  15


Gln Ser Arg Val Arg Asp Asp Leu Gly Ala Leu Gly Phe Ala Ala Ser
            20                  25                  30


Lys Leu Trp Asn Val Gly Arg Trp Thr Cys Ser Arg Ile Trp Asp Glu
        35                  40                  45


Ile Gly His Ile Pro Asn His Thr Glu Leu Thr Ala Tyr Leu Lys Asn
    50                  55                  60


His Glu Arg Tyr Asp Asp Leu His Ser Gln Ser Ser Gln Arg Val Leu
65                  70                  75                  80


Gln Glu Leu Ala Glu Ala Phe Ser Gly Trp Tyr Gly Lys Arg Arg Asn
                85                  90                  95


Gly Asp Thr Arg Ala Asn Pro Pro Gly Tyr Arg Lys His Gly Glu Lys
            100                 105                 110


His Pro Arg Ser Thr Val Thr Phe Lys Thr Ala Gly Phe Lys Leu Asp
        115                 120                 125


Thr Glu Tyr Asn Arg Val Arg Leu Ser Gln Gly Ser Asn Leu Lys Glu
    130                 135                 140


Tyr Trp Ser Asp Phe Ile Leu Cys Lys Tyr Gln Thr Arg Pro Asp Val
145                 150                 155                 160


Asp Leu Ser Thr Val Glu Gly Val Lys Gln Val Lys Ala Val Trp Ser
                165                 170                 175


Gly Asp Lys Trp Glu Leu Arg Phe Ile Cys Lys Val Glu Val Asp Val
            180                 185                 190
```

```
Ser Glu Ser Ser Gly Glu Lys Thr Val Gly Ile Asp Leu Gly Ile Thr
        195                 200                 205

Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly His Ser Glu Leu Tyr Pro
    210                 215                 220

Leu Asn Gly Leu Lys Gln Asp Asp Tyr Tyr Phe Ser Lys Arg Leu Ala
225                 230                 235                 240

Gln Cys Asp Asp Ser Asn Ser Ala Gln Ala Thr Arg Leu Asn Gln Lys
                245                 250                 255

Lys Ser Asn Arg Arg Thr His Tyr Phe His Thr Leu Ser Lys His Ile
            260                 265                 270

Val Gln Arg Cys Val Glu Asp Asp Val Gly Thr Ile Val Ile Gly Asn
        275                 280                 285

Leu Ser Gly Ile Arg Glu Asp Asp Glu Asn Gly Glu Ser Lys Asn Trp
    290                 295                 300

Gly Lys His Gly Asn Leu Asp Leu His Ser Trp Ala Phe Asp Arg Phe
305                 310                 315                 320

Thr Glu Leu Leu Thr Tyr Lys Ala Glu Met Glu Gly Ile Thr Val Glu
                325                 330                 335

Glu Val Ser Glu Arg Asp Thr Ser Lys Ser Cys Ser Cys Cys Gly Arg
            340                 345                 350

Lys Arg Lys Ala Asn Arg Val Glu Arg Gly Leu Tyr Val Cys Asp Asn
        355                 360                 365

Cys Gly Thr Thr Ala Asn Ala Asp Val Asn Gly Ala Glu Asn Ile Arg
    370                 375                 380
```

```
Gln Lys Val Ser Pro Ser Ser Pro Asn Leu Ser Val Asn Arg Ser Asn
385                 390                 395                 400


Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu Phe Asp Thr Glu Thr Gly
                405                 410                 415


Ala Phe Ala Pro Gln Glu Arg Val Thr Ser
            420                 425


<210>  710
<211>  428
<212>  PRT
<213>  Streptomyces sp. HGB0020

<400>  710

Met Lys Leu Val Ile Arg Val Lys Leu Leu Pro Thr Pro His Gln Ala
1               5                   10                  15


Ser Ala Leu Gln Ala Thr Leu His Thr Cys Asn Glu Ala Ala Asn His
            20                  25                  30


Ala Ser Arg His Ala Phe Thr Thr Gly Ile Lys Arg Asn Arg Glu Leu
        35                  40                  45


Arg Thr Gln Ile Tyr Thr Gln Ile Lys Glu Arg Phe Ser Leu Gly Ala
    50                  55                  60


Gln Ala Ala Gln Leu Ala Ile Lys Lys Ala Cys Asn Ala Tyr Ala Ser
65                  70                  75                  80


Leu Arg Gly Ser Leu Lys Ala Gly His Leu Gly Arg Pro Gly Thr Lys
                85                  90                  95


Arg His Thr Arg Ala Thr Asn Lys Pro Ile Thr Phe Arg Pro Asp Ala
            100                 105                 110


Ala Gln Pro Tyr Asp Asp Arg Met Leu Ser Trp Gln Thr Glu Gln Arg
        115                 120                 125
```

```
Thr Val Ser Ile Trp Thr Val His Gly Arg Met Lys His Ile Pro Tyr
    130                 135                 140

Thr Gly Gln Glu Asp Gln Leu Leu Leu Leu Ala His Arg Arg Gln Gly
145                 150                 155                 160

Gln Ser Asp Leu Leu His His Asn Gly Gln Trp Tyr Leu Leu Ala Thr
                165                 170                 175

Ile Asp Val Pro Glu Pro Pro Gln Asn Pro Ala Pro His Asp Phe Ile
            180                 185                 190

Gly Val Asp Leu Gly Ile Glu Asn Ile Ala Thr Thr Ser Thr Gly Arg
        195                 200                 205

Arg His Ser Gly Arg Lys Ile Asn Arg Thr Arg Glu Asn Asp Arg Arg
    210                 215                 220

Leu Tyr Arg Arg Leu Ala Lys Lys Lys Thr Arg Ser Ala Lys Arg Arg
225                 230                 235                 240

Ala Lys Arg His Ala Gly Lys Gln Ala Arg Arg Thr Arg Asp Ile Asn
                245                 250                 255

His Lys Ile Ser Lys His Ile Val Thr Glu Ala Gln Arg Thr Gly Arg
            260                 265                 270

Gly Ile Ala Leu Glu Asp Leu Ser Gly Ile Arg Glu Arg Ala Arg Leu
        275                 280                 285

Lys Lys Pro Gln Arg Val Thr Met Asn Ser Trp Ala Phe Gly Gln Leu
    290                 295                 300

Gly Ser Phe Ile Ala Tyr Lys Ala Arg Lys Ala Gly Val Pro Leu Val
305                 310                 315                 320

His Val Ser Pro Ala Tyr Thr Ser Gln Glu Cys Ser Gln Cys His His
```

```
                325                 330                 335

Ile Asp Lys Arg Asn Arg Pro Ser Gln Ala Val Phe Ala Cys Arg Ser
            340                 345                 350

Cys Gly Phe Val Glu His Ala Asp Leu Asn Ala Ser His Val Ile Gly
        355                 360                 365

Arg Arg Gly Trp Trp Val Trp Val Cys Gly Ala Glu Ser Gln Val Pro
    370                 375                 380

Ala Leu Thr Leu Val Val Gln Gly Trp Met Arg Arg Ser Ala Glu Ala
385                 390                 395                 400

Ile Gly Glu Gly Glu Leu Gln Ala Gly Val Ser Asp Arg Gln Arg Thr
                405                 410                 415

Arg Thr Leu Val His Gly Ala Met Met Arg Arg Ala
            420                 425


<210>  711
<211>  440
<212>  PRT
<213>  Vibrio breoganii

<400>  711

Met Lys Ile Val Arg Ser Asp Arg Leu Asn Ile Asn Thr Asn Thr His
1               5                   10                  15

Gln Ser Glu Ala Leu Arg Ala Thr Leu Asn Val Tyr Arg Lys Tyr Val
            20                  25                  30

Arg Asp Leu Met Val Leu Ile Asn Ala Arg Trp Arg Lys Phe Gln His
        35                  40                  45

His Ser Gly Asn Glu Ile Ile Ala Ala Val Glu Ser Leu Ile His Pro
    50                  55                  60
```

```
Thr Lys Lys Arg Pro Glu Ile Lys His His Tyr Phe His His His Tyr
65                  70                  75                  80

Tyr Lys Phe Pro Ser Tyr Leu Arg Arg Val Ala Ile Met Asp Ala Met
                85                  90                  95

Gly Gln Val Arg Ser Phe His Ser Arg Phe Asn Asp Trp Leu Asp Ser
            100                 105                 110

Gly Cys Lys Asn Arg Pro Pro Lys Leu Thr Cys Ala Thr Ala Thr Tyr
        115                 120                 125

Pro Ser Leu Tyr Ala Gly Gln Cys Ile Lys Phe Ser Asn Cys Gly Thr
    130                 135                 140

Lys Ala Asp Ile Lys Val Phe Lys Ser Asn Asp Trp Val Trp Ile Ala
145                 150                 155                 160

Val Lys Leu Asn Gly Lys Glu Arg Phe Ser Gly Lys Lys Leu Ser Pro
                165                 170                 175

Leu Leu Val Leu Lys Asn Lys Lys Trp Leu Leu Ser Val Pro Val Lys
            180                 185                 190

Met Asp Val Ser Leu Lys Pro Lys Val Asn Phe Ser Gly Lys Val Leu
        195                 200                 205

Ser Val Asp Val Gly Ile Asn Thr Thr Ala Thr Cys Ala Val Val Asp
    210                 215                 220

Lys Ser Gly Thr Val His Gly Arg Tyr Phe Leu Asn Arg Ser Asp Lys
225                 230                 235                 240

Asp Arg Glu Tyr Arg Leu Met Asn Arg Ile Arg Ala Lys Ala Arg Lys
                245                 250                 255

Gln Thr Arg His Gly Asn Lys Leu Pro Ser Gly Phe Cys Lys Asn Asp
            260                 265                 270
```

```
His Arg Arg Leu Lys Gln Leu Ala Asp Asn Glu Ala His Gln Ile Ser
        275                 280                 285

Arg Arg Ile Val Ser Leu Ala Arg Asp Ser Glu Cys Asp Ala Ile Ala
    290                 295                 300

Val Glu Asp Leu Lys Gly Trp Arg Pro Ser Ala Gly Lys Lys Arg Ser
305                 310                 315                 320

Thr Met Lys Ala Lys Phe His Arg Trp Tyr His Arg Met Leu Ile Asp
                325                 330                 335

Arg Leu Glu Ser Lys Ala Ile Glu Leu Gly Ile Arg Leu Ile Asn Val
            340                 345                 350

Tyr Ala Arg Gly Thr Ser Ser Asn Ala Tyr Asp Gly Ser Gly Lys Val
        355                 360                 365

Lys Arg Asp Lys Gly Asn Tyr Ala Leu Cys Gln Phe Val Thr Gly Lys
    370                 375                 380

Arg Tyr Asn Ala Asp Leu Asn Ala Ala Tyr Asn Ile Ala Ala Arg Gly
385                 390                 395                 400

Ile Leu Lys Phe Phe Tyr Pro Lys Val Arg Glu Lys Leu Trp Lys Ser
                405                 410                 415

Gly Lys Pro Asn Ala Cys Pro Leu Thr Gly Ser Pro Phe Val Leu Ser
            420                 425                 430

Ser Ile Trp Leu Leu Ser Gln Thr
        435                 440
```

<210> 712
<211> 376
<212> PRT
<213> Streptomyces sp. 69

<400> 712

```
Met Pro Asp Ala Val Gln Ala Pro Ala Ile Ala Ala Thr Leu His Thr
1               5                  10                  15

Val Asn Asp Leu Ala Asn Trp Val Ser Asp Val Ala Phe Thr Cys Gly
            20                  25                  30

Val Pro Arg Glu Tyr Glu Leu Arg Lys His Thr Tyr Ala Arg Leu Arg
        35                  40                  45

Ala Glu Gly Leu Gly Ala Gln Ala Ala Gln His Val Ile Lys Lys Val
    50                  55                  60

Arg Asp Ala Tyr Thr Thr Leu His Ala Asn Leu Arg Ala Gly Asn Leu
65                  70                  75                  80

Gly Lys Pro Gly Ser Lys Arg Arg Arg Lys Ala Glu Ser Lys Pro Val
                85                  90                  95

Thr Phe Arg Pro Gln Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser
            100                 105                 110

Trp Gln Tyr Asp Ala Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg
        115                 120                 125

Ile Lys Gly Val Arg Phe Thr Cys Ser Ala Arg Ala Leu Lys Val Leu
    130                 135                 140

Gln Gln Tyr Arg Lys Gly Ala Ser Asp Leu Ile Glu Arg Asp Gly Val
145                 150                 155                 160

Phe Tyr Leu Ile Ala Thr Cys Glu Val Pro Glu Ala Glu Gln Tyr Glu
                165                 170                 175

Pro Asp Gly Trp Ile Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr
            180                 185                 190
```

```
Thr Ser Thr Gly Tyr Gln Ala Ala Gly Arg Gln Ile Asn Arg Tyr Arg
        195                 200                 205

Lys Arg Gln Leu Ala Leu Arg Ala Lys Leu Gln Lys Lys Arg Thr Lys
    210                 215                 220

Ser Ala Lys Arg Arg Leu Lys Glu Arg Ser Arg Arg Glu Gln Arg His
225                 230                 235                 240

Val Lys Asn Thr Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala
                245                 250                 255

Glu Arg Thr Ser Ala Gly Ile Ser Leu Glu Glu Leu Lys Gly Ile Arg
            260                 265                 270

Gln Arg Val Arg Leu Arg Lys Pro Gln Arg Val Ala Leu His Ser Trp
        275                 280                 285

Ala Phe Ala Gln Leu Gly Asp Phe Ile Val Tyr Lys Ala Arg Arg Ala
    290                 295                 300

Gly Val Pro Val Val Phe Val Asp Pro Ala Tyr Thr Ser Gln Gln Cys
305                 310                 315                 320

Ser Glu Cys Gly His Ile Asp Lys Lys Asn Arg Thr Ser Gln Ala Leu
                325                 330                 335

Phe Thr Cys Arg Asn Cys Gly Val Val Ala His Ala Asp Arg Asn Ala
            340                 345                 350

Ser Arg Val Leu Ala Arg Arg Gly Gln Asn Ala Trp Thr Ala Gly Arg
        355                 360                 365

Glu Ser Arg Val Pro Ala Thr Pro
    370                 375
```

<210> 713

<211> 366
<212> PRT
<213> Salimicrobium flavidum

<400> 713

Met Ala Thr Lys Thr Phe Leu Val Arg Leu Lys Ser Leu Ser Lys Lys
1 5 10 15

Lys His Lys Gln Phe Val Cys Glu Gln Gln Thr Phe Ala Ser Cys Val
20 25 30

Asn His Cys Val Glu Arg Leu Gln Ser Gly Glu Lys Leu Ser Ser Lys
35 40 45

Asn Val Pro Phe Asp Leu Lys Ser Ala Ile Lys Asn Glu Gly Ile Arg
50 55 60

Lys Ala Lys Lys Ala Val Ser Asp Val Lys Lys Gly Leu Ala Lys Thr
65 70 75 80

Val Pro Thr Phe Arg Ser Ser Leu Gly Ile Lys Ile Asn Asn Gln Asn
85 90 95

Trp Asn Thr Val Glu Lys Asn Gly Arg Trp Tyr Ile Ala Phe Thr Thr
100 105 110

Asn Glu Gly Lys Lys Thr Phe Pro Val Val Glu Thr Glu Tyr Val His
115 120 125

Thr Tyr Phe Pro Phe Phe Thr Tyr Gln Asn Arg Glu Phe Arg Gly Thr
130 135 140

Ile Glu Val Leu Arg Lys Gly Arg Asp Trp Tyr Val Ala Val Pro Val
145 150 155 160

Gln Val Ser Ser Glu Leu Asp Ala Glu Lys Thr His Lys Pro Tyr Glu
165 170 175

```
Ala Tyr Thr Pro Val Gly Val Asp Leu Gly Leu Arg His Leu Ala Val
            180                 185                 190

Leu Ser Glu Pro Val Ser Gly Ile Arg Gln Phe Phe Ser Gly Lys Glu
        195                 200                 205

Val Gly Phe Lys Arg Arg His Phe Arg Ser Leu Arg Arg Ser Leu Gly
    210                 215                 220

Lys Lys Lys Ala Gln Arg Ala Leu Glu His Val Gly Lys Lys Glu Ser
225                 230                 235                 240

Arg Trp Met Lys Asp Tyr Asn Arg Lys Leu Ala Lys Ala Ile Val Asp
                245                 250                 255

Phe Ala Arg Gln Phe Asp Asn Pro Met Ile Lys Met Glu Gln Leu Asp
            260                 265                 270

Asp Ile Arg Lys Thr Cys Lys Ser Leu Lys Arg Ala Asp Arg Thr Ile
        275                 280                 285

His Ser Trp Ala Phe Tyr Gln Leu Lys Gln Phe Ile Arg Glu Lys Ala
    290                 295                 300

Ala Asp Tyr Asn Ile Pro Val Val Asp Ile Asn Pro Tyr Gln Thr Ser
305                 310                 315                 320

Gln Glu Cys Phe Leu Cys Gly Tyr Ala Glu Lys Gly Asn Arg His Met
                325                 330                 335

Asp Thr Phe His Cys Lys Lys Cys Gly His Ser Asn His Ala Asp Leu
            340                 345                 350

Asn Ala Ser Asn Asn Ile Ala Thr Ser Thr Ser Leu Ala Val
        355                 360                 365
```

<210> 714
<211> 385

<212> PRT
<213> Streptomyces sp. 69

<400> 714

```
Met Lys Ile Val Thr Gln Val Lys Leu Met Pro Asp Ala Val Gln Ala
1               5                   10                  15


Pro Ala Ile Ala Ala Thr Leu His Thr Val Asn Asp Leu Ala Asn Trp
            20                  25                  30


Val Ser Asp Val Ala Phe Thr Cys Gly Val Pro Arg Glu Tyr Glu Leu
        35                  40                  45


Arg Lys His Thr Tyr Ala Arg Leu Arg Ala Glu Gly Leu Gly Ala Gln
    50                  55                  60


Ala Ala Gln His Val Ile Lys Lys Val Arg Asp Ala Tyr Thr Thr Leu
65                  70                  75                  80


His Ala Asn Leu Arg Ala Gly Asn Leu Gly Lys Pro Gly Ser Lys Arg
                85                  90                  95


Arg Arg Lys Ala Glu Ser Lys Pro Val Thr Phe Arg Pro Gln Ala Ala
            100                 105                 110


Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Ala Gln Thr
        115                 120                 125


Val Ser Ile Trp Thr Thr Ala Gly Arg Ile Lys Gly Val Arg Phe Thr
    130                 135                 140


Cys Ser Ala Arg Ala Leu Lys Val Leu Gln Gln Tyr Arg Lys Gly Ala
145                 150                 155                 160


Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Ile Ala Thr Cys
                165                 170                 175


Glu Val Pro Glu Ala Glu Gln Tyr Glu Pro Asp Gly Trp Ile Gly Val
```

```
            180                 185                 190

Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Thr Gly Tyr Gln Ala
        195                 200                 205

Ala Gly Arg Gln Ile Asn Arg Tyr Arg Lys Arg Gln Leu Ala Leu Arg
    210                 215                 220

Ala Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg Arg Leu Lys
225                 230                 235                 240

Glu Arg Ser Arg Arg Glu Gln Arg His Val Lys Asn Thr Asn His Ile
                245                 250                 255

Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser Ala Gly Ile
            260                 265                 270

Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg Leu Arg Lys
        275                 280                 285

Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln Leu Gly Asp
    290                 295                 300

Phe Ile Val Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val Phe Val
305                 310                 315                 320

Asp Pro Ala Tyr Thr Ser Gln Gln Cys Ser Glu Cys Gly His Ile Asp
                325                 330                 335

Lys Lys Asn Arg Thr Ser Gln Ala Leu Phe Thr Cys Arg Asn Cys Gly
            340                 345                 350

Val Val Ala His Ala Asp Arg Asn Ala Ser Arg Val Leu Ala Arg Arg
        355                 360                 365

Gly Gln Asn Ala Trp Thr Ala Gly Arg Glu Ser Arg Val Pro Ala Thr
    370                 375                 380
```

Pro
385

<210> 715
<211> 360
<212> PRT
<213> bacterium LF-3

<400> 715

Met Gln Leu Thr Glu Thr Val Lys Leu Tyr Pro Asn Lys Tyr Gln Ile
1   5   10   15

Glu Leu Ile Lys Val Thr Met Thr Glu Tyr Ile Ser Thr Val Asn His
            20   25   30

Leu Val Leu Asp Ala Ile Asn Gly Arg Ala Ile Thr Lys Ile Thr Thr
        35   40   45

Ala Asp Val Asn Ala Ile Leu Pro Ser Ala Leu Cys Asn Gln Cys Ile
    50   55   60

Arg Asp Ala Lys Ser Ile Ile Arg Lys Tyr Asn Lys Ala Leu Arg Asn
65   70   75   80

Ser Asn Thr Lys Val Arg Leu Pro Val Leu Lys Lys Met Cys Cys Tyr
                85   90   95

Ile Asn Asn Gln Asn Phe Arg Ile Ser Asp Asp Cys Ile Ser Phe Pro
            100   105   110

Val Ile Ile Asn Gly Lys Ser Lys Arg Ile Ser Val Lys Thr Lys Ile
        115   120   125

Ser Lys Arg Gln Lys Ser Ile Phe Ser Ser Ser Lys Leu Gly Thr Met
    130   135   140

Arg Ile Val Val Lys Gly His Asp Leu Val Ala Gln Ile Val Tyr Asp
145   150   155   160

```
Ala Lys Glu Asp Ala Ala Ser Ser Asn Asn Asn Val Met Gly Val Asp
                165                 170                 175

Phe Gly Ile Lys Cys Pro Ala Val Ser Tyr Cys Pro Asp Gly Ser Val
            180                 185                 190

Lys Phe Tyr Gly Asn Gly Arg Lys Asn Lys Tyr Ile Arg Arg His Tyr
        195                 200                 205

Asn Asn Leu Arg Lys Arg Phe Gln Lys Ala Lys Lys Pro Lys Ala Val
    210                 215                 220

Val Lys Ile Asn Asn Lys Glu Gln Arg Ile Met Lys Asp Ile Asp His
225                 230                 235                 240

Lys Leu Ser Arg Glu Ile Val Asn Thr Ala Lys Thr His Asp Val Ser
                245                 250                 255

Val Ile Lys Leu Glu Arg Leu Gln Asn Ile Arg Ser Thr Thr Arg Thr
            260                 265                 270

Ser Arg Lys Asn Asn His Ser Leu His Thr Trp Ser Phe Tyr Arg Leu
        275                 280                 285

Ala Gln Phe Ile Glu Tyr Lys Ala Lys Leu Ala Gly Ile Lys Val Glu
    290                 295                 300

Tyr Val Asp Pro Ala Tyr Thr Ser Gln Ile Cys Pro Ile Cys Gly Ser
305                 310                 315                 320

Val His His Ala Asn Asp Arg Asn Tyr Thr Cys Arg Cys Gly Phe His
                325                 330                 335

Thr His Arg Asp Leu Leu Gly Ala Ile Asn Ile Cys Asn Ser Thr Glu
            340                 345                 350
```

Tyr Ile Gly Asn Arg Tyr Thr Ala
355 360

<210> 716
<211> 204
<212> PRT
<213> Anoxybacillus pushchinoensis

<400> 716

Met Ala Gln Val Ala Val Lys Val Val Glu Lys Gln Asn Asn Asp Glu
1 5 10 15

Asn Ile Met Gly Val Asp Leu Gly Leu Lys Val Pro Val Val Ala Val
20 25 30

Thr Ser Asn Ser Lys Thr Arg Phe Phe Gly Asn Gly Arg Gln Asn Lys
35 40 45

Tyr Ile Arg Arg Lys Tyr Lys Val Leu Arg Gln Gln Leu Gly Lys Ala
50 55 60

Lys Gln Leu Lys Lys Ile Lys Gln Ile Gly Asn Lys Glu Gln Arg Trp
65 70 75 80

Met Lys Asp Gln Asp His Lys Ile Ser Arg Gln Ile Val Asn Phe Ala
85 90 95

Lys Glu Asn His Val Ser Val Ile Arg Leu Glu Lys Leu Thr Asn Ile
100 105 110

Arg Asn Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu His Thr
115 120 125

Trp Ser Phe Tyr Arg Leu Ser Lys Tyr Ile Glu Tyr Lys Ala Asn Leu
130 135 140

Glu Gly Ile Lys Val Glu Tyr Val Asn Pro Lys Tyr Thr Ser Gln Lys
145 150 155 160

```
Cys Pro Lys Cys Gln Thr Leu Asn Lys Ala Asn Asp Arg Lys Tyr Val
                165                 170                 175


Cys Lys Cys Cys Gly Tyr Arg Thr His Arg Asp Arg Val Gly Ala Leu
            180                 185                 190


Asn Ile Met Lys Ala Pro Met Ala Asp Gly Val Ala
        195                 200


<210>  717
<211>  224
<212>  PRT
<213>  Bacillus mycoides

<400>  717

Met Leu Lys His Lys Leu Gly Thr Leu Arg Ile Thr Lys Lys Ser Asn
1               5                   10                  15


Lys Trp Met Ala Gln Ile Ser Val Thr Leu Pro Thr Asn Glu Arg Ala
            20                  25                  30


Gly Thr Lys Ile Leu Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val
        35                  40                  45


Ala Ile Thr Asp Asp Asp Lys Val Arg Phe Phe Gly Asn Gly Arg Gln
    50                  55                  60


Asn Lys Tyr Arg Lys Arg Lys Phe Arg Ser Val Arg Lys Lys Leu Gly
65                  70                  75                  80


Lys Asp Lys Lys Val Asn Ala Ile Arg Arg Phe Asp Asp Lys Glu Gln
                85                  90                  95


Arg Trp Met Gln Glu Lys Asp His Lys Ile Ser Arg Glu Ile Ile Asp
            100                 105                 110


Phe Ala Ile Ala Asn Gln Ile Ser Val Ile Arg Leu Glu Gln Leu Thr
        115                 120                 125
```

```
Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu
    130                 135                 140

His Thr Trp Ser Phe Tyr Arg Leu Ala Gln Phe Ile Ala Tyr Lys Ala
145                 150                 155                 160

Thr Ile Ala Gly Ile Gln Ile Glu Tyr Val Asn Pro Ala Tyr Thr Ser
                165                 170                 175

Gln Ser Cys Pro Lys Cys Ala Glu Lys Asn Lys Ala Arg Asp Arg Lys
            180                 185                 190

Tyr Lys Cys Pro Cys Gly Phe Lys Thr His Arg Asp Ile Val Gly Ala
        195                 200                 205

Met Asn Ile Arg Tyr Thr Thr Val Ile Asp Gly Asn Ser Gln Ser Ala
    210                 215                 220
```

<210> 718
<211> 351
<212> PRT
<213> Paenibacillus sp. OSY-SE

<400> 718

```
Met Gln Thr Val Thr Val Gln Ile Arg Leu Phe Pro Arg Asp Pro Ala
1               5                   10                  15

Ile Met Lys Glu Met Gly Asn Glu Tyr Ile His Thr Val Asn His Leu
            20                  25                  30

Thr Glu Gln Ala Glu Ala Ser Gly Ala Phe Pro Lys Val Thr Ser Lys
        35                  40                  45

Asp Val Glu Ala Asn Leu Pro Ser Ala Val Arg Asn Gln Ala Ile Arg
    50                  55                  60

Asp Ala Arg Ser Ile His Asn Lys Thr Lys Lys Gln Gly Lys Arg Pro
```

```
65                  70                  75                  80

Ile Leu Lys Arg Arg Ala Tyr Tyr Val Asn Asn Gln Asn Tyr Ser Phe
                85                  90                  95

Gly Asp Ser Asn Val Ser Phe Pro Val Met Met Asn Gly Lys Val Gln
            100                 105                 110

Arg Leu Thr Val Ser Val Arg Ile Thr Glu Arg Glu Gln Arg Leu Leu
        115                 120                 125

Phe Ser Asn Lys Leu Gly Leu Leu Arg Val Val Glu Lys Ser Gly Lys
    130                 135                 140

Trp Tyr Val His Ile Ala Val Glu Ile Pro Thr Glu Pro Leu Thr Ser
145                 150                 155                 160

Gly Ala Thr Met Gly Ile Asp Leu Gly Leu Lys Val Pro Ala Val Val
                165                 170                 175

Val Thr Ser Thr Gly Lys Thr Gln Phe Val Gly Asn Gly Arg Gln Asn
            180                 185                 190

Arg Tyr Met Arg Arg Lys Phe Gln Ala Arg Arg Arg Lys Met Gly Lys
        195                 200                 205

Leu Lys Lys Leu Ser Ala Ile Arg Lys Gln Gln Asn Lys Glu His Arg
    210                 215                 220

Tyr Met Lys Asp Gln Asn His Lys Ile Ser Arg Lys Ile Val Asn Met
225                 230                 235                 240

Ala Ile Glu Glu Gln Val Ser Val Ile Lys Ile Glu Lys Leu Thr Asn
                245                 250                 255

Ile Arg Gln Thr Thr Arg Thr Ser Arg Lys Asn Ala Lys Asn Leu His
            260                 265                 270
```

```
Thr Trp Ser Phe Tyr Gln Leu Gln Met Phe Ile Ala Tyr Lys Ala Ala
        275                 280                 285


Leu Ala Gly Ile Lys Val Leu Glu Val Asn Pro Ala Tyr Thr Ser Gln
    290                 295                 300


Thr Cys Pro Ala Cys Ser Lys Arg Asn Lys Ala Asp Asp Arg Thr Tyr
305                 310                 315                 320


Gln Cys Leu Cys Gly Phe His Thr His Arg Asp Arg Val Gly Ala Ile
                325                 330                 335


Asn Ile Met Arg Gln Pro Gly Ala Asp Gly Asn Ser Leu Ser Ala
            340                 345                 350


<210>  719
<211>  390
<212>  PRT
<213>  Streptomyces sp. NRRL S-146

<400>  719

Met Lys Leu Val Ile Arg Val Lys Leu Leu Pro Thr Pro Glu Gln Ala
1               5                   10                  15


Ser Ala Leu Gln Ala Thr Leu His Ala Cys Asn Ala Ala Ala Asn His
            20                  25                  30


Val Ser His Thr Ala Phe Thr Thr Gly Thr Arg Arg Asn Arg Glu Leu
        35                  40                  45


Arg Ala Leu Thr Tyr Thr Gln Val Lys Thr Arg Trp Ser Leu Gly Ala
    50                  55                  60


Gln Ala Ala Gln His Val Ile Lys Lys Thr Ala Asp Ala Tyr Ala Ala
65                  70                  75                  80


Leu Thr Gly Asn Leu Lys Ala Gly Asn Leu Gly Lys Pro Gly Ser Lys
                85                  90                  95
```

```
Arg Phe Arg Lys Ala Thr Glu Lys Pro Ile Thr Phe Arg Pro Gln Gly
            100                 105                 110

Ala Gln Pro Tyr Asp Asp Arg Met Leu Ser Trp Gln Met Pro Gln Arg
        115                 120                 125

Thr Val Ser Ile Trp Thr Val Ala Gly Arg Met Lys Arg Leu Ala Phe
    130                 135                 140

Thr Gly Glu Glu Thr Gln Leu Leu Leu Leu Ala His His Arg Gln Gly
145                 150                 155                 160

Glu Ser Asp Leu Thr Ser His Asn Gly His Trp Tyr Leu Leu Ala Thr
                165                 170                 175

Val Asp Leu Pro Glu Ser Pro Thr Thr Pro Asp Pro Arg Glu Phe Ile
            180                 185                 190

Gly Ile Asp Leu Gly Ile Thr Asn Ile Ala Thr Thr Ser Thr Gly His
        195                 200                 205

Arg His Ser Gly Arg His Leu Asn Arg Ser Arg Gln Asn Asp Arg Arg
    210                 215                 220

Asn Arg Asp Asn Leu Ala Arg Lys Gln Thr Arg Ser Ala Lys Arg Arg
225                 230                 235                 240

Ala Lys His Arg Ala Gly Arg Glu Ala Arg Arg Thr Arg Asp Ile Asn
                245                 250                 255

His Lys Ile Ser Lys His Ile Val Thr Glu Ala Gln Arg Thr Gly Arg
            260                 265                 270

Gly Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Glu Arg Ala Arg Leu
        275                 280                 285
```

```
Lys Lys Pro Gln Arg Val Thr Ile His Ser Trp Ala Phe Ala Gln Leu
    290                 295                 300

Gly Ala Phe Ile Ala Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val
305                 310                 315                 320

His Val His Pro Ala Tyr Thr Ser Gln Glu Cys Ser Arg Cys His His
                325                 330                 335

Ile Asp Lys Arg Asn Arg Pro Ala Gln Ala Val Phe Ser Cys Arg Asn
            340                 345                 350

Cys Gly Phe Val Glu His Ala Asp Leu Asn Ala Ser His Val Ile Ala
        355                 360                 365

Gly Arg Gly Trp Trp Met Trp Val Cys Gly Ala Glu Ser Gln Val Pro
    370                 375                 380

Ala Leu Thr Leu Ile Ala
385                 390
```

<210> 720
<211> 382
<212> PRT
<213> Methylocaldum sp. SAD2

<400> 720

```
Met Met Arg Thr Ala Ser Ile Arg Leu Glu Leu Ser Ala Ala Gln Ala
1               5                   10                  15

Asp Ala Leu Ala Arg Leu Arg Ala Ser Tyr Ala Asp Ala Cys Asn Arg
            20                  25                  30

Leu Val Pro Ile Val Arg Glu Tyr Arg Leu Trp Asn Arg Val Gly Leu
        35                  40                  45

His Gln Arg Thr Tyr Thr Met Leu Arg Glu Ala Thr Pro Leu Gly Ser
    50                  55                  60
```

```
Gln Met Cys Cys Asn Ala Ile Phe Ser Val Cys Lys Ala Tyr Lys Ala
65                  70                  75                  80

Gln Lys Glu Leu Gly Arg Ile Arg Lys Asp Ala Pro Val Pro Gly Ile
                85                  90                  95

Arg Phe Asp Arg Ala Ser Val His Phe Asp Lys Arg Thr Tyr Ser Leu
            100                 105                 110

Lys Gly Glu Thr Val Ser Leu Tyr Thr Leu Asp Gly Arg Ile Glu Val
        115                 120                 125

Pro Met Arg Leu Gly Glu His Gln Arg Arg Ile Leu Glu Ser Gly Lys
    130                 135                 140

Pro Lys Glu Ala Glu Leu Val Phe Arg Lys Gly Lys Trp Phe Leu Asn
145                 150                 155                 160

Leu Val Val Glu Ser Gly Asp Val Glu Pro Val Ala Ser Gly Pro Val
                165                 170                 175

Met Gly Val Asp Val Gly Glu Asn Asn Leu Ala Ala Thr Ser Thr Gly
            180                 185                 190

Lys Val Phe Gly Gly Glu His Leu Arg Asp Arg Arg Asp Arg Tyr Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Arg Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Ala Arg His Val Lys His Ile
225                 230                 235                 240

Asn His Glu Thr Ser Lys Ala Ile Val Gln Ala Ala Ile Gln Ala Gly
                245                 250                 255

Val Ala Lys Ile Thr Met Glu Asp Leu Thr His Ile Trp Glu Arg Ile
```

260 265 270

Lys Ala Gly Lys Arg Met Arg Gly Arg Leu His Arg Trp Ala Trp Arg
275 280 285

Gln Leu Gln Thr Phe Val Glu Tyr Lys Ala Lys Val Ala Gly Ile Ala
290 295 300

Val Glu Tyr Val Ser Pro Ala Tyr Thr Ser Gln Thr Cys Ser Cys Cys
305 310 315 320

Gly Gly Leu Gly Lys Arg Ser Lys His Arg Phe Glu Cys Pro His Cys
325 330 335

Gly Leu Arg Ala His Ser Asp Cys Asn Ala Ser Arg Asn Leu Ala Arg
340 345 350

Ile Gly Glu Ile Ala Val Ser Pro Arg Ala Ala Val Asn Thr Pro Asp
355 360 365

Val Gly Ser Val Asp Met Gly Asn His Val Cys Ala Ser Gln
370 375 380

<210> 721
<211> 393
<212> PRT
<213> Thermococcus sp. EXT12c

<400> 721

Met Pro Ser Glu Thr Ile Lys Leu Thr Thr Lys Phe Lys Leu Lys Glu
1 5 10 15

Thr Pro Glu Gly Leu Asp Gly Leu Phe Gln Thr Tyr Arg Glu Ile Val
20 25 30

Asn Phe Leu Ile Thr Tyr Ala Ser Glu Asn Asn Ile Thr Ser Phe Tyr
35 40 45

```
Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80

Phe Lys Ser Phe Arg Lys Arg Arg Lys Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95

Pro Val Phe Lys Arg Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Glu Lys Gly Thr Val Lys Leu Thr Thr Pro Ser Gly Arg
        115                 120                 125

Ile Gln Leu Glu Phe Tyr Pro Ala Arg Tyr His Glu Lys Phe Lys Asp
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Thr Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Lys Glu Val Lys Val Ser Glu Pro Lys Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Arg Ile Gln Gly Lys Ile Arg Ala Gly
    210                 215                 220

Lys Arg Arg Arg Glu Leu Leu Glu Lys Tyr Gly Leu Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255
```

```
Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Glu Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Lys Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350

Asn Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser Leu Thr Met Lys Thr Gly Val Gly Lys Val Ile Arg Tyr Asp
    370                 375                 380

Trp Phe Thr Ser Ser Lys Ser Ser Gly
385                 390
```

<210> 722
<211> 389
<212> PRT
<213> Rhodococcus jostii

<400> 722

```
Met Lys Arg Val Val Lys Ile Lys Leu Ala Pro Thr Asp Ala Gln Ala
1               5                   10                  15

Arg Ala Leu His Asp Thr Leu Met Leu Cys Asp Thr Ala Ala Gly Val
```

```
            20                  25                  30

Val Ser Arg Val Ala Gln Ala Ser Glu Asp Arg Arg Ala Phe Ala Leu
        35                  40                  45

Gln Lys Ala Val Tyr His Gln Leu Lys Ala Leu Gly Leu Ser Ala Gln
    50                  55                  60

Pro Ala Val Arg Thr Ile Lys Lys Val Ala Asp Ala Tyr Ala Thr Arg
65                  70                  75                  80

Gly Ala Asn Leu Glu Ala Gly Asn Tyr Gly Pro Gly Gly Gly Lys Arg
                85                  90                  95

Ala Thr Asp Ile Ala Ala Thr Ala Ile Gly Phe Arg Ala Leu Ala Ala
            100                 105                 110

Gln Pro Phe Asp Asp Arg Cys Leu Ser Trp Gln Gln Gln Gly Ser Thr
        115                 120                 125

Ile Ser Ile Trp Thr Ser Glu Gly Arg Leu Lys Ala Val Arg Tyr Val
    130                 135                 140

Cys Ala Pro Trp Gln Arg Ala Leu Leu Glu His Arg Cys Gly Glu Thr
145                 150                 155                 160

Asp Leu Val Phe Arg Asp Asn Met Trp Phe Leu His Ala Thr Val Asp
                165                 170                 175

Val Pro Ala Pro Glu Pro Val Glu Pro Val Val Val Glu Glu Phe Leu
            180                 185                 190

Gly Val Asp Leu Gly Ile Val Asn Leu Ala Val Thr Ser Asp Asp Thr
        195                 200                 205

Ala Ala Ser Ala Asp Trp Ser Ser Gly Ala Val Thr Ala Arg Arg Gly
    210                 215                 220
```

```
Lys Tyr Thr Arg Thr Arg Arg Thr Leu Gln Lys Val Gly Ser Lys Ser
225                 230                 235                 240


Ala Lys Arg Lys Leu Arg Arg Arg Arg Glu Lys Glu His Arg Tyr Ala
                245                 250                 255


Thr Asp Ile Asn His Gln Ile Ser Lys Thr Ile Val Ala Gln Ala Gln
            260                 265                 270


Arg Thr Gly Arg Gly Ile Val Leu Glu Asp Leu Ser Gly Ile Arg Glu
        275                 280                 285


Arg Val Arg Pro Ala Lys Ala Gln Arg Gln Gln Leu His Ser Trp Ala
    290                 295                 300


Tyr Ala Gln Leu Arg Asp Phe Val Thr Tyr Lys Ala Ala Ser Val Gly
305                 310                 315                 320


Val Pro Val Glu Val Ile Asn Pro Arg Asn Thr Ser Arg Thr Cys Tyr
                325                 330                 335


Pro Cys Gly His Val Asp Lys Ala Asn Arg Ile Thr Gln Asp Arg Phe
            340                 345                 350


Val Cys Arg Val Cys Gly His Val Asp Gln Ala Asp His Asn Ala Ala
        355                 360                 365


Leu Asn Ile Ala Tyr Leu Gly Tyr Val Lys Tyr Met Thr Thr Thr His
    370                 375                 380


Gly Tyr Trp Ala Ala
385


<210>  723
<211>  191
<212>  PRT
<213>  Halanaerobium sp.
```

<400> 723

```
Met Gly Ile Asp Ile Gly Leu Arg Gln Leu Ala Val Ala Ser Val Lys
1               5                  10                  15

Asn Ser Gln Gly Lys Glu Ile Asn Arg Gln Phe His Asn Gly Lys Gln
            20                  25                  30

Ala Gly Phe Ile Arg Lys Lys Tyr Arg Met Leu Arg Arg Lys Leu Gly
        35                  40                  45

Gln Ser Lys Lys Val Lys Ala Ile Lys Asn Ile Asn Asp Lys Glu Gln
    50                  55                  60

Arg Trp Met Thr Asp Leu Asn His Lys Ile Ser Arg Gln Leu Val Asn
65                  70                  75                  80

Leu Ala Val Gln Glu Gln Val Gly Thr Ile Ile Met Glu Asn Leu Glu
                85                  90                  95

Asn Ile Arg Asn Thr Ala Lys Ser Leu Asn Arg Ala Asp Arg Asn Ile
            100                 105                 110

His Asn Trp Thr Phe Tyr Gln Leu Gln Gln Phe Ile Glu Tyr Lys Ala
        115                 120                 125

Glu Leu Ala Gly Ile Lys Val Glu Tyr Ile Asn Pro Lys Tyr Thr Ser
    130                 135                 140

Gln Ser Cys Ser Arg Cys Ala Lys Val Lys Lys Ser Asn Arg Lys Ala
145                 150                 155                 160

Asn Leu Tyr Ser Cys Glu Cys Gly Asn His Ile His Ser Asp Leu Asn
                165                 170                 175

Ala Gly Arg Asn Ile Thr Asn Lys Tyr Leu Glu Gln Gln Ser Ala
            180                 185                 190
```

<210> 724
<211> 414
<212> PRT
<213> bacterium LF-3

<400> 724

```
Met Lys His Met Gln Leu Ser Glu Thr Val Lys Leu Tyr Pro Thr Glu
1               5                   10                  15


Tyr Gln Ile Glu Leu Ile Arg Asn Thr Met Ser Glu Tyr Ile Ser Thr
            20                  25                  30


Val Asn Asn Ile Val Ser Asp Tyr Thr Asn Lys Asp Asn Gly Asn Ile
        35                  40                  45


Glu Ser Val Lys Glu Ile Lys Asn Ile Lys Ser Ile Ser Lys Leu Thr
    50                  55                  60


Thr Ala Asp Val Lys Ala Lys Leu Pro Ser Ala Leu Cys Asn Gln Cys
65                  70                  75                  80


Ile Arg Asp Ala Lys Ser Ile Val Lys Lys Tyr Asp Lys Ala Cys Lys
                85                  90                  95


Glu Val Glu Lys Ala Lys Lys Asn Lys Lys Asn Lys Lys Ser Lys Lys
            100                 105                 110


Asn Lys Asn Ser Lys Asn Val Lys Glu Val Glu Glu Ile Lys Glu Val
        115                 120                 125


Lys Glu Val Lys Lys Leu Lys Glu Ile Lys Val Pro Val Leu Lys Lys
    130                 135                 140


Leu Cys Cys Tyr Ile Asn Asn Gln Asn Phe Lys Ile Gln Asp Asn Tyr
145                 150                 155                 160


Ile Ser Phe Pro Val Met Ile Asp Gly Lys Ser Lys Arg Ile Ser Val
                165                 170                 175
```

```
Lys Thr Lys Met Thr Asp Lys Gln Lys Leu Ile Leu Ser Ser His Arg
            180                 185                 190

Leu Gly Thr Met Arg Ile Val Ile Lys Asn Ile Asn Ile Leu Val Ala
        195                 200                 205

Gln Phe Val Tyr Glu Ile Asn Glu Ile Glu Lys Val Asn Glu Ser Asn
    210                 215                 220

Asn Val Met Gly Val Asp Leu Gly Ile Lys Cys Pro Ala Val Ser Tyr
225                 230                 235                 240

Cys Thr Asp Gly Ser Val Lys Phe Tyr Gly Asn Gly Arg Lys Asn Lys
                245                 250                 255

Tyr Met Arg Arg His Tyr Ala Asn Leu Arg Lys Trp Phe Gln Lys Ala
            260                 265                 270

Lys Lys Pro Thr Val Val Lys Arg Ile Lys Asn Lys Glu Gln Arg Ile
        275                 280                 285

Met Lys Asp Ile Asp His Lys Ile Ser Arg Glu Ile Val Asn Thr Ala
    290                 295                 300

Lys Lys His Lys Ala Lys Val Ile Lys Leu Glu Arg Leu Glu Asn Ile
305                 310                 315                 320

Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn Pro Ser Leu His Thr
                325                 330                 335

Trp Ser Phe Tyr Arg Leu Ala Gln Tyr Ile Glu Tyr Lys Ala Lys Leu
            340                 345                 350

Ala Gly Ile Glu Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Lys
        355                 360                 365

Cys Leu Gln Cys Gly Asn Ile His His Ala Lys Asp Arg Lys Tyr Ile
```

370 375 380

Cys Lys Cys Gly Tyr His Thr His Arg Asp Leu Leu Gly Ala Ile Asn
385 390 395 400

Ile Cys Asn Ser Thr Glu Tyr Ile Gly Asn Arg Cys Ile Ala
405 410

<210> 725
<211> 382
<212> PRT
<213> Verrucomicrobium sp. 3C

<400> 725

Met Met Arg Thr Ala Ser Ile Lys Leu Asp Ala Ser Pro Glu Gln Arg
1 5 10 15

Ala Ala Leu Ala Ala Leu Gln Ser Ala Phe Ala Asn Ala Cys Gln Arg
20 25 30

Leu Ser Ala Val Val Arg Glu His Arg Val Trp Asn Arg Val Ala Leu
35 40 45

His Gln Arg Ala Tyr Ser Glu Met Arg Ser Ser Thr Pro Leu Gly Ser
50 55 60

Gln Met Cys Cys Asn Ala Ile Phe Ser Val Cys Lys Ala Tyr Lys Ala
65 70 75 80

Leu Lys Val Thr Gly Arg Ile Pro Lys Asp Thr Pro Val Pro Ala Ile
85 90 95

Ser Phe Gln Arg Ala Ser Val His Phe Asp Lys Arg Thr Tyr Ala Leu
100 105 110

Lys Lys Asn Ala Val Ser Leu Tyr Ser Leu Gly Gly Arg Val Ile Val
115 120 125

```
Pro Met Arg Leu Gly Glu His Gln Arg Arg Ile Leu Ser Phe Gly Arg
    130                 135                 140

Pro Lys Glu Ala Glu Leu Ala Phe Arg Lys Gly Asn Trp Tyr Phe Asn
145                 150                 155                 160

Leu Val Val Glu Ser Asp Asp Lys Glu Ser Ile Ala Ser Gly Pro Val
                165                 170                 175

Met Gly Val Asp Val Gly Glu Asn Asn Leu Ala Ala His Ser Leu Gly
            180                 185                 190

Gly Ile Phe Gly Gly Gly Arg Leu Cys Asp Arg Arg Asp His His Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Arg Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Arg Arg His Val Thr His Val
225                 230                 235                 240

Asn His Glu Thr Ser Lys Ala Ile Val Arg Glu Ala Leu Glu Ala Gly
                245                 250                 255

Val Ser Lys Ile Thr Met Glu Asp Leu Thr His Ile Arg Asp Arg Ile
            260                 265                 270

Lys Ala Gly Lys Arg Met Arg Gly Arg Leu His Arg Trp Ala Phe Arg
        275                 280                 285

Gln Leu Gln Arg Phe Val Glu Tyr Lys Ala Lys Ser Ala Gly Ile Ala
    290                 295                 300

Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ser Ser Cys
305                 310                 315                 320

Lys Gln Leu Gly Arg Arg Thr Lys His Arg Phe Ala Cys Pro His Cys
                325                 330                 335
```

Gly Leu Arg Ala His Ser Asp Leu Ser Ala Ser Arg Asn Leu Ala Arg
            340   345   350

Ile Gly Gly Thr Ala Val Pro Pro Arg Ala Ala Val Ser Thr Pro Asn
        355   360   365

Val Gly Gly Ala Asp Val Gly Asn His Val Cys Ala Ser Gln
    370   375   380

<210> 726
<211> 371
<212> PRT
<213> Nitrosococcus oceani

<400> 726

Met Lys Arg Thr Val Ser Ile Lys Leu Val Pro Thr Pro Glu Gln Ala
1   5   10   15

Gln Ala Leu Leu Glu Leu Gln Ser Glu Leu Ala Lys Ala Cys Asn Leu
            20   25   30

Ile Val Pro Phe Ala Arg Asp Asn Arg Cys Trp Asn Arg Val Ala Leu
        35   40   45

His His Leu Ala Tyr Tyr Pro Val Arg Glu Ala Thr Asn Leu Gly Ser
    50   55   60

Gln Met Val Cys Asn Ala Leu Lys Ala Val Ala Asp Ala Tyr Lys Val
65   70   75   80

Leu Lys Leu Lys Lys Ser Asp Asp Ile Pro Ala Ile Arg Phe Arg Glu
                85   90   95

Thr Gly Ser Val His Phe Asp Ala Arg Thr Tyr Arg Leu Lys Gly Asp
            100   105   110

Ala Val Ser Leu Tyr Thr Leu Thr Gly Arg Ala Ile Val Lys Met Ser

```
        115                 120                 125

Pro Gly Glu Phe Gln Ala Gln Tyr Leu Ala Ala Gly Lys Pro Lys Glu
    130                 135                 140

Gly Lys Leu Val Arg Arg Gly Lys Gln Trp Phe Phe Asn Leu Val Leu
145                 150                 155                 160

Asp Trp Pro Asp Thr Ala Ser Ala Lys Gly Ser Gly Ile Leu Gly Ile
                165                 170                 175

Asp Leu Gly Glu Asn Asn Leu Ala Ser Thr Ser Ser Gly Lys Ile Leu
            180                 185                 190

Gly Gly Gly Pro Leu Arg His Val Arg Asp Arg His Leu Ala Leu Arg
        195                 200                 205

Arg Arg Leu Gln Ser Asn Gly Arg Gln Ser Ala Arg Gln Leu Leu Arg
    210                 215                 220

Lys Val Ser Ser Lys Glu Arg Arg His Met Arg Gln Val Asn His Glu
225                 230                 235                 240

Ala Ser Lys Ala Met Val Glu Glu Ala Leu Lys Gln Gly Ala Ser Thr
                245                 250                 255

Ile Val Leu Glu Thr Leu Thr His Ile Arg Lys Arg Ile Lys Gly Gly
            260                 265                 270

Lys Arg Leu Arg Phe Arg Leu His Arg Trp Ala Trp Arg Glu Leu Gln
        275                 280                 285

Asp Phe Ile Ala Tyr Lys Ala Glu Ala Ala Gly Ile Gln Val Ile Tyr
    290                 295                 300

Val Asn Pro Ala Tyr Ser Ser Lys Thr Cys Ser Ala Cys Gly Cys Leu
305                 310                 315                 320
```

Gly Ser Arg Ile Gln His Lys Phe Ser Cys Ser Ser Cys Gly His Leu
325 330 335

Ala His Ser Asp Arg Asn Ala Ala Val Asn Leu Ala Lys Leu Ala Arg
340 345 350

Ser Ile Gly Ile Ala Arg Pro Glu Val Ala Pro Ala His Val Ala Val
355 360 365

Pro Thr His
370

<210> 727
<211> 321
<212> PRT
<213> Nitrosococcus oceani AFC27

<400> 727

Met Ala Tyr Tyr Pro Val Arg Glu Ala Thr Arg Leu Gly Ser Gln Met
1 5 10 15

Val Cys Asn Ala Val Lys Ala Val Ala Asp Ala Tyr Lys Val Leu Lys
20 25 30

Leu Gly Arg His Asp Glu Ile Pro Val Ile Arg Phe Arg Glu Thr Gly
35 40 45

Ser Val His Phe Asp Ala Arg Thr Tyr Arg Leu Lys Gly Asp Ala Val
50 55 60

Ser Leu Tyr Thr Leu Thr Gly Arg Ala Ile Val Lys Met Ser Pro Gly
65 70 75 80

Glu Phe Gln Ala Gln Tyr Leu Ala Ala Gly Lys Pro Lys Glu Gly Lys
85 90 95

Leu Val Arg Arg Gly Lys Gln Trp Phe Phe Asn Leu Val Leu Asp Trp
100 105 110

```
Pro Asp Thr Ala Pro Ala Lys Gly Ser Gly Ile Leu Gly Ile Asp Leu
        115                 120                 125

Gly Glu Asn Asn Leu Ala Ser Thr Ser Ser Gly Lys Ile Leu Gly Gly
    130                 135                 140

Gly Pro Leu Arg His Val Arg Asp Arg His Leu Ala Leu Arg Arg Arg
145                 150                 155                 160

Leu Gln Ser Asn Gly Arg Gln Ser Ala Arg Gln Leu Leu Lys Lys Val
                165                 170                 175

Ser Gly Lys Glu Arg Arg His Met Arg Gln Val Asn His Glu Ala Ser
            180                 185                 190

Lys Ala Met Val Gly Glu Ala Leu Lys Gln Gly Ala Ser Thr Ile Val
        195                 200                 205

Leu Glu Thr Leu Thr His Ile Arg Lys Arg Ile Lys Gly Gly Lys Arg
    210                 215                 220

Leu Arg Ala Arg Leu His Arg Trp Ala Trp Arg Glu Leu Gln Asp Phe
225                 230                 235                 240

Ile Ala Tyr Lys Ala Glu Ala Ala Gly Ile Arg Val Ile Tyr Val Asn
                245                 250                 255

Pro Ala Tyr Ser Ser Lys Ser Cys Ser Ala Cys Gly Cys Leu Gly Ser
            260                 265                 270

Arg Ile Gln His Lys Phe Ser Cys Ser Ser Cys Gly His Leu Ala His
        275                 280                 285

Ser Asp Arg Asn Ala Ala Val Asn Leu Ala Lys Leu Ala Lys Ser Ile
    290                 295                 300
```

```
Gly Ile Ala Arg Leu Gly Val Ala Pro Ala His Val Ala Val Pro Thr
305                 310                 315                 320


His



<210>  728
<211>  388
<212>  PRT
<213>  Nocardiopsis sp. JB363

<400>  728

Met Lys Leu Val Val Arg Val Lys Leu Leu Pro Ser Pro Glu Gln Ala
1               5                   10                  15


Arg Ala Leu Gln Ala Thr Leu Arg Thr Cys Asn Glu Ala Ala Asp His
            20                  25                  30


Ala Ser Gln Val Ala Gln Ala Thr Gly Ala Thr Asn Lys Tyr Ala Leu
        35                  40                  45


Gln Arg Ala Val Tyr His Glu Leu Lys Ala Arg Phe Gly Leu Ser Ala
    50                  55                  60


Gln Pro Thr Val Arg Val Leu Gly Lys Val Cys Asp Ala Tyr Thr Thr
65                  70                  75                  80


Arg Gln Ala Asn Leu Lys Ala Gly Asn Leu Gly Arg Lys Gly Ser Pro
                85                  90                  95


Arg Arg Gln Arg Val Glu Ser Thr Pro Ile Ser Phe Arg Pro Asp Ala
            100                 105                 110


Ala Gln Pro Phe Asp Asp Arg Cys Leu Ser Trp Gln Met Asp Ala Arg
        115                 120                 125


Thr Val Ser Ile Trp Thr Val Ala Gly Arg Met Lys Asn Leu Gly Phe
    130                 135                 140
```

```
Val Thr Ser Pro Glu Gln Leu Lys Leu Leu Thr Glu Tyr Arg Gln Gly
145                 150                 155                 160

Glu Ser Asp Leu Ile Tyr Arg Asp Gly Gln Trp Phe Leu Ala Ala Thr
                165                 170                 175

Cys Glu Val Pro Glu Gln Glu Glu Asn Pro Glu Pro Val Gly Phe Met
            180                 185                 190

Gly Val Asp Leu Gly Ile Val Glu Ile Ala Thr Thr Ser Ala Gly Asp
        195                 200                 205

Arg Phe Ser Gly Arg Val Leu Asn Arg Tyr Arg Arg Lys Gln Asn Arg
    210                 215                 220

Leu Arg Ala Lys Leu Gln Arg Lys Asn Thr Lys Ser Ala Lys Arg Val
225                 230                 235                 240

Leu Lys Arg Leu Arg Arg Arg Glu Ala Arg Arg Ala Arg Glu Val Asn
                245                 250                 255

His Gln Ile Ser Lys Ser Ile Val Glu Arg Ala Glu Arg Thr Asp His
            260                 265                 270

Gly Ile Val Leu Glu Asp Leu Lys Gly Ile Arg Gly Arg Val Arg Gln
        275                 280                 285

Ala Lys Arg Gln Arg Ser Ala Leu His Ser Trp Ser Phe Ala Gln Leu
    290                 295                 300

Arg Asp Phe Ile Gly Tyr Lys Ala Arg Arg Val Gly Val Pro Val Leu
305                 310                 315                 320

Val Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ser Glu Cys Asp His
                325                 330                 335

Thr Ser Arg Arg Asn Arg Pro Thr Arg Asn Arg Phe Val Cys Arg Gln
```

340 345 350

Cys Gly Val Val Leu His Ala Asp Val Asn Ala Ser Arg Asn Leu Ala
355 360 365

His Arg Gly Gln Ala Val Trp Thr Ala Gly Arg Thr Ser Thr Ala Pro
370 375 380

Thr Pro Ser Arg
385

<210> 729
<211> 359
<212> PRT
<213> Bacillus licheniformis

<400> 729

Met Ser Gln Thr Ile Thr Val Lys Val Lys Leu Leu Leu Thr Lys Glu
1 5 10 15

Gln Glu Glu Ile Leu Asn Glu Met Ser His Thr Tyr Ile Ser Val Ile
20 25 30

Asn Gln Leu Val Ser Glu Met Val Asp Asn Lys Lys Ser Thr Lys Lys
35 40 45

Thr Ser Lys His Val Thr Ala Leu Leu Pro Gly Ser Val Lys Asn Gln
50 55 60

Ala Ile Arg Asp Ser Lys Ser Ile Phe Ser Lys Arg Val Lys Lys Ser
65 70 75 80

Asn Tyr Lys Ile Ile Pro Ile Leu Lys Lys Pro Val Cys Val Trp Asn
85 90 95

Asn Gln Asn Tyr Ser Phe Asp Phe Thr His Ile His Leu Pro Leu Thr
100 105 110

```
Ile Asp Gly Lys Thr Lys Arg Thr Pro Ile Arg Ala Leu Leu Val Asp
        115                 120                 125

Lys His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu
    130                 135                 140

Arg Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Asn
145                 150                 155                 160

Ile Ser Leu Ile Glu Lys Thr Gly Thr Lys Val Met Gly Val Asp Leu
                165                 170                 175

Gly Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Gly Lys Thr Arg
            180                 185                 190

Phe Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Lys Phe Lys
        195                 200                 205

Ser Lys Arg Lys Gln Leu Gly Lys Leu Lys Lys Leu Asn Val Ile Arg
    210                 215                 220

Lys Leu Glu Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys
225                 230                 235                 240

Ile Ser Arg Ala Ile Val Asn Phe Ala Ile Asp His Asn Ile Ser Val
                245                 250                 255

Ile Arg Leu Glu Gln Leu Thr Asn Ile Arg Gln Thr Ala Arg Thr Ser
            260                 265                 270

Leu Lys Asn Glu Lys Asn Leu His Asn Trp Ser Phe Tyr Arg Leu Ser
        275                 280                 285

Gln Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr
    290                 295                 300

Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Lys Cys Ser Glu Lys
305                 310                 315                 320
```

```
Asn Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys
                325                 330                 335


His Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Val
            340                 345                 350


Asp Gly Asn Ser Gln Pro Ala
        355


<210>  730
<211>  126
<212>  PRT
<213>  bacterium LF-3

<400>  730

Met Lys Asp Ile Asp His Lys Leu Ser Arg Glu Ile Ile Asn Thr Ala
1               5                   10                  15


Lys Ala His Asp Val Ser Val Ile Lys Leu Glu Arg Leu Gln Asn Ile
            20                  25                  30


Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn His Ser Leu His Thr
        35                  40                  45


Trp Ser Phe Tyr Arg Leu Ala Gln Phe Ile Glu Tyr Lys Ala Lys Leu
    50                  55                  60


Ala Gly Ile Lys Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Ile
65                  70                  75                  80


Cys Pro Ile Cys Gly Arg Ile Gln His Ala Lys Asp Arg Asn Tyr Ile
                85                  90                  95


Cys Arg Cys Gly Tyr His Thr His Arg Asp Leu Leu Gly Ala Ile Asn
            100                 105                 110


Ile Cys Asn Ser Thr Glu Tyr Ile Gly Asn Arg Tyr Thr Ala
```

115 120 125

<210> 731
<211> 384
<212> PRT
<213> Nocardiopsis sp. JB363

<400> 731

Met Arg Val Lys Leu Leu Pro Ser Pro Glu Gln Ala Arg Ala Leu Gln
1 5 10 15

Ala Thr Leu Arg Thr Cys Asn Glu Ala Ala Asp His Ala Ser Gln Val
20 25 30

Ala Gln Ala Thr Gly Ala Thr Asn Lys Tyr Ala Leu Gln Arg Ala Val
35 40 45

Tyr His Glu Leu Lys Ala Arg Phe Gly Leu Ser Ala Gln Pro Thr Val
50 55 60

Arg Val Leu Gly Lys Val Cys Asp Ala Tyr Thr Thr Arg Gln Ala Asn
65 70 75 80

Leu Lys Ala Gly Asn Leu Gly Arg Lys Gly Ser Pro Arg Arg Gln Arg
85 90 95

Val Glu Ser Thr Pro Ile Ser Phe Arg Pro Asp Ala Ala Gln Pro Phe
100 105 110

Asp Asp Arg Cys Leu Ser Trp Gln Met Asp Ala Arg Thr Val Ser Ile
115 120 125

Trp Thr Val Ala Gly Arg Met Lys Asn Leu Gly Phe Val Thr Ser Pro
130 135 140

Glu Gln Leu Lys Leu Leu Thr Glu Tyr Arg Gln Gly Glu Ser Asp Leu
145 150 155 160

```
Ile Tyr Arg Asp Gly Gln Trp Phe Leu Ala Ala Thr Cys Glu Val Pro
                165                 170                 175

Glu Gln Glu Glu Asn Pro Glu Pro Val Gly Phe Met Gly Val Asp Leu
            180                 185                 190

Gly Ile Val Glu Ile Ala Thr Thr Ser Ala Gly Asp Arg Phe Ser Gly
        195                 200                 205

Arg Val Leu Asn Arg Tyr Arg Arg Lys Gln Asn Arg Leu Arg Ala Lys
    210                 215                 220

Leu Gln Arg Lys Asn Thr Lys Ser Ala Lys Arg Val Leu Lys Arg Leu
225                 230                 235                 240

Arg Arg Arg Glu Ala Arg Arg Ala Arg Glu Val Asn His Gln Ile Ser
                245                 250                 255

Lys Ser Ile Val Glu Arg Ala Glu Arg Thr Asp His Gly Ile Val Leu
            260                 265                 270

Glu Asp Leu Lys Gly Ile Arg Gly Arg Val Arg Gln Ala Lys Arg Gln
        275                 280                 285

Arg Ser Ala Leu His Ser Trp Ser Phe Ala Gln Leu Arg Asp Phe Ile
    290                 295                 300

Gly Tyr Lys Ala Arg Arg Val Gly Val Pro Val Leu Val Val Asp Pro
305                 310                 315                 320

Ala Tyr Thr Ser Gln Thr Cys Ser Glu Cys Asp His Thr Ser Arg Arg
                325                 330                 335

Asn Arg Pro Thr Arg Asn Arg Phe Val Cys Arg Gln Cys Gly Val Val
            340                 345                 350

Leu His Ala Asp Val Asn Ala Ser Arg Asn Leu Ala His Arg Gly Gln
        355                 360                 365
```

```
Ala Val Trp Thr Ala Gly Arg Thr Ser Thr Ala Pro Thr Pro Ser Arg
    370                 375                 380


<210>  732
<211>  359
<212>  PRT
<213>  Bacillus mycoides

<400>  732

Met Ser Gln Thr Leu Thr Val Lys Val Lys Leu Ile Pro Thr Lys Glu
1               5                   10                  15


Gln Ile Arg Leu Leu Glu Gln Ser Ser His Glu Tyr Ile Lys Val Ile
            20                  25                  30


Asn Thr Leu Val Ser Glu Met Val Glu Ala Lys Lys Ser Thr Lys Lys
        35                  40                  45


Ser Thr Lys Asp Ile Glu Ala Asn Ile Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Leu Phe Val Thr Lys Val Lys Lys Ser
65                  70                  75                  80


Lys Tyr Lys Ile Ile Pro Ile Leu Lys Lys Pro Val Cys Val Trp Asn
                85                  90                  95


Asn Gln Asn Tyr Ser Phe Asp Ser Asn Tyr Ile Ser Val Pro Leu Met
            100                 105                 110


Ile Asn Gly Lys Ser Thr Arg Leu Lys Val Arg Ala Leu Leu Ile Asp
        115                 120                 125


Lys Asn Asn Arg Asn Leu Asp Leu Leu Thr His Lys Leu Gly Thr Leu
    130                 135                 140


Arg Ile Thr Lys Lys Ser Asp Lys Trp Ser Ala Gln Ile Ser Val Thr
```

```
145                 150                 155                 160

Leu Pro Arg Ser Glu Lys Ala Gly Thr Lys Ile Leu Gly Val Asp Leu
                165                 170                 175

Gly Leu Lys Val Pro Ala Val Ala Ile Thr Asp Asn Asp Lys Ile Arg
            180                 185                 190

Phe Phe Gly Asn Gly Arg Gln Asn Lys Tyr Arg Lys Arg Lys Phe Arg
        195                 200                 205

Ser Ala Arg Lys Lys Leu Gly Arg Asp Lys Lys Val Asn Ala Ile Arg
    210                 215                 220

Arg Phe Asn Asp Lys Glu Gln Arg Trp Met Gln Asp Lys Asp His Lys
225                 230                 235                 240

Ile Ser Arg Glu Ile Ile Asp Phe Ala Ile Glu Asn His Ile Ser Val
                245                 250                 255

Ile Arg Leu Glu Lys Leu Thr Asn Ile Arg Gln Thr Ala Arg Thr Ser
            260                 265                 270

Arg Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser
        275                 280                 285

Gln Phe Ile Ala Tyr Lys Ala Thr Leu Ala Gly Ile Lys Ile Glu Tyr
    290                 295                 300

Val Asp Pro Ala Tyr Thr Ser Gln Ser Cys Pro Lys Cys Ala Glu Lys
305                 310                 315                 320

Asn Lys Ala Gln Asp Arg Lys Tyr Lys Cys Ser Cys Gly Phe Glu Thr
                325                 330                 335

His Arg Asp Ile Val Gly Ala Met Asn Ile Arg Tyr Ala Thr Val Ile
            340                 345                 350
```

Asp Gly Asn Ser Gln Ser Ala
        355

<210> 733
<211> 358
<212> PRT
<213> Bacillus sp. FJAT-46582

<400> 733

Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1   5   10   15

Gln Asp Leu Thr Leu Thr Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
            20   25   30

Asn Asp Leu Val Ser Glu Met Val Lys Glu Lys Lys Ser Thr Lys Lys
        35   40   45

Thr Ser Lys Asn Ile Gly Ala Ser Leu Pro Ser Ala Val Lys Asn Gln
    50   55   60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Thr Lys
65   70   75   80

Phe Glu Thr Ile Pro Val Leu Lys Lys Pro Thr Cys Ile Trp Asn Asn
                85   90   95

Gln Asn Tyr Ser Leu Asp Phe Thr His Ile Ser Leu Pro Ile Met Ile
            100   105   110

Asp Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Ile Asp Lys
        115   120   125

Glu Asn Arg Asn Phe Asn Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130   135   140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Thr
145   150   155   160

```
Pro Thr Pro Gln Lys Thr Gly Phe Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Gly Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Lys Lys Arg Lys Phe Arg Ser
        195                 200                 205

Val Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Ser
    210                 215                 220

Ser Lys Asn Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Glu Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Lys Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Val Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Cys Ala Pro Val Ile Asp
            340                 345                 350
```

Gly Asn Ser Gln Ser Ala
        355

<210> 734
<211> 358
<212> PRT
<213> Bacillus sp. FJAT-46582

<400> 734

Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1   5   10   15

Gln Asp Leu Thr Leu Thr Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
            20   25   30

Asn Asp Leu Val Ser Glu Met Val Lys Glu Lys Lys Ser Thr Lys Lys
        35   40   45

Thr Ser Lys Asn Ile Gly Ala Ser Leu Pro Ser Ala Val Lys Asn Gln
    50   55   60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Thr Lys
65   70   75   80

Phe Glu Thr Ile Pro Val Leu Lys Lys Pro Thr Cys Ile Trp Asn Asn
                85   90   95

Gln Asn Tyr Ser Leu Asp Phe Thr His Ile Ser Leu Pro Ile Met Ile
            100   105   110

Asp Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Ile Asp Lys
        115   120   125

Glu Asn Arg Asn Phe Asn Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130   135   140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Thr
145   150   155   160

```
Pro Thr Pro Gln Lys Thr Gly Phe Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Gly Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Lys Lys Arg Lys Phe Arg Ser
        195                 200                 205

Val Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Ser
    210                 215                 220

Ser Lys Asn Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Glu Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Lys Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Ser Pro Val Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Cys Ala Pro Val Ile Asp
            340                 345                 350

Gly Asn Ser Gln Ser Ala
```

355

<210> 735
<211> 380
<212> PRT
<213> Ectothiorhodospira sp. PHS-1

<400> 735

Met Met Arg Thr Ala Ser Ile Arg Leu Glu Val Ser Ala Glu Gln Ala
1 5 10 15

Ser Ala Leu Ala Ala Leu Arg Thr Ala Tyr Ala Asp Ala Cys Asn Arg
20 25 30

Leu Val Pro Ile Val Arg Glu Tyr Arg Leu Trp Asn Trp Val Gly Leu
35 40 45

His Gln Arg Thr Tyr Ser Asn Leu Arg Glu Ala Thr Pro Leu Gly Ser
50 55 60

Gln Met Cys Cys Asn Val Ile Phe Ser Val Cys Lys Ala Tyr Lys Ala
65 70 75 80

Gln Lys Glu Leu Gly Arg Ile Arg Lys Asp Glu Pro Ile Pro Glu Ile
85 90 95

Arg Phe Asp Arg Leu Ser Val His Phe Asp Lys Arg Thr Tyr Thr Leu
100 105 110

Lys Asn Asp Ala Val Thr Leu Tyr Thr Leu Asp Gly Arg Ile Lys Val
115 120 125

Ala Met Arg Pro Gly Glu His Gln Arg Arg Ile Leu Thr Ser Gly Gln
130 135 140

Pro Lys Glu Ala Glu Leu Val Leu Arg Lys Gly Gln Trp Phe Phe Asn
145 150 155 160

```
Leu Val Val Glu Ser Gly Asp Ala Glu Pro Val Ala Ser Gly Pro Val
                165                 170                 175

Met Gly Val Asp Val Gly Glu Asn Thr Leu Ala Ala His Ser Leu Gly
            180                 185                 190

Lys Val Phe Gly Gly Asp Pro Leu Arg Asp Lys Arg Asp Arg Tyr Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Ala Arg Arg Val Lys His Ile
225                 230                 235                 240

Asn His Glu Thr Ser Lys Ala Ile Val Gln Thr Ala Ile Gln Ala Gly
                245                 250                 255

Val Ala Lys Ile Thr Met Glu Asp Leu Thr His Ile Arg Ser Arg Ile
            260                 265                 270

Lys Ala Gly Lys Arg Met Arg Gly Arg Leu His Arg Trp Ala Trp Arg
        275                 280                 285

Gln Leu Gln Ser Phe Val Glu Tyr Lys Ala Lys Ala Ala Gly Ile Ala
    290                 295                 300

Val Glu Tyr Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Ser Asp Cys
305                 310                 315                 320

Gly Ser Ile Gly Lys Arg Ser Lys His Arg Phe Val Cys Glu His Cys
                325                 330                 335

Gly Leu Arg Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Arg
            340                 345                 350

Ile Gly Ser Gly Ala Pro Leu Ser Arg Ala Ala Val Asn Thr Pro Asp
        355                 360                 365
```

```
Val Gly Asn Gly Ile Asn His Ala Leu Val Ser Gln
    370                 375                 380


<210>  736
<211>  400
<212>  PRT
<213>  Thermoproteus tenax

<400>  736

Met Arg Gly Cys Ser Pro Met Thr Ser Val Val Leu Thr Val Val Gly
1               5                   10                  15


Lys Val Ile Glu Pro Asn Lys Gly Lys Thr Leu Glu Leu Asn Arg Ala
            20                  25                  30


Leu Glu Glu Tyr Leu Lys Leu Val Arg Trp Tyr Val Gly Phe Gly Ile
        35                  40                  45


Thr Ser Lys Thr Lys Leu His Glu Leu Thr Tyr Glu Glu Ala Lys Lys
    50                  55                  60


Arg Phe Ser Leu Asn Thr Ala Leu Ile Gln Thr Ala Arg Asp Lys Ala
65                  70                  75                  80


Val Glu Ile Leu Lys Ser Phe Ser Glu Arg Lys Ala Glu Gly Arg Ala
                85                  90                  95


Lys Ala Asp Arg Pro Ala Val Lys Arg Val Ser Ile Arg Leu Asp Arg
            100                 105                 110


Arg Ala Phe Lys Leu Asp Lys Ser Ser Thr Lys Leu Thr Pro Tyr Trp
        115                 120                 125


Leu Val Val Ser Leu Arg Arg Gly Val Arg Ile Ala Leu Pro Leu Ala
    130                 135                 140


Phe Gly Ser Arg Gln Lys Gln Phe Ile Glu Glu Thr Leu Gln Gly Leu
```

```
145                 150                 155                 160

Trp Glu Leu Asp Ser Val Glu Leu Val Lys Arg Asp Gly Val Trp Phe
                165                 170                 175

Ala His Phe Lys Ile Lys Lys Asn Val Val Thr Tyr Gly Ala Glu Glu
            180                 185                 190

Ala Lys Thr Leu Ile Gly Val Asp Leu Gly Glu Trp Asn Ala Val Ala
        195                 200                 205

Ala Ala Ala Ile Ser Arg Asp Ser Pro Ser Arg Pro Met Arg Gly Gln
    210                 215                 220

Phe Trp Gly Gly Gln Arg Ile Arg Phe Val Arg Gly Lys Tyr Ala His
225                 230                 235                 240

Ile Arg Arg Ser Leu Gln Arg Lys Lys Arg Leu Asp Leu Val Lys Arg
                245                 250                 255

Ile Gly Ser Lys Glu Gly Arg Thr Val Asn Gln Met Leu His Glu Ile
            260                 265                 270

Ala Lys Gly Val Val Glu Tyr Ala Lys Gln Phe Pro Lys Pro Val Ile
        275                 280                 285

Val Met Glu Asp Leu Glu Gly Ile Arg Asp Arg Met Ser Gly Asp Asn
    290                 295                 300

Lys Leu Leu Asn Arg Arg Leu His Ser Trp Ser Phe Arg Lys Leu Gln
305                 310                 315                 320

Lys Tyr Ile Glu Tyr Lys Ala Leu Leu Ser Gly Ile Pro Ile Val Tyr
                325                 330                 335

Val Lys Pro Lys Asn Thr Ser Arg Thr Cys His Arg Cys Gly Phe Thr
            340                 345                 350
```

```
Val Asp Glu Val Lys Gly Arg Glu Phe Arg Cys Pro Arg Cys Gly Leu
        355                 360                 365


Arg Tyr Asn Arg Asp Leu Asn Ala Ala Ile Asn Ile Ala Leu Ala Leu
    370                 375                 380


Thr Arg Gly Arg Gly Trp Gly Ala Val Thr Pro Pro Arg Thr Pro Thr
385                 390                 395                 400


<210>  737
<211>  354
<212>  PRT
<213>  Paenibacillus sp. FSL R7-0333

<400>  737

Met Gln Ser Val Thr Ile Lys Ile Arg Phe Phe Pro Asn Asn Ser Ile
1               5                   10                  15


Glu Leu Lys Ser Leu Ser Asn Glu Tyr Ile Arg Val Ile Asn Leu Leu
            20                  25                  30


Thr Glu Gln Ala Glu Gln Ala Glu Gln Ala Gly Ala Phe Pro Lys Leu
        35                  40                  45


Thr Thr Lys His Val Ala Ala Thr Leu Pro Ser Ala Val Ile Asn Gln
    50                  55                  60


Ala Ile Arg Asp Ala Lys Ser Ile Phe Lys Lys Val Lys Lys Asp Arg
65                  70                  75                  80


Lys Arg Pro Ile Leu Lys Lys Pro Thr Tyr Tyr Ile Asn Asn Gln Asn
                85                  90                  95


Tyr Ser Ile Arg Asp Ser Ser Ile Ala Phe Pro Ile Ile Ile Asn Asn
            100                 105                 110


Ile Val Lys Lys Thr Val Phe Pro Ala Val Leu Thr Glu Arg Asp Lys
        115                 120                 125
```

```
Lys Tyr Leu Gln Tyr Ala Lys Cys Gly Leu Met Arg Ile Val Glu Lys
    130                 135                 140

Ser Gly Lys Trp Phe Ala Gln Val Ser Leu Glu Val Pro Thr Glu Ile
145                 150                 155                 160

Thr Thr Gly Glu His Val Met Gly Val Asp Leu Gly Leu Lys Phe Pro
                165                 170                 175

Ala Val Ala Val Thr Ser Gly Gly Lys Thr Gly Phe Phe Gly Asn Ala
            180                 185                 190

Arg Glu Asn Lys Tyr Arg Lys Arg Lys Phe Arg Ser Glu Arg Lys Val
        195                 200                 205

Leu Gly Lys Lys Lys Lys Leu His Ala Ile Arg Arg Leu Asp Asn Lys
    210                 215                 220

Glu Gln Arg Trp Met Lys Asp Arg Asp His Lys Ala Ser Arg Gln Ile
225                 230                 235                 240

Ile Asn Phe Ala Thr Lys Asn Gln Val Ser Val Ile His Leu Glu Lys
                245                 250                 255

Leu Thr Asn Ile Arg Lys Thr Thr Arg Thr Ser Arg Lys Asn Glu Lys
            260                 265                 270

Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln Phe Ile Glu Tyr
        275                 280                 285

Lys Ala Asn Met Ala Gly Ile Lys Val Glu Tyr Val Asp Pro Ala Tyr
    290                 295                 300

Thr Ser Gln Lys Cys Pro Ser Cys Ser Ala Leu Asn Lys Ala Thr Asp
305                 310                 315                 320
```

```
Arg Lys Tyr Ser Cys Leu Cys Gly Phe His Thr His Arg Asp Lys Val
                325                 330                 335


Gly Ala Met Asn Ile Ile His Ala Pro Val Ile Gly Gly Asn Ser Arg
            340                 345                 350


Ser Ala
```

<210> 738
<211> 358
<212> PRT
<213> Bacillaceae

<400> 738

```
Met Ser Gln Thr Ile Thr Val Gln Val Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Ser Glu Met Ser Gln Ser Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Thr Leu Val Ser Glu Met Val Ala Glu Lys Lys Ser Thr Lys Lys
        35                  40                  45


Ser Ser Lys Asn Ile Ser Ala Ala Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Asn Lys
65                  70                  75                  80


Tyr Lys Val Ile Pro Val Leu Lys Lys Pro Val Cys Ile Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Leu Thr His Ile Leu Met Pro Ile Met Val
            100                 105                 110


Asn Gly Lys Ala Thr Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Lys
        115                 120                 125
```

```
Asp Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Val Thr Lys Lys Thr Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Pro Ile Gln Gly Thr Asp Leu Lys Val Met Gly Ile Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Lys Arg Lys Phe Arg Ser
        195                 200                 205

Glu Arg Lys Thr Leu Gly Lys Arg Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Ser Lys Asp Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Ile Asp Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Lys Leu Ala Asn Ile Arg Gln Thr Ala Ser Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Asn Trp Ser Phe Tyr Arg Leu Ala Lys
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Met Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Lys Cys Phe Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
```

325 330 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
340 345 350

Gly Asn Ser His Ser Ala
355

<210> 739
<211> 376
<212> PRT
<213> Streptomyces sp. CdTB01

<400> 739

Met Pro Glu Ala Glu Gln Ala Ala Ala Leu Ser Ala Thr Leu Arg Ala
1 5 10 15

Val Asn Asp Leu Ala Cys Trp Val Ser Asp Val Ala Phe Ala His Gly
20 25 30

Val Pro Arg Glu Tyr Glu Leu Arg Lys Arg Thr Tyr Pro Arg Leu Lys
35 40 45

Ala Glu Gly Leu Gly Ala Gln Ala Ala Gln His Thr Ile Lys Lys Val
50 55 60

Arg Asp Ala Tyr Thr Ala Leu Arg Ala Asn Val Arg Ala Gly Asn Leu
65 70 75 80

Gly Lys Glu Gly Ser Lys Arg Arg Arg Lys Ala Glu Ser Lys Pro Ile
85 90 95

Thr Phe Arg Pro Glu Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser
100 105 110

Trp Lys Tyr Asp Gln Gln Thr Val Ser Ile Trp Thr Thr Glu Gly Arg
115 120 125

```
Leu Lys Gly Val Arg Phe Val Cys Ser Ala Ser Ala Leu Lys Val Leu
    130                 135                 140

Gln Gln Tyr Arg Lys Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Val
145                 150                 155                 160

Phe Tyr Leu Ile Ala Thr Cys Glu Val Pro Glu Ala Glu Pro Tyr Glu
                165                 170                 175

Pro Gly Gly Phe Ile Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr
            180                 185                 190

Thr Ser Thr Gly Tyr Gln Ala Ala Gly Arg Arg Leu Asn Arg Tyr Arg
        195                 200                 205

Lys Arg Gln Leu Ala Leu Arg Ala Lys Leu Gln Lys Lys Arg Thr Lys
    210                 215                 220

Ser Ala Lys Arg Arg Leu Lys Glu Arg Ser Arg Arg Glu Gln Arg His
225                 230                 235                 240

Ala Lys Asn Thr Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala
                245                 250                 255

Glu Arg Thr Ser Ala Gly Ile Ser Leu Glu Glu Leu Lys Gly Ile Arg
            260                 265                 270

Gln Arg Val Arg Leu Arg Lys Pro Gln Arg Val Ala Leu His Ser Trp
        275                 280                 285

Ala Phe Ala Gln Leu Gly Glu Phe Ile Val Tyr Lys Ala Lys Arg Ala
    290                 295                 300

Gly Val Pro Leu Val Phe Val Asp Pro Ala Tyr Ser Ser Arg Glu Cys
305                 310                 315                 320

Ala Glu Cys Gly His Ile Asp Arg Leu Asn Arg Ile Ser Gln Ala Thr
                325                 330                 335
```

```
Phe Val Cys Arg Ser Cys Gly Ile Val Ala His Ala Asp Arg Asn Ala
            340                 345                 350


Ser His Val Leu Gly Arg Arg Gly Glu Asp Ala Trp Thr Ala Gly Arg
        355                 360                 365


Glu Ser Arg Val Pro Ala Ile Pro
    370                 375
```

<210> 740
<211> 126
<212> PRT
<213> uncultured Clostridium sp.

<400> 740

```
Met Lys Asp Ile Asp His Lys Leu Ser Arg Glu Ile Ile Asn Thr Ala
1               5                   10                  15


Lys Ala His Asp Val Ser Val Ile Lys Leu Glu Arg Leu Gln Asn Ile
            20                  25                  30


Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn His Ser Leu His Thr
        35                  40                  45


Trp Ser Phe Tyr Arg Leu Ala Thr Phe Ile Glu Tyr Lys Ala Lys Leu
    50                  55                  60


Ala Gly Ile Lys Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Ile
65                  70                  75                  80


Cys Pro Ile Cys Gly Ser Val His His Ala Asn Asp Arg Asn Tyr Thr
                85                  90                  95


Cys Arg Cys Gly Phe His Thr His Arg Asp Leu Leu Gly Ala Ile Asn
            100                 105                 110


Ile Cys Asn Ser Thr Glu Tyr Ile Gly Asn Arg Tyr Thr Ala
```

115 120 125

<210> 741
<211> 256
<212> PRT
<213> Halorubrum distributum

<400> 741

Val Arg Thr Val Trp Thr Gly Glu Lys Trp Glu Leu His Phe Val Cys
1 5 10 15

Lys Val Glu Val Glu Val Ala Glu Ala Pro Gly Glu Lys Ala Val Gly
20 25 30

Val Asp Leu Gly Ile Asn Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly
35 40 45

His Ser Glu Leu Tyr Pro Leu Asn Cys Leu Lys Gln Asp Asp Tyr Tyr
50 55 60

Phe Ser Lys Arg Ile Ala Arg Cys Asp Asp Ser Asn Ser Glu Gln Ala
65 70 75 80

Thr Arg Leu Asn Gln Lys Lys Ser Ala Arg Arg Thr His Tyr Phe His
85 90 95

Thr Leu Ser Lys His Ile Val Glu Arg Cys Val Asp Glu Gly Val Gly
100 105 110

Thr Ile Val Val Gly Asn Leu Ser Gly Ile Arg Glu Asp Asp Asp Ser
115 120 125

Asp Glu Ser Arg Asn Trp Gly Lys His Gly Asn Leu Asp Leu His Ser
130 135 140

Trp Ala Phe Asp Arg Phe Thr Asp Leu Leu Glu Tyr Lys Ala Glu Met
145 150 155 160

```
Glu Gly Ile Thr Val Glu Glu Val Ser Glu Glu Asp Thr Ser Lys Ser
                165                 170                 175

Cys Ser Cys Cys Gly Arg Lys Arg Asp Ala Asn Arg Val Glu Arg Gly
            180                 185                 190

Leu Tyr Val Cys Asp Glu Cys Gly Thr Val Ala Asn Ala Asp Val Asn
        195                 200                 205

Gly Ala Glu Asn Ile Arg Gln Lys Val Ser Pro Ser Pro Ala Thr Asp
    210                 215                 220

Gly Gly Asp Arg Ser Asn Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu
225                 230                 235                 240

Phe Asp Lys Glu Thr Gly Ala Phe Ala Pro Gln Glu Arg Ala Thr Ser
                245                 250                 255
```

<210> 742
<211> 376
<212> PRT
<213> Halobacillus hunanensis

<400> 742

```
Met Gly Gly Glu Asn Met Ala Thr Lys Thr Ile Leu Val Lys Leu Lys
1               5                   10                  15

His Val Thr Lys Lys Lys His Lys Gln Phe Met Glu Glu Gln Ala Val
            20                  25                  30

Tyr Ala Ser Cys Val Asn His Cys Val Glu Arg Leu Leu Asn Gly Glu
        35                  40                  45

Lys Leu Ser Ser Lys Asp Val Ser Phe Pro Leu Lys Ser Ala Ile Lys
    50                  55                  60

Asn Glu Gly Ile Arg Arg Ala Lys Lys Ala Val Ser Asp Phe Lys Lys
65                  70                  75                  80
```

```
Gly Ile Ala Lys Thr Ile Pro Val Phe Arg Asn Ser Leu Asn Ile Lys
               85                  90                  95

Ile Asn Asn Gln Asn Trp Asn Thr Val Asp Lys Asn Gly Arg Trp Tyr
            100                 105                 110

Ile Ala Phe Thr Ser Asn Gln Gly Lys Lys Ala Leu Pro Val Val Glu
        115                 120                 125

Thr Lys Asp Val Gln Ser Tyr Phe Pro Phe Leu Thr Ser His Thr Arg
    130                 135                 140

Glu Phe Arg Gly Thr Val Glu Leu Phe Arg Lys Gly Arg Arg Trp Tyr
145                 150                 155                 160

Val Ala Ile Pro Ile Gln Val Ser Ser Asp Leu Asp Leu Gly Asn Asn
               165                 170                 175

His Pro Ser Val Thr Lys Pro Leu Thr Asp Tyr Thr Ser Ile Gly Val
            180                 185                 190

Asp Leu Gly Leu Arg His Leu Val Val Leu Ser Glu Pro Thr Ser Gly
        195                 200                 205

Lys Arg Gln Phe Phe Ser Gly Lys Glu Val Gly Tyr Lys Arg Arg His
    210                 215                 220

Phe Arg Ser Leu Arg Arg Ser Leu Gly Lys Lys Lys Ala Gln Arg Ala
225                 230                 235                 240

Met Glu Arg Val Gly Gln Lys Glu Ser Arg Trp Met Lys Asp Tyr Asn
               245                 250                 255

Arg Lys Leu Ala Gln Asp Ile Val Thr Phe Ala Gln Gln Phe Glu Arg
            260                 265                 270

Pro Met Ile Lys Leu Glu Gln Leu Glu Asn Ile Arg Lys Thr Cys Arg
```

```
        275                 280                 285

Ser Met Lys Arg Ala Asp Lys Thr Ile His Ser Trp Ala Phe Tyr Gln
    290                 295                 300

Leu Lys Gln Cys Ile Lys Glu Arg Ala Ala Thr Phe Asn Ile Pro Val
305                 310                 315                 320

Val Asp Ile Asp Pro Tyr Gln Thr Ser Gln Thr Cys Phe Ala Cys Lys
                325                 330                 335

His Ala Glu Arg Ser Asn Arg Asn Arg Glu Ala Phe His Cys Lys Asn
            340                 345                 350

Cys Gly His Lys Ala His Ala Asp Leu Asn Ala Ser Arg Asn Ile Ala
        355                 360                 365

Thr Ser Thr Asn Leu Ala Ala Ser
    370                 375


<210>  743
<211>  389
<212>  PRT
<213>  Thermococcus celer

<400>  743

Met Pro Asn Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Asn
1               5                   10                  15

Pro Pro Asn Gly Leu Asp Asn Leu Ile Gln Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn Thr Leu Ile Thr His Ala His Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60
```

```
Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80

Tyr Lys Ser Tyr Arg Lys Arg Asn Lys Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95

Pro Ala Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Asp Arg Lys Ile Ile Lys Leu Ser Thr Pro Asn Gly Arg
        115                 120                 125

Ile Ser Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Arg Gly
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Lys Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Val Asn Val Val Phe Ser Thr Glu Val Glu Ala Gln Glu Pro Lys Ser
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Val Arg Thr
        195                 200                 205

Gly Tyr Tyr Val Lys Arg Arg Arg Ile Gln Arg Lys Leu Lys Ala Gly
    210                 215                 220

Lys Lys Arg Lys Lys Leu Leu Glu Lys Tyr Gly Glu Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Val Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Glu Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Asn Ile Arg
            260                 265                 270
```

```
Glu Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Ser Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Arg Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly Tyr Arg Gly Val Lys
                325                 330                 335

Cys Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350

Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro Glu
        355                 360                 365

Ser His Ser Met Lys Met Gly Gly Trp Lys Val Gly Arg Asn Asp Val
    370                 375                 380

Tyr Lys Ser Tyr Gly
385
```

<210> 744
<211> 358
<212> PRT
<213> Bacillus thermoamylovorans

<400> 744

```
Met Ser Gln Thr Val Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15

Gln Ala Leu Thr Leu Thr Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
            20                  25                  30

Asn Asp Leu Val Ser Glu Met Val Lys Glu Lys Lys Asn Thr Lys Lys
```

```
        35                  40                  45

Thr Ser Lys Asn Ile Asp Val Ser Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Thr Lys
65                  70                  75                  80

Phe Glu Thr Val Pro Val Leu Lys Lys Pro Met Cys Ile Trp Asn Asn
                85                  90                  95

Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Tyr Leu Pro Ile Met Ile
            100                 105                 110

Asp Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Lys
        115                 120                 125

Asp Asn Arg Asn Phe Asn Leu Leu Lys Gln Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Val Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Val Lys Lys Thr Gly Val Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Ile Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Glu Asn Lys Tyr Lys Lys Arg Lys Phe Arg Ser
        195                 200                 205

Val Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Ser Lys Asn Lys Glu Gln Arg Trp Met Lys Asp Lys Asp His Lys Ile
225                 230                 235                 240
```

```
Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Val Ser Val Ile
                245                 250                 255


Arg Leu Glu Arg Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270


Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285


Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Glu Val Glu Tyr Val
    290                 295                 300


Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Arg Cys Ser Glu Lys Asn
305                 310                 315                 320


Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335


Arg Asp Ile Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Val Asp
            340                 345                 350


Gly Asn Ser Gln Pro Ala
        355


<210>  745
<211>  126
<212>  PRT
<213>  uncultured Clostridium sp.

<400>  745

Met Lys Asp Ile Asp His Lys Leu Ser Arg Glu Ile Val Asn Thr Ala
1               5                   10                  15


Lys Ala His Asp Val Ser Val Ile Lys Leu Glu Gln Leu Gln Asn Ile
            20                  25                  30


Arg Ser Thr Thr Arg Thr Ser Arg Lys Asn Asn His Ser Leu His Thr
        35                  40                  45
```

```
Trp Ser Phe Tyr Arg Leu Ala Thr Phe Ile Glu Tyr Lys Ala Lys Leu
    50                  55                  60

Ala Gly Ile Glu Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Ile
65                  70                  75                  80

Cys Pro Ile Cys Gly Ser Val His His Ala Asn Asp Arg Asn Tyr Thr
                85                  90                  95

Cys Arg Cys Gly Phe His Thr His Arg Asp Leu Leu Gly Ala Ile Asn
            100                 105                 110

Ile Cys Asn Ser Thr Glu Tyr Ile Gly Asn Arg Tyr Thr Ala
        115                 120                 125
```

<210> 746
<211> 358
<212> PRT
<213> Gracilibacillus timonensis

<400> 746

```
Met Ser Gln Thr Ile Thr Ile Lys Val Lys Leu Ile Pro Thr Lys Glu
1               5                   10                  15

Gln Ala Ser Ile Leu Ser Glu Met Ser Lys Thr Tyr Ile Ser Val Ile
            20                  25                  30

Asn Thr Leu Val Ser Glu Met Val Asp Glu Lys Lys Ser Thr Lys Lys
        35                  40                  45

Ser Ser Lys Asp Ile Ser Val Ser Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Gly Lys Lys Ser Lys
65                  70                  75                  80

Tyr Lys Val Ile Pro Ile Leu Lys Lys Thr Val Cys Val Trp Asn Asn
```

```
                85                  90                  95

Gln Asn Tyr Ser Phe Asp Ser Thr His Ile Ser Met Pro Ile Met Met
            100                 105                 110

Asp Gly Lys Ala Lys Lys Ile Pro Ile Arg Ala Leu Phe Met Asp Lys
        115                 120                 125

Asp Asn Arg Asn Met Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ala Asn Lys Trp Met Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Val Gln Gly Thr Gly Leu Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Lys Arg Lys Phe Arg Ser
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Arg Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Ser Lys Asp Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Gln Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Asp His Arg Val Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285
```

```
Phe Met Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Thr Cys Phe Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Thr Cys Lys Cys Gly Phe Lys Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350

Gly Asn Ser Gln Ser Ala
        355
```

<210> 747
<211> 388
<212> PRT
<213> Streptomycetaceae bacterium MP113-05

<400> 747

```
Met Pro Gly Met Lys Ile Val Thr Gln Val Lys Leu Ile Pro Glu Ala
1               5                   10                  15

Asp Gln Ala Ala Ala Leu Ser Ala Thr Leu Arg Thr Val Asn Asp Leu
            20                  25                  30

Ala Cys Trp Val Ser Glu Val Ala Phe Ala His Gly Val Pro Arg Glu
        35                  40                  45

Tyr Glu Leu Arg Lys Tyr Thr Tyr Pro Arg Leu Lys Ala Glu Gly Leu
    50                  55                  60

Gly Ala Gln Ala Ala Gln His Val Ile Lys Lys Val Arg Asp Ala Tyr
65                  70                  75                  80

Thr Thr Leu His Ala Asn Ile Arg Ala Gly Asn Leu Gly Lys Ser Lys
                85                  90                  95
```

```
Ser Lys Arg Arg Val Lys Ala Gly Ser Arg Pro Ile Thr Phe Arg Ser
            100                 105                 110

Glu Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp
        115                 120                 125

Ala Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Lys Ser Val
    130                 135                 140

Arg Phe Val Cys Ser Ala Asp Ala Leu Lys Thr Leu Arg Glu Tyr Arg
145                 150                 155                 160

Lys Gly Glu Ala Asp Leu Ile Glu Cys Asp Gly Val Phe Tyr Leu Ile
                165                 170                 175

Ala Thr Cys Glu Val Pro Glu Ala Glu Thr Tyr Glu Pro Asp Cys Phe
            180                 185                 190

Ile Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Thr Ala
        195                 200                 205

Tyr Gln Ala Ala Gly Arg Gly Leu Ser Arg Tyr Arg Lys Arg Gln Val
    210                 215                 220

Ala Leu Arg Ala Lys Leu Gln Lys Lys Cys Thr Lys Ser Ala Lys Arg
225                 230                 235                 240

Arg Leu Lys Glu Arg Ser Arg Arg Glu Ala Arg His Val Lys Asn Thr
                245                 250                 255

Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala Glu Arg Thr Ser
            260                 265                 270

Ala Gly Ile Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg
        275                 280                 285
```

```
Leu Arg Lys Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln
    290                 295                 300

Leu Gly Asp Phe Ile Val Tyr Lys Ala Lys Arg Ala Gly Val Pro Leu
305                 310                 315                 320

Val Phe Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ala Glu Cys Gly
                325                 330                 335

His Val Asp Lys Arg Asn Arg Val Asp Gln Gly Leu Phe Ile Cys Arg
            340                 345                 350

Gly Cys Gly Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile
        355                 360                 365

Ala Thr Arg Gly Glu Thr Val Trp Asn Ala Gly Arg Glu Ser Arg Val
    370                 375                 380

Pro Ala Thr Pro
385
```

<210> 748
<211> 253
<212> PRT
<213> Verrucomicrobium sp. 3C

<220>
<221> misc_feature
<222> (105)..(105)
<223> Xaa can be any naturally occurring amino acid

<400> 748

```
Met Arg Leu Gly Glu His Gln Arg Arg Ile Leu Ser Ser Gly Arg Pro
1               5                   10                  15

Lys Glu Ala Glu Leu Val Phe Arg Lys Gly Asn Trp Tyr Phe Asn Leu
            20                  25                  30

Val Val Glu Ser Asp Asp Lys Glu Ser Ile Ala Ser Gly Pro Val Met
```

```
        35                  40                  45

Gly Val Asp Val Gly Glu Asn Asn Leu Ala Ala His Ser Leu Gly Gly
    50                  55                  60

Ile Phe Gly Gly Gly Arg Leu Cys Asp Arg Arg Asp Arg His Leu Ala
65                  70                  75                  80

Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Arg Ser Ala Lys Gln Lys
                85                  90                  95

Leu Arg Gln Val Ser Gly Lys Glu Xaa Arg His Val Thr His Val Asn
            100                 105                 110

His Glu Thr Ser Lys Ala Ile Val Arg Glu Ala Leu Glu Ala Gly Val
        115                 120                 125

Ala Lys Ile Met Met Glu Asp Leu Thr His Ile Arg Asp Arg Ile Lys
    130                 135                 140

Ala Gly Lys Arg Met Arg Gly Arg Leu His Arg Trp Thr Phe Arg Gln
145                 150                 155                 160

Leu Gln Arg Phe Val Glu Tyr Lys Ala Lys Ser Ala Gly Ile Ala Val
                165                 170                 175

Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ser Ser Cys Lys
            180                 185                 190

Gln Leu Gly Arg Arg Thr Lys His Arg Phe Ala Cys Pro His Cys Gly
        195                 200                 205

Leu Arg Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Arg Ile
    210                 215                 220

Gly Gly Thr Met Val Pro Pro Arg Ala Ala Val Ser Thr Pro Asn Val
225                 230                 235                 240
```

```
Gly Gly Ala Asp Val Gly Asn His Val Cys Ala Ser Arg
                245                 250


<210>  749
<211>  353
<212>  PRT
<213>  Paenibacillus sp. PDC88

<400>  749

Met Gln Pro Ile Thr Val Lys Ile Arg Phe Phe Pro Lys Asp Ile Ser
1               5                   10                  15


Gly Leu Lys Glu Leu Ser Lys Glu Tyr Ile Arg Ile Val Asn Thr Leu
            20                  25                  30


Thr Glu Arg Ala Glu Ile Glu Gly Ser Phe Pro Lys Val Thr Thr Lys
        35                  40                  45


Asn Ile Glu Ala Ala Leu Pro Ser Ala Val Leu Asn Gln Val Ile Arg
    50                  55                  60


Asp Ala Lys Ser Val Phe Arg Ile Thr Lys Lys Arg Lys Lys Arg Pro
65                  70                  75                  80


Val Leu Lys Lys Pro Thr Tyr Cys Ile Asn Asn Gln Asn Tyr Ser Leu
                85                  90                  95


Asp Gln Ser Ser Leu Ala Phe Pro Ile Met Val Asn Gly Lys Ala Lys
            100                 105                 110


Lys Thr Ile Phe Pro Ala Leu Ile Thr Glu Arg Asp Lys Lys Ile Leu
        115                 120                 125


Gln Ala Ala Lys Leu Gly Leu Met Arg Val Val Glu Lys Ser Gly Lys
    130                 135                 140


Trp Phe Ala Gln Ile Ser Leu Glu Val Pro Thr Pro Ser Gln Lys Pro
145                 150                 155                 160
```

```
Thr Lys Glu Gln Leu Met Gly Ile Asp Leu Gly Leu Lys Val Pro Ala
                165                 170                 175

Val Ala Val Thr Asn Glu Gly Lys Thr Lys Phe Phe Gly Asn Gly Arg
            180                 185                 190

Glu Asn Lys Phe Met Lys Arg Lys Phe Arg Lys Thr Arg Lys Cys Leu
        195                 200                 205

Gly Glu Lys Lys Lys Leu Ser Thr Leu Arg Lys Leu His Asp Lys Glu
    210                 215                 220

Gln Arg Trp Met Lys Asp Lys Asp His Lys Ile Ser Arg Glu Ile Val
225                 230                 235                 240

Asn Phe Ala Val Asp Asn Gln Val Ser Ile Ile Arg Leu Glu Gln Leu
                245                 250                 255

Thr Asn Ile Arg Lys Thr Thr Arg Thr Ser Arg Lys Asn Glu Lys Asn
            260                 265                 270

Leu His Thr Trp Ser Phe Tyr Arg Leu Ala Gln Phe Ile Glu Tyr Lys
        275                 280                 285

Ala Asn Met Val Gly Ile Lys Val Glu Tyr Val Asp Pro Ala Tyr Thr
    290                 295                 300

Ser Gln Lys Cys Pro Thr Cys Asp Ser Lys Asn Lys Val Lys Asp Arg
305                 310                 315                 320

Lys Tyr Ala Cys Ser Cys Gly Tyr Lys Thr His Arg Asp Arg Val Gly
                325                 330                 335

Ala Ile Asn Ile Ile His Ala Pro Val Ile Gly Gly Asn Ser Gln Ser
            340                 345                 350
```

Ala

<210> 750
<211> 408
<212> PRT
<213> uncultured Clostridium sp.

<400> 750

Met Gln Leu Ser Glu Thr Val Lys Leu Tyr Pro Thr Glu Tyr Gln Ile
1 5 10 15

Glu Leu Thr Arg Asn Thr Met Ser Glu Tyr Ile Ser Thr Val Asn Asn
20 25 30

Ile Val Ser Asp Tyr Thr Asn Lys Asp Asn Gly Asn Ile Glu Ser Val
35 40 45

Lys Glu Ile Lys Asn Ile Lys Ser Ile Ser Lys Leu Thr Thr Ala Asp
50 55 60

Val Lys Ala Lys Leu Pro Ser Ala Leu Cys Asn Gln Cys Ile Arg Asp
65 70 75 80

Ala Lys Ser Ile Val Lys Lys Tyr Asp Lys Ala Cys Lys Glu Val Glu
85 90 95

Lys Ala Lys Lys Asn Lys Lys Asn Gln Lys Ser Lys Lys Asn Lys Asn
100 105 110

Ser Lys Asn Val Lys Glu Val Glu Glu Ile Lys Glu Val Lys Lys Leu
115 120 125

Lys Glu Ile Lys Val Pro Val Leu Lys Lys Leu Cys Cys Tyr Ile Asn
130 135 140

Asn Gln Asn Phe Lys Ile Gln Asp Asn Tyr Ile Ser Phe Pro Val Met
145 150 155 160

```
Ile Asp Gly Lys Ser Lys Arg Ile Ser Val Lys Thr Lys Met Thr Asp
                165                 170                 175

Lys Gln Lys Leu Ile Leu Ser Ser His Arg Leu Gly Thr Met Arg Ile
            180                 185                 190

Val Ile Lys Asn Ile Asn Thr Leu Val Ala Gln Phe Val Tyr Glu Ile
        195                 200                 205

Asn Glu Ile Glu Lys Val Asn Glu Ser Asn Asn Val Met Gly Val Asp
    210                 215                 220

Leu Gly Ile Lys Cys Pro Ala Val Ser Tyr Cys Thr Asp Gly Ser Val
225                 230                 235                 240

Lys Phe Tyr Gly Asn Gly Arg Lys Asn Lys Tyr Met Arg Arg His Tyr
                245                 250                 255

Ala Asn Leu Arg Lys Trp Phe Gln Lys Ala Lys Lys Pro Thr Val Val
            260                 265                 270

Lys Arg Ile Lys Asn Lys Glu Gln Arg Ile Met Lys Asp Ile Asp His
        275                 280                 285

Lys Ile Ser Arg Glu Ile Val Asn Thr Ala Lys Lys His Lys Ala Lys
    290                 295                 300

Val Ile Lys Leu Glu Arg Leu Glu Asn Ile Arg Ser Thr Thr Arg Thr
305                 310                 315                 320

Ser Arg Lys Asn Asn Pro Ser Leu His Thr Trp Ser Phe Tyr Arg Leu
                325                 330                 335

Ala Gln Tyr Ile Glu Tyr Lys Ala Lys Leu Ala Gly Ile Glu Val Glu
            340                 345                 350

Tyr Val Tyr Pro Ala Tyr Thr Ser Gln Lys Cys Pro Gln Cys Gly Asn
```

355 360 365

Ile His His Ala Lys Asp Arg Lys Tyr Ile Cys Lys Cys Gly Tyr His
370 375 380

Thr His Arg Asp Leu Leu Gly Ala Ile Asn Ile Cys Asn Ser Thr Glu
385 390 395 400

Tyr Ile Gly Asn Arg Cys Ile Ala
405

<210> 751
<211> 358
<212> PRT
<213> Gracilibacillus timonensis

<400> 751

Met Ser Gln Thr Ile Thr Ile Lys Ile Lys Leu Ile Pro Thr Lys Glu
1 5 10 15

Gln Ala Ser Ile Leu Ser Glu Met Ser Lys Thr Tyr Ile Ser Val Ile
20 25 30

Asn Thr Leu Val Ser Glu Met Val Asp Glu Lys Lys Ser Thr Lys Lys
35 40 45

Ser Ser Lys Asp Ile Ser Val Ser Leu Pro Ser Ala Val Lys Asn Gln
50 55 60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Gly Lys Lys Ser Lys
65 70 75 80

Tyr Lys Val Ile Pro Ile Leu Lys Lys Thr Val Cys Val Trp Asn Asn
85 90 95

Gln Asn Tyr Ser Phe Asp Ser Thr His Ile Ser Met Pro Ile Met Met
100 105 110

```
Asp Gly Lys Ala Lys Lys Ile Pro Ile Arg Ala Leu Phe Met Asp Lys
        115                 120                 125

Asp Asn Arg Asn Met Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ala Asn Lys Trp Met Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Val Gln Gly Thr Gly Leu Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Lys Arg Lys Phe Arg Ser
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Arg Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Ser Lys Asp Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Gln Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Asp His Arg Val Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Met Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Thr Cys Phe Glu Lys Asn
305                 310                 315                 320
```

```
Lys Ala Gln Asp Arg Lys Tyr Thr Cys Lys Cys Gly Phe Lys Lys His
                325                 330                 335


Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350


Gly Asn Ser Gln Ser Ala
        355
```

<210> 752
<211> 358
<212> PRT
<213> Bacillus cereus

<400> 752

```
Met Tyr Gln Ala Val Thr Val Lys Ile Lys Leu Leu Leu Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45


Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Gly Lys
65                  70                  75                  80


Cys Glu Ile Ile Pro Val Ser Lys Lys Pro Ile Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Ser Leu Pro Leu Thr Ile
            100                 105                 110


Glu Gly Lys Thr Lys Arg Val Ser Val Arg Ala Leu Leu Ile Asp Lys
```

```
        115                 120                 125

His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Ala Glu Lys Ile Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Ser Ala Ile Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320
```

```
Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335


Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350


Gly Asn Ser Gln Ser Ala
        355


<210>  753
<211>  391
<212>  PRT
<213>  Thermococcus zilligii

<400>  753

Met Pro Ser Glu Thr Val Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15


Thr Pro Glu Glu Leu Asp Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30


Asn Phe Leu Ile Thr Tyr Ala Phe Glu Asn Lys Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Gly Gly Leu Arg Lys Lys Tyr Ser Lys
    50                  55                  60


Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80


Phe Lys Ser Tyr Arg Lys Arg Lys Lys Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95


Pro Val Phe Met Lys Asp Val Val Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Glu Ala Gly Val Val Lys Leu Ser Ala Pro Ser Gly Arg
        115                 120                 125
```

```
Val Gln Leu Glu Phe Tyr Ser Ala Lys Tyr His Glu Arg Phe Lys Asp
    130                 135                 140

Trp Arg Ile Gly Gln Ala Trp Leu Val Arg Ser Lys Lys Gly Val Phe
145                 150                 155                 160

Leu Asn Val Val Phe Ser Lys Asp Val Glu Ile Arg Glu Pro Glu Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asp Trp Lys Phe Val Gln Ile Ile Thr His Glu Arg Glu Val Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Arg Ile Gln Lys Lys Leu Arg Ala Gly
    210                 215                 220

Arg Lys Lys Glu Lys Leu Leu Glu Lys Tyr Gly Glu Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Gly Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Ala Glu Ile Arg
            260                 265                 270

Asn Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Leu Arg Val Val Phe Val Asp Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320
```

```
Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly Asp Arg Val Leu Lys
                325                 330                 335

Cys Gly Cys Gly Phe Glu Gly Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350

Ile Arg Leu Arg Gly Leu Lys Met Trp Gly Val Thr Val Pro Pro Glu
        355                 360                 365

Ser Gln Pro Met Ser Arg Gly Trp Lys Val Ser Arg Asn Asp Ile Tyr
    370                 375                 380

Glu Leu Tyr Lys Ser Tyr Gly
385                 390
```

<210> 754
<211> 358
<212> PRT
<213> Bacillus cereus

<400> 754

```
Met Tyr Gln Ala Val Thr Val Lys Ile Lys Leu Leu Leu Thr Lys Glu
1               5                   10                  15

Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30

Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45

Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Gly Lys
65                  70                  75                  80

Cys Glu Ile Ile Pro Val Ser Lys Lys Pro Ile Cys Val Trp Asn Asn
                85                  90                  95
```

```
Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Ser Leu Pro Leu Thr Ile
            100                 105                 110

Glu Gly Lys Thr Lys Arg Val Ser Val Arg Ala Leu Val Ile Asp Lys
        115                 120                 125

His Asn Arg Asn Leu Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Thr Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Ser Ala Ile Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
```

```
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350

Gly Asn Ser Gln Ser Ala
        355
```

<210> 755
<211> 358
<212> PRT
<213> Terrabacteria group

<400> 755

```
Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Ile Pro Thr Lys Glu
1               5                   10                  15

Gln Ala Ser Ile Leu Ser Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
            20                  25                  30

Asn Asp Leu Val Ser Asp Met Val Lys Glu Lys Lys Ser Thr Lys Lys
        35                  40                  45

Ser Ser Lys His Met Asp Val Pro Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Val Lys Lys Ser Lys
65                  70                  75                  80

Tyr Glu Val Val Pro Val Leu Lys Lys Pro Met Cys Ile Trp Asn Asn
                85                  90                  95
```

```
Gln Asn Tyr Ser Phe Asp Leu Thr His Ile Ser Met Pro Ile Val Val
            100                 105                 110

Asn Gly Lys Val Lys Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Lys
        115                 120                 125

Asp Asn Arg Ser Ile Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Val
145                 150                 155                 160

Pro Thr Thr Gln Gly Thr Gly Leu Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Lys Arg Arg Lys Phe Arg Ser
        195                 200                 205

Glu Arg Lys Thr Leu Gly Lys Lys Lys Lys Leu Asp Ala Ile Arg Ser
    210                 215                 220

Ser Lys Asp Lys Glu Gln Arg Trp Met Lys Glu Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Ile Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Lys Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Glu Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ala Gln
        275                 280                 285

Phe Met Glu Tyr Lys Ala Asn Leu Ala Gly Ile Arg Val Glu Tyr Val
    290                 295                 300
```

```
Asn Pro Ala Tyr Thr Ser Gln Ile Cys Pro Lys Cys Ser Glu Lys Asn
305                 310                 315                 320


Lys Val Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335


Arg Asp Leu Val Gly Ala Met Asn Ile Arg Ser Ala Pro Val Val Asp
            340                 345                 350


Gly Asn Ser Gln Ser Ala
        355


<210>  756
<211>  211
<212>  PRT
<213>  Duodenibacillus massiliensis


<220>
<221>  misc_feature
<222>  (10)..(10)
<223>  Xaa can be any naturally occurring amino acid

<400>  756

Met Arg Phe Phe Leu Trp Arg Phe Ser Xaa Ser Gly Glu Glu His Leu
1               5                   10                  15


Lys Asn Leu Lys Ala Asp Glu Ile Met Gly Ile Asp Val Gly Glu Asn
            20                  25                  30


Asn Ile Ala Ala Val Ser Thr Gly Arg Ile Trp Lys Ala Gly Ala Leu
        35                  40                  45


Lys Asp Lys Arg Asp Arg Tyr Met Ser Gln Arg Lys Arg Leu Gln Arg
    50                  55                  60


Asn Gly Ser Gln Ser Ala Arg Gln His Leu Lys Lys Ala Ser Gly Arg
65                  70                  75                  80
```

```
Glu Arg Arg His Val Thr His Val Asn Asn Val Val Ser Lys Glu Ile
                85                  90                  95


Val Gln Glu Ala Ala Lys Arg Gly Ile Lys Leu Ile Ala Leu Glu Asp
            100                 105                 110


Leu Thr His Ile Arg Asp His Ile Lys Ala Gly Lys Arg Ile Arg Ser
        115                 120                 125


Arg Leu His Arg Trp Ser Phe Arg Glu Leu Gln Glu Met Ile Val Tyr
    130                 135                 140


Lys Ala Ala Ala Ala Gly Ile Arg Cys Val Phe Leu Asp Pro Arg Tyr
145                 150                 155                 160


Thr Ser Gln Thr Cys Ser Gln Cys Gly Ala Pro Gly Lys Arg His Lys
                165                 170                 175


His Gly Phe Arg Cys Ser Gln Cys Gly His Leu Ala His Ser Asp Leu
            180                 185                 190


Asn Ala Ser Arg Asn Leu Gln Gly Leu Cys Arg Gln Leu Ser Ala Gln
        195                 200                 205


Gly Leu Met
    210


<210>  757
<211>  359
<212>  PRT
<213>  Bacillus mycoides

<400>  757

Met Ser Gln Thr Leu Thr Val Lys Val Lys Leu Ile Pro Thr Lys Glu
1               5                   10                  15


Gln Ser Arg Leu Leu Glu Glu Ser Ser Arg Glu Tyr Ile Lys Val Met
            20                  25                  30
```

```
Asn Met Leu Val Ser Glu Met Val Glu Ala Lys Lys Ser Thr Lys Lys
        35                  40                  45

Ser Thr Lys Asp Ile Glu Ala Asn Ile Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Leu Phe Ala Thr Lys Val Lys Lys Ser
65                  70                  75                  80

Asn Tyr Lys Ile Ile Pro Ile Leu Lys Lys Pro Val Cys Val Trp Asn
                85                  90                  95

Asn Gln Asn Tyr Ser Phe Asp Ser Thr His Ile Ser Ile Pro Phe Lys
            100                 105                 110

Val Asn Gly Lys Ser Thr Arg Leu Lys Val Arg Val Leu Leu Ile Asn
        115                 120                 125

Lys Lys Asn Arg Asn Leu Asp Leu Leu Lys His Lys Leu Gly Thr Leu
    130                 135                 140

Arg Ile Thr Lys Lys Ser Asn Lys Trp Met Ala Gln Ile Ser Val Thr
145                 150                 155                 160

Leu Pro Thr Asn Glu Arg Ala Gly Thr Lys Ile Leu Gly Val Asp Leu
                165                 170                 175

Gly Leu Lys Val Pro Ala Val Ala Ile Thr Asp Asp Asp Lys Val Arg
            180                 185                 190

Phe Phe Gly Asn Gly Arg Gln Asn Lys Tyr Arg Lys Arg Lys Phe Arg
        195                 200                 205

Ser Val Arg Lys Lys Leu Gly Lys Asp Lys Lys Val Asn Ala Ile Arg
    210                 215                 220
```

```
Arg Phe Asp Asp Lys Glu Gln Arg Trp Met Gln Glu Lys Asp His Lys
225                 230                 235                 240


Ile Ser Arg Glu Ile Ile Asp Phe Ala Ile Ala Asn Gln Ile Ser Val
                245                 250                 255


Ile Arg Leu Glu Gln Leu Thr Asn Ile Arg Gln Thr Ala Arg Thr Ser
            260                 265                 270


Arg Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ala
        275                 280                 285


Gln Phe Ile Ala Tyr Lys Ala Thr Ile Ala Gly Ile Gln Ile Glu Tyr
    290                 295                 300


Val Asn Pro Ala Tyr Thr Ser Gln Ser Cys Pro Lys Cys Ala Glu Lys
305                 310                 315                 320


Asn Lys Ala Arg Asp Arg Lys Tyr Lys Cys Pro Cys Gly Phe Lys Thr
                325                 330                 335


His Arg Asp Ile Val Gly Ala Met Asn Ile Arg Tyr Ala Thr Val Ile
            340                 345                 350


Asp Gly Asn Ser Gln Ser Ala
        355


<210>  758
<211>  358
<212>  PRT
<213>  Bacillus sp. FJAT-46582

<400>  758

Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Asp Leu Thr Leu Thr Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
            20                  25                  30
```

```
Asn Asp Leu Val Ser Glu Met Val Lys Glu Lys Lys Ser Thr Lys Lys
        35                  40                  45

Thr Ser Lys Asn Ile Gly Ala Ser Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Thr Lys
65                  70                  75                  80

Leu Glu Thr Ile Pro Val Leu Lys Lys Pro Thr Cys Ile Trp Asn Asn
                85                  90                  95

Gln Asn Tyr Ser Leu Asp Phe Thr His Ile Ser Leu Pro Ile Met Ile
            100                 105                 110

Asp Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125

Glu Asn Arg Asn Phe Asn Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Thr
145                 150                 155                 160

Pro Thr Pro Gln Lys Thr Gly Phe Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Gly Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Lys Lys Arg Lys Phe Arg Ser
        195                 200                 205

Val Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Ser
    210                 215                 220

Ser Lys Asn Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
```

225 230 235 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Glu Ile Ser Val Ile
245 250 255

Arg Ile Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
260 265 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
275 280 285

Phe Ile Glu Tyr Lys Ala Lys Leu Glu Gly Ile Lys Val Glu Tyr Val
290 295 300

Asn Pro Val Tyr Thr Ser Gln Thr Cys Pro His Cys Ser Glu Lys Asn
305 310 315 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
325 330 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Cys Ala Pro Val Ile Asp
340 345 350

Gly Asn Ser Gln Ser Ala
355

<210> 759
<211> 117
<212> PRT
<213> Paramaledivibacter caminithermalis DSM 15212

<400> 759

Val Asn His Lys Ile Ser Lys Glu Ile Val Asn Ile Ala Lys Glu Glu
1 5 10 15

Lys Ala Ile Ile Asn Leu Glu Glu Leu Lys Asn Ile Arg Glu Arg Ile
20 25 30

```
Lys Tyr Ser Lys Lys Met Asn Lys Arg Leu His Asn Trp Asn Phe Tyr
        35                  40                  45

Gln Leu Gln Thr Phe Ile Glu Tyr Lys Ala Asn Ala Glu Gly Leu Glu
    50                  55                  60

Val Val Tyr Val Lys Pro Asn Tyr Thr Ser Gln Met Cys Ser Ala Cys
65                  70                  75                  80

Glu His Ile Asp Lys Arg Asn Arg Pro Asn Gln Ser Thr Phe Lys Cys
                85                  90                  95

Lys Ala Cys Gly Tyr Glu Ala Asn Ala Asp Tyr Asn Thr Ser Val Asn
            100                 105                 110

Ile Ala Asn Val Leu
        115
```

<210> 760
<211> 358
<212> PRT
<213> Bacillus sp. FJAT-46582

<400> 760

```
Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15

Gln Asp Leu Thr Leu Thr Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
            20                  25                  30

Asn Asp Leu Val Ser Glu Met Val Lys Glu Lys Lys Ser Thr Lys Lys
        35                  40                  45

Thr Ser Lys Asn Ile Gly Ala Ser Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Thr Lys
65                  70                  75                  80
```

```
Leu Glu Thr Ile Pro Val Leu Lys Lys Pro Thr Cys Ile Trp Asn Asn
                85                  90                  95

Gln Asn Tyr Ser Leu Asp Phe Thr His Ile Ser Leu Pro Ile Met Ile
            100                 105                 110

Asp Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125

Glu Asn Arg Asn Phe Asn Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Thr
145                 150                 155                 160

Pro Thr Pro Gln Lys Thr Gly Phe Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Gly Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Lys Lys Arg Lys Phe Arg Ser
        195                 200                 205

Val Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Ser
    210                 215                 220

Ser Lys Asn Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Glu Ile Ser Val Ile
                245                 250                 255

Arg Ile Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
```

```
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Lys Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Val Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Cys Ala Pro Val Ile Asp
            340                 345                 350

Gly Asn Ser Gln Ser Ala
        355
```

<210> 761
<211> 242
<212> PRT
<213> Escherichia coli

<400> 761

```
Met Ile Phe Thr Lys Ile Ile Arg Gly Phe Ile Arg Ala Glu Leu Val
1               5                   10                  15

Phe Arg Lys Gly Leu Trp Phe Phe Asn Leu Val Val Glu Ile Thr Asp
            20                  25                  30

Thr Thr Met Val Val Ser Glu Lys Thr Met Gly Val Asp Met Gly Glu
        35                  40                  45

Asn Asn Leu Ala Ala His Ser Leu Gly Lys Leu Phe Gly Gly Glu Gln
    50                  55                  60

Leu Arg Asp Glu Arg Asp Arg His Leu Ala Leu Arg Arg Arg Leu Gln
65                  70                  75                  80
```

```
Ser Asn Gly Ser Gln Ser Ala Lys Gln Lys Leu Arg Gln Val Ser Gly
                85                  90                  95

Lys Glu Met Arg Arg Val Lys Gln Thr Asn His Glu Thr Ser Lys Val
            100                 105                 110

Ile Val Ala Ala Ala Ala Glu Ala Gly Ile Gly Thr Ile Ile Leu Glu
        115                 120                 125

Asp Leu Thr His Ile Arg Asp Arg Ile Lys Ala Gly Lys Arg Val Arg
    130                 135                 140

Ser Arg Leu His Arg Trp Ala Trp Arg Gln Leu Gln Thr Phe Ile Glu
145                 150                 155                 160

Tyr Lys Ala Arg Ala Val Gly Ile Met Val Lys Tyr Val Asn Pro Ala
                165                 170                 175

Tyr Ser Ser Gln Ser Cys Ser Cys Cys Gly Cys Leu Gly Lys Arg His
            180                 185                 190

Lys His Arg Phe Glu Cys Pro His Cys Gly Phe Arg Ala His Ser Asp
        195                 200                 205

Leu Asn Ala Ser Arg Asn Leu Ala Trp Ile Gly Glu Thr Ala Val Leu
    210                 215                 220

Pro Arg Ala Ser Val Asn Thr Pro Asp Val Gly Ser Pro Ser Leu Ala
225                 230                 235                 240

Pro Gln
```

<210> 762
<211> 390
<212> PRT
<213> Streptomyces sp. Ag82_G6-1

<400> 762

```
Met Lys Leu Val Ile Arg Val Lys Leu Leu Pro Thr Pro Glu Gln Ala
1               5                   10                  15

Ser Ala Leu Gln Ala Thr Leu His Ala Cys Asn Ala Ala Ala Asn His
            20                  25                  30

Val Ser His Thr Ala Phe Thr Thr Gly Thr Lys Arg Asn Arg Glu Leu
        35                  40                  45

Arg Ala Leu Thr Tyr Thr Gln Leu Lys Thr Arg Trp Ser Leu Gly Ala
    50                  55                  60

Gln Ala Ala Gln His Val Ile Lys Lys Thr Ala Asp Ala Tyr Thr Ala
65                  70                  75                  80

Leu Thr Gly Asn Leu Asn Ala Gly Asn Leu Gly Lys Pro Gly Ser Lys
                85                  90                  95

Arg Phe Arg Arg Ala Thr Glu Lys Pro Ile Thr Phe Arg Pro Glu Gly
            100                 105                 110

Ala Gln Pro Tyr Asp Asp Arg Met Leu Ser Trp Gln Met Pro Gln Arg
        115                 120                 125

Thr Val Ser Ile Trp Thr Val Ala Gly Arg Met Lys Arg Leu Ala Phe
    130                 135                 140

Thr Gly Gln Glu Thr Gln Leu Leu Leu Leu Ala His His Arg Gln Gly
145                 150                 155                 160

Glu Ser Asp Leu Ile Asn His Asn Gly His Trp Tyr Leu Leu Ala Thr
                165                 170                 175

Val Asp Leu Pro Glu Asn Pro Thr Thr Pro Asp Pro Arg Gly Phe Ile
            180                 185                 190

Gly Ile Asp Leu Gly Ile Thr Asn Ile Ala Thr Thr Ser Thr Gly His
```

```
        195                 200                 205

Arg His Ser Gly Arg Arg Leu Asn Arg Ser Arg Gln Asn Asp Arg Arg
    210                 215                 220

Asn Arg Asp Asn Leu Ala Lys Lys Gln Thr Arg Ser Ala Thr Arg Arg
225                 230                 235                 240

Ala Lys Arg Arg Ala Gly Arg Glu Ala Arg Arg Thr Arg Asp Ile Asn
                245                 250                 255

His Lys Ile Ser Lys His Ile Val Thr Glu Ala Gln Arg Thr Gly Arg
            260                 265                 270

Gly Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Glu Arg Ala Arg Leu
        275                 280                 285

Lys Lys Pro Gln Arg Val Thr Ile His Ser Trp Ala Phe Ala Gln Leu
    290                 295                 300

Gly Ala Phe Ile Ala Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val
305                 310                 315                 320

His Val His Pro Ala Tyr Thr Ser Gln Glu Cys Ser Arg Cys His His
                325                 330                 335

Ile Asp Lys Arg Asn Arg Pro Thr Gln Ala Val Phe Ser Cys Arg Asn
            340                 345                 350

Cys Gly Phe Val Glu His Ala Asp Leu Asn Ala Ser His Val Ile Ala
        355                 360                 365

Asp Arg Gly Trp Trp Thr Trp Val Cys Gly Ala Glu Ser Gln Val Pro
    370                 375                 380

Ala Leu Thr Leu Ile Ala
385                 390
```

<210> 763
<211> 274
<212> PRT
<213> Ktedonobacter racemifer

<400> 763

Met Phe Lys Pro Val Arg Cys Pro Arg Ser Gln His Cys Ala Val Arg
1 5 10 15

Tyr Asn Val His Thr Ser Thr Leu Asp Trp Gln Thr Gln Thr Val Arg
20 25 30

Leu Ser Thr Thr Gln Gly Lys Met Ser Leu Ala Phe Thr Val Pro His
35 40 45

Phe Ser Glu Arg Tyr Arg Gly Cys Arg Ile Thr Thr Ala Asp Leu Leu
50 55 60

Cys Cys Asn Gly Thr Trp Trp Leu His Val Val Val Asp Val Pro Glu
65 70 75 80

Pro Val Val Gln Pro His Pro Glu Val Ile Gly Val Asp Leu Gly Leu
85 90 95

Asn Arg Pro Ala Val Thr Ser Thr Arg His Phe Leu Gly Thr Arg Arg
100 105 110

Trp Lys Glu Ile Asp Arg Arg Ile Phe Arg Leu Lys Arg Lys Leu Gln
115 120 125

Ser Asn Gly Ser Lys Ser Thr Lys Arg His Leu Lys Lys Leu Ala Arg
130 135 140

Lys Gln Met Arg Phe His Arg Asp Cys Asp His Val Leu Ser Lys Arg
145 150 155 160

Leu Val Gln Gln Ala Pro Pro Gly Ser Thr Ile Val Leu Glu Asn Leu
165 170 175

```
Thr Asn Leu Arg Glu Gly Val Arg His Arg Lys Gly Glu Gly Gln Arg
            180                 185                 190

Arg Leu His Thr Trp Ser Phe Ala Gln Leu Tyr Gly Phe Ile Ala Tyr
        195                 200                 205

Lys Ala Gln Glu Arg Gly Ile Val Val Glu Arg Val Asp Pro Arg His
    210                 215                 220

Thr Ser Gln Thr Cys Ser Arg Cys Gly His Gln Ala Arg Asn Asn Arg
225                 230                 235                 240

Arg Ser Gln Ser Val Phe His Cys Arg Ala Cys Gly Tyr Gln Leu His
                245                 250                 255

Ala Asp Leu Asn Ala Ala Ile Val Arg Arg Phe Gly Ala Tyr Gln Ile
            260                 265                 270

Ser Leu
```

<210> 764
<211> 445
<212> PRT
<213> Natrinema versiforme

<400> 764

```
Met Ala Lys Gln Val Val Thr Arg Thr Tyr Thr Ala Phe Ile Arg Asn
1               5                   10                  15

Gln Ser Arg Val Ser Asp Asp Leu Asp Ser Leu Gly Phe Ala Ala Ser
            20                  25                  30

Lys Leu Trp Asn Val Gly Arg Trp Thr Ile Ser Arg Val Trp Asp Glu
        35                  40                  45

Leu Asp Tyr Ile Pro Glu His Asp Glu Leu Thr Ala Tyr Leu Lys Ser
```

```
    50                  55                  60

His Glu Arg Tyr Asp Asp Leu His Ser Gln Ser Ser Gln Arg Val Leu
65                  70                  75                  80

Gln Glu Leu Ala Glu Ala Phe Asn Gly Trp Tyr Ser Lys Arg Arg Asn
                85                  90                  95

Gly Asp Thr Arg Ala Asn Pro Pro Gly Tyr Arg Lys His Gly Asp Glu
            100                 105                 110

His Pro Arg Ser Thr Val Thr Phe Lys Asn Lys Gly Phe Lys Leu Asp
        115                 120                 125

Thr Gln Tyr Asn Arg Val Arg Leu Ser Lys Gly Ser Asn Leu Lys Glu
    130                 135                 140

Tyr Trp Ser Asp Phe Ile Leu Cys Glu Tyr Gln Thr Arg Pro Asp Ile
145                 150                 155                 160

Asp Leu Ser Thr Val Glu Ser Val Gln Gln Val Arg Ala Val Trp Thr
                165                 170                 175

Gly Asp Glu Trp Glu Leu His Phe Val Cys Lys Val Glu Val Glu Val
            180                 185                 190

Ala Glu Ser Pro Gly Glu Lys Thr Val Gly Val Asp Leu Gly Ile Asn
        195                 200                 205

Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly His Ser Glu Leu Tyr Pro
    210                 215                 220

Leu Asn Cys Leu Lys Gln Asp Asn Tyr Tyr Phe Ser Lys Arg Ile Ala
225                 230                 235                 240

Arg Cys Asp Asp Ser Asn Ser Glu Gln Ala Thr Arg Leu Asn Gln Lys
                245                 250                 255
```

```
Lys Ser Arg Arg Arg Thr His Tyr Phe His Ala Leu Ser Lys His Ile
            260                 265                 270

Val Gln Arg Cys Val Glu Glu Gly Val Gly Thr Ile Val Val Gly Asp
        275                 280                 285

Leu Ser Gly Ile Arg Glu Asp Glu Glu Asn Gly Glu Ser Lys Asn Trp
    290                 295                 300

Gly Lys His Gly Asn Leu Asp Leu His Ser Trp Ala Phe Asp Arg Phe
305                 310                 315                 320

Thr Asp Leu Leu Glu Tyr Lys Ala Glu Met Glu Gly Ile Ser Val Glu
                325                 330                 335

Asp Val Pro Glu Arg Gly Thr Ser Lys Ser Cys Ser Cys Cys Ser Arg
            340                 345                 350

Glu Arg Lys Ala Asn Arg Val Glu Arg Gly Leu Tyr Val Cys Asp Glu
        355                 360                 365

Cys Gly Leu Val Ala Asn Ala Asp Val Asn Gly Ala Glu Asn Ile Arg
    370                 375                 380

Gln Lys Val Ser Pro Ser Pro Val Thr Asp Gly Val Asp Glu Thr Leu
385                 390                 395                 400

Cys Val Ser Ser Ala His Gln Asn Ala Lys Arg Ser Glu Asp Gly Asp
                405                 410                 415

Arg Ser Asn Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu Phe Asp Lys
            420                 425                 430

Glu Thr Gly Ala Phe Ala Pro Gln Glu Arg Val Thr Ser
        435                 440                 445
```

<210> 765

<211> 208
<212> PRT
<213> Methanosarcina sp. MTP4

<400> 765

Met Gly Val Asp Val Gly Ile Asn Tyr Leu Ala Val Ala Ser Thr Thr
1 5 10 15

Asp Lys Lys Cys Glu Phe Phe Ala Gly Gly Glu Leu Lys Asn Leu Arg
20 25 30

Asn Thr Tyr Lys Lys Met Arg Ala Arg Leu Gln Ser Lys Gly Thr Leu
35 40 45

Ser Ala Lys Arg Val Met Lys Arg Leu Ser Gly Lys Glu Lys Arg Leu
50 55 60

Met Lys Asp Val Asn His Cys Ile Ser Lys Lys Ile Val Glu Phe Ala
65 70 75 80

Leu Glu Asn Asn Val Ser Val Ile Gly Leu Glu Asp Leu Thr Gly Ile
85 90 95

Arg Asp Arg Thr Gln Tyr Arg Val Arg Lys Lys Gln Arg Tyr Thr His
100 105 110

Ser Ser Trp Ala Phe Arg Gln Leu Gln Thr Phe Ile Glu Tyr Lys Ala
115 120 125

Lys Gln Val Gly Ile Leu Val Glu Tyr Ile Asn Pro Glu Tyr Thr Ser
130 135 140

Gln Thr Cys Ser Arg Cys Asn His Ile Ser Lys Asn Asn Arg Lys Gly
145 150 155 160

Leu Arg Phe Arg Cys Gly Ala Cys Gly Phe Glu Met Asn Ala Asp Leu
165 170 175

```
Asn Ala Ala Arg Asn Ile Glu His Arg Thr Arg Asp Phe Arg Tyr Ser
            180                 185                 190


Val Glu Ser Gln Gly Cys Leu Ser Thr Ile His Thr Asn Lys Met Ile
        195                 200                 205


<210>  766
<211>  358
<212>  PRT
<213>  Bacillus cereus

<400>  766

Met Tyr Gln Ala Val Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45


Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Thr Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Ala Lys
65                  70                  75                  80


Tyr Lys Ile Ile Pro Val Leu Lys Lys Pro Ile Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr Tyr Ile Arg Leu Pro Leu Met Ile
            100                 105                 110


Glu Gly Lys Thr Lys Lys Val Ser Val Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125


His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140
```

```
Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Ala Glu Lys Ile Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Ser Ala Ile Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
```

340 345 350

Gly Asn Ser Gln Ser Ala
355

<210> 767
<211> 268
<212> PRT
<213> Exiguobacterium sp. KKBO11

<400> 767

Val Cys Val Trp Asn Asn Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile
1 5 10 15

Ser Phe Pro Val Trp Met Asp Gly Lys Ser Val Lys Met Arg Phe Arg
20 25 30

Ala Ala Met Val Asp Lys Asp Asn Arg Asn Thr Arg Leu Leu Ala Asn
35 40 45

Lys Leu Gly Thr Leu Arg Val Thr Lys Lys Gly Arg Lys Trp Ile Ala
50 55 60

Gln Ile Ser Val His Val Pro Thr Val Pro Arg Thr Gly Val Arg Val
65 70 75 80

Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Ala Val Thr Asp
85 90 95

Asp Asp Thr Thr Arg Phe Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met
100 105 110

Lys Arg Lys Phe Arg Ala Glu Arg Lys Glu Leu Gly Lys Lys Lys Lys
115 120 125

Pro Lys Ala Ile Lys Arg Arg Asn Gln Lys Glu Gln Arg Trp Met Arg
130 135 140

```
Asp Lys Asp His Lys Val Ser Arg Ala Ile Val Asp Phe Ala Arg Gln
145                 150                 155                 160


Lys Lys Ile Ser Val Ile Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln
                165                 170                 175


Thr Ala Arg Thr Ser Arg Lys Asn Asn Gln Asn Leu His Ser Trp Ser
            180                 185                 190


Phe Tyr Arg Leu Ala Ser Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly
        195                 200                 205


Ile Lys Val Glu Tyr Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro
    210                 215                 220


Ser Cys Ser Val Arg Asn Lys Val Arg Asp Arg Val Tyr Thr Cys Ala
225                 230                 235                 240


Cys Gly Phe Lys Gly His Arg Asp Ala Val Gly Ala Met Asn Ile Arg
                245                 250                 255


Tyr Ala Pro Val Met Asp Gly Asn Ser Pro Ser Ala
            260                 265


<210>  768
<211>  376
<212>  PRT
<213>  Streptomyces chartreusis

<400>  768

Met Pro Glu Ala Glu Gln Val Ala Ala Leu Leu Ala Thr Leu Arg Thr
1               5                   10                  15


Val Asn Glu Ala Ala Asn Trp Val Ser Thr Val Ala Phe Glu Gln Gly
            20                  25                  30


Val Pro Arg Glu Tyr Glu Leu Arg Lys His Thr Tyr Ala Glu Leu Lys
        35                  40                  45
```

```
Ser Arg Gly Leu Gly Ala Gln Ala Ala Gln His Thr Ile Lys Lys Val
    50                  55                  60

Arg Asp Ala Tyr Thr Thr Leu Lys Ala Asn Ile Lys Ala Gly Asn Leu
65                  70                  75                  80

Gly Lys Pro Gly Ser Lys Arg Arg Lys Lys Ala Glu Ser Thr Pro Ile
                85                  90                  95

Ala Phe Arg Pro Ala Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser
            100                 105                 110

Trp Gln Tyr Asp Ala Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg
        115                 120                 125

Ile Arg Gly Met Arg Phe Ile Cys Ser Ala Asp Gly Leu Lys Met Leu
    130                 135                 140

Arg Gln His Arg Gln Gly Glu Ser Asp Leu Val Glu Arg Asn Gly Val
145                 150                 155                 160

Phe Tyr Leu Ile Ala Thr Cys Glu Val Pro Glu Glu Lys Ser Tyr Glu
                165                 170                 175

Pro Asp Gly Phe Ile Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr
            180                 185                 190

Thr Ser Thr Gly Tyr Gln Ala Ala Gly Arg Asp Leu Asn Arg His Arg
        195                 200                 205

Lys Arg His Gly Asp Leu Arg Thr Lys Leu Gln Arg Lys Gly Thr Lys
    210                 215                 220

Ser Ala Lys Arg Leu Leu Lys Lys Arg Asn Arg Arg Glu Arg Arg His
225                 230                 235                 240

Val Ser Asn Thr Asn His Ile Ile Ala Lys Thr Ile Val Thr Glu Ala
```

```
                245                 250                 255

Glu Arg Thr Ser Ala Gly Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg
            260                 265                 270

Gln Arg Val Arg Leu Arg Lys Pro Gln Arg Val Thr Leu His Ser Trp
        275                 280                 285

Ala Phe Ala Gln Leu Gly Glu Ser Ile Ala Tyr Lys Ala Arg Arg Ala
    290                 295                 300

Gly Val Pro Val Val His Val Asn Pro Ala Tyr Thr Ser Gln Met Cys
305                 310                 315                 320

Cys Glu Cys Gly His Val Asp Lys Lys Asn Arg Val Asp Gln Asp Leu
                325                 330                 335

Phe Thr Cys Arg Asn Cys Gly Val Val Ala His Ala Asp Arg Asn Ala
            340                 345                 350

Ser His Asn Ile Ala Gln Arg Gly Ala Val Val Trp Asn Ala Gly Arg
        355                 360                 365

Glu Ser Arg Val Pro Asp Thr Pro
    370                 375


<210>  769
<211>  376
<212>  PRT
<213>  Streptomyces sp. St140

<400>  769

Met Pro Lys Ala Asp Gln Ala Ala Ala Leu Arg Ser Thr Leu Arg Thr
1               5                   10                  15

Val Asn Glu Ala Ala Asn Trp Val Ser Gly Val Ala Phe Glu Arg Gly
            20                  25                  30
```

```
Val Pro Arg Glu Tyr Glu Leu Arg Lys His Thr Tyr Ala Glu Leu Lys
        35                  40                  45

Ala Gln Gly Leu Gly Ala Gln Ala Ala Gln His Val Ile Lys Lys Thr
    50                  55                  60

Arg Asp Ala Tyr Thr Thr Leu Lys Ala Asn Ile Lys Ala Gly Asn Leu
65                  70                  75                  80

Gly Lys Pro Ala Ser Lys Arg Arg Arg Lys Ala Glu Ser Lys Pro Ile
                85                  90                  95

Val Phe Arg Pro Glu Ala Ala Gln Pro Tyr Asp Asp Arg Cys Leu Ser
            100                 105                 110

Trp Gln Tyr Asp Gln Gln Thr Val Ser Ile Trp Thr Thr Ala Gly Arg
        115                 120                 125

Leu Arg Gly Val Arg Phe Ala Cys Ser Pro Asp Ala Leu Arg Met Leu
    130                 135                 140

Arg Glu His Arg Lys Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Ala
145                 150                 155                 160

Phe Tyr Leu Ile Ala Val Cys Asp Ile Pro Glu Pro Glu Val Tyr Glu
                165                 170                 175

Pro Ala Gly Phe Val Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr
            180                 185                 190

Ala Ser Thr Gly Tyr Arg Ala Ala Gly Arg Gly Leu Asn Arg His Arg
        195                 200                 205

Lys Arg Gln Leu Asp Leu Arg Lys Lys Leu Gln Ala Lys Gly Thr Lys
    210                 215                 220

Ser Ala Lys Arg Leu Leu Lys Lys Arg Ser Arg Lys Glu Ala Arg His
225                 230                 235                 240
```

```
Thr Ala Asn Val Asn His Ile Ile Ser Lys Thr Ile Val Thr Thr Ala
                245                 250                 255


Glu Arg Thr Gly Ser Gly Ile Ala Leu Glu Asp Leu Thr Gly Ile Arg
            260                 265                 270


Ser Arg Val Arg Leu Arg Lys Asp Gln Arg Thr Ser Leu His Ser Trp
        275                 280                 285


Ser Phe His Gln Leu Gly Gln Tyr Ile Glu Tyr Lys Ala Lys Arg Ala
    290                 295                 300


Gly Val Pro Leu Val Tyr Val Asp Pro Ala Tyr Thr Ser Gln Gln Cys
305                 310                 315                 320


Ser Glu Cys Gly His Ile Asp Arg Lys Asn Arg Val Asp Gln Ala Thr
                325                 330                 335


Phe Ala Cys Arg Ser Cys Gly Ala Leu Met His Ala Asp Asp Asn Ala
            340                 345                 350


Ser His Asn Ile Gly Arg Lys Ala Lys Thr Val Trp Thr Ala Gly Arg
        355                 360                 365


Glu Ser Arg Val Pro Ala Ile Pro
    370                 375


<210>  770
<211>  351
<212>  PRT
<213>  Paenibacillus sp. FSL R7-0333

<400>  770

Met Gln Thr Val Thr Ile Gln Ile Arg Ile Phe Pro Thr Arg Pro Ser
1               5                   10                  15


Val Leu Val Asp Met Gly Asn Glu Tyr Ile Arg Thr Val Asn Glu Leu
```

```
            20                  25                  30

Thr Glu Gln Ala Glu Arg Ser Gly Thr Phe Pro Lys Leu Thr Ser Lys
        35                  40                  45

Thr Ile His Ala Asn Leu Pro Ser Ala Val Lys Asn Gln Val Ile Arg
    50                  55                  60

Asp Ala Lys Ser Leu Phe Gln Arg Phe Lys Lys Thr Lys Lys Arg Pro
65                  70                  75                  80

Leu Leu Gln Lys Arg Val Tyr Tyr Val Asn Asn Gln Asn Tyr Thr Ile
                85                  90                  95

Trp Gly Asn His Ile Ser Phe Pro Val Ile Leu Asp Gly Lys Val Gln
            100                 105                 110

Arg Phe Val Val Pro Val Leu Leu Pro Asp Arg Glu Arg Asp Met Leu
        115                 120                 125

Ser Asn Gly Lys Pro Gly Leu Leu Arg Val Val Gln Lys Ser Ala Lys
    130                 135                 140

Trp Phe Val Gln Ile Ser Ile Glu Arg Pro Thr Glu Pro Ala Glu Gly
145                 150                 155                 160

His Glu Val Met Gly Ile Asp Leu Gly Leu Lys Val Pro Ala Val Val
                165                 170                 175

Val Thr Ser Ser Gly Lys Thr Lys Phe Cys Gly Asn Gly Arg Lys Asn
            180                 185                 190

Lys Phe Val Arg Arg Lys Tyr Ser Thr Tyr Arg Arg Lys Leu Gly Lys
        195                 200                 205

Leu Lys Lys Leu Ser Ala Ile Arg Lys Gln Asn Asp Lys Glu Ser Arg
    210                 215                 220
```

```
Tyr Met Lys Asp Gln Asn His Lys Ile Ser Arg Gln Ile Val Asn Met
225                 230                 235                 240


Ala Ile Gln Glu Gln Val Ser Val Ile Lys Leu Glu Lys Leu Thr Asp
                245                 250                 255


Ile Arg Lys Thr Thr Arg Thr Ser Arg Lys Asn Ala Lys Asn Leu His
            260                 265                 270


His Trp Ser Phe Tyr Gln Leu Gln Met Phe Ile Gly Tyr Lys Ala Thr
        275                 280                 285


Leu Ala Gly Ile Gln Val Val Glu Val Asn Pro Ala Tyr Thr Ser Gln
    290                 295                 300


Thr Cys Pro Ser Cys Gly Glu Arg Asn Lys Ala Lys Asp Arg Thr Tyr
305                 310                 315                 320


Gln Cys Asp Cys Gly Tyr Thr Ala His Arg Asp Arg Val Gly Ala Ile
                325                 330                 335


Asn Ile Met Arg Gln Pro Val Ala Asp Gly Asn Ser Leu Pro Ala
            340                 345                 350


<210>  771
<211>  358
<212>  PRT
<213>  Bacillus mycoides

<400>  771

Met Tyr Gln Thr Val Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45
```

```
Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Val Lys
65                  70                  75                  80

Cys Lys Ile Ile Pro Val Leu Lys Lys Thr Ile Cys Leu Trp Asn Asn
                85                  90                  95

Gln Asn Tyr Ser Phe Asp Phe Thr Tyr Ile Arg Leu Pro Leu Met Ile
            100                 105                 110

Asp Gly Lys Thr Lys Lys Val Ser Val Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125

His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Ala Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Asn Ala Met Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240
```

```
Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255


Arg Leu Glu Gln Leu Val Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270


Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285


Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300


Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320


Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335


Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350


Gly Asn Ser Gln Ser Ala
        355


<210>  772
<211>  426
<212>  PRT
<213>  Haloquadratum walsbyi

<400>  772

Met Ala Lys Gln Val Val Thr Arg Thr Tyr Ile Ala Ser Ile Arg Asn
1               5                   10                  15


Gln Ser Gln Val Gln Asp Asp Leu Asp Ser Leu Gly Phe Ala Ala Ser
            20                  25                  30


Lys Leu Trp Asn Val Gly Arg Trp Thr Cys Ser Arg Ile Trp Asp Glu
        35                  40                  45
```

```
Ile Asp His Ile Pro Asn His Asn Glu Leu Thr Thr Tyr Leu Lys Thr
    50                  55                  60

His Glu Arg Tyr Asp Asp Leu His Ser Gln Ser Ser Gln Arg Val Leu
65                  70                  75                  80

Gln Glu Leu Ala Glu Ala Phe Asn Gly Trp Tyr Gly Lys Arg Arg Asn
                85                  90                  95

Gly Asp Thr Asn Ala Asn Pro Pro Gly Tyr Arg Lys His Gly Asp Asp
            100                 105                 110

His Pro Arg Ser Thr Val Thr Phe Lys Ala Ala Gly Phe Lys Leu Asp
        115                 120                 125

Thr Gln Tyr Tyr Arg Val Arg Leu Ser Lys Gly Ser Asn Leu Lys Asp
    130                 135                 140

Tyr Trp Ser Asp Phe Ile Leu Cys Glu Tyr Gln Thr Arg Pro Asp Val
145                 150                 155                 160

Asp Leu Ser Thr Val Glu Asn Val Gln Gln Val Arg Ile Val Trp Thr
                165                 170                 175

Gly Thr Glu Trp Glu Leu His Phe Val Cys Lys Val Gln Ile Asp Val
            180                 185                 190

Ala Glu Ala Pro Ser Glu Asn Thr Val Gly Val Asp Leu Gly Ile Asn
        195                 200                 205

Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly His Gly Glu Leu Tyr Pro
    210                 215                 220

Leu Asn Cys Leu Lys Gln Asp Asp Tyr Tyr Phe Ser Lys Arg Ile Ala
225                 230                 235                 240

Arg Cys Asp Asp Ser Asn Ser Glu Gln Ala Thr Arg Leu Asn His Lys
```

```
                245                 250                 255

Lys Ser Ala Arg Arg Thr His Tyr Phe His Thr Leu Ser Lys His Ile
            260                 265                 270

Val Glu Arg Cys Val Glu Glu Gly Val Gly Thr Ile Val Val Gly Asp
        275                 280                 285

Leu Ser Gly Ile Arg Glu Asp Asp Asp Thr Asn Lys Ser Lys Asn Trp
    290                 295                 300

Gly Lys His Gly Asn Leu Asp Leu His Ser Trp Ala Phe Asp Arg Phe
305                 310                 315                 320

Thr Asp Leu Leu Glu Tyr Lys Ala Glu Met Glu Gly Ile Thr Val Glu
                325                 330                 335

Glu Ala Ser Glu Glu Asp Thr Ser Lys Ser Cys Ser Cys Cys Gly Arg
            340                 345                 350

Lys Arg Asp Ala Asn Arg Val Glu Arg Gly Leu Tyr Val Cys Asp Asp
        355                 360                 365

Cys Gly Thr Val Ala Asn Ala Asp Val Asn Gly Ala Glu Asn Ile Arg
    370                 375                 380

Gln Lys Val Ser Leu Ser Ser Leu Asn Leu Ser Val Asn Arg Ser Asn
385                 390                 395                 400

Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu Phe Asp Lys Glu Thr Gly
                405                 410                 415

Ala Phe Ala Pro Glu Glu Arg Val Arg Ser
            420                 425

<210>  773
<211>  358
<212>  PRT
```

<213> Bacillus caseinilyticus

<400> 773

```
Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                  10                  15


Gln Ala Ser Val Leu Gln Asn Met Ser Gln Ser Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Thr Leu Val Thr Glu Met Val Ala Glu Lys Lys Ser Thr Lys Lys
        35                  40                  45


Ser Ser Lys Asp Ile Ser Ala Leu Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Val Lys Lys Asn Lys
65                  70                  75                  80


Tyr Lys Val Ile Pro Val Leu Lys Lys Pro Val Cys Ile Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Ser Met Pro Ile Met Ile
            100                 105                 110


Asn Gly Lys Ala Thr Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Lys
        115                 120                 125


Asp Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140


Ile Thr Arg Lys Ala Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160


Pro Thr Thr Gln Gly Thr Gly Leu Lys Val Arg Gly Val Asp Leu Gly
                165                 170                 175


Leu Lys Val Pro Ala Val Ala Val Lys Asp Asp Asp Arg Leu Cys Phe
            180                 185                 190
```

```
Phe Gly Asn Gly Arg Gln Asn Lys Tyr Ile Lys Arg Lys Tyr Arg Ser
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Ser
    210                 215                 220

Ser Lys Glu Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Asp Lys Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Tyr Ile Arg Gln Thr Thr Arg Ser Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Asn Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Val Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Lys Cys Ser Glu Lys Asn
305                 310                 315                 320

Lys Ala Leu Asp Gly Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Val Asp
            340                 345                 350

Gly Asn Ser Gln Pro Ala
        355
```

<210> 774
<211> 371
<212> PRT
<213> Nitrosococcus oceani

<400> 774

```
Met Lys Arg Thr Val Ser Ile Lys Leu Val Pro Thr Pro Glu Gln Ala
1               5                   10                  15

Gln Ala Leu Leu Glu Leu Gln Ser Glu Leu Ala Lys Ala Cys Asn Leu
            20                  25                  30

Ile Val Pro Phe Ala Arg Asp Asn Arg Cys Trp Asn Arg Val Ala Leu
        35                  40                  45

His His Leu Ala Tyr Tyr Pro Val Arg Glu Ala Thr Arg Leu Gly Ser
    50                  55                  60

Gln Met Val Cys Asn Ala Val Lys Ala Val Ala Asp Ala Tyr Lys Val
65                  70                  75                  80

Leu Lys Leu Gly Arg His Asp Glu Ile Pro Val Ile Arg Phe Arg Glu
                85                  90                  95

Thr Gly Ser Val His Phe Asp Ala Arg Thr Tyr Arg Leu Lys Gly Asp
            100                 105                 110

Ala Val Ser Leu Tyr Thr Leu Thr Gly Arg Ala Ile Val Lys Met Ser
        115                 120                 125

Pro Gly Glu Phe Gln Ala Gln Tyr Leu Ala Ala Gly Lys Pro Lys Glu
    130                 135                 140

Gly Lys Leu Val Arg Arg Gly Lys Gln Trp Phe Phe Asn Leu Val Leu
145                 150                 155                 160

Asp Trp Pro Asp Thr Ala Pro Ala Lys Gly Ser Gly Ile Leu Gly Ile
                165                 170                 175

Asp Leu Gly Glu Asn Asn Leu Ala Ser Thr Ser Ser Gly Lys Ile Leu
            180                 185                 190
```

```
Gly Gly Gly Pro Leu Arg His Val Arg Asp Arg His Leu Ala Leu Arg
        195                 200                 205

Arg Arg Leu Gln Ser Asn Gly Arg Gln Ser Ala Arg Gln Leu Leu Lys
    210                 215                 220

Lys Val Ser Gly Lys Glu Arg Arg His Met Arg Gln Val Asn His Glu
225                 230                 235                 240

Ala Ser Lys Ala Met Val Gly Glu Ala Leu Lys Gln Gly Ala Ser Thr
                245                 250                 255

Ile Val Leu Glu Thr Leu Thr His Ile Arg Lys Arg Ile Lys Gly Gly
            260                 265                 270

Lys Arg Leu Arg Ala Arg Leu His Arg Trp Ala Trp Arg Glu Leu Gln
        275                 280                 285

Asp Phe Ile Ala Tyr Lys Ala Glu Ala Ala Gly Ile Arg Val Ile Tyr
    290                 295                 300

Val Asn Pro Ala Tyr Ser Ser Lys Ser Cys Ser Ala Cys Gly Cys Leu
305                 310                 315                 320

Gly Ser Arg Ile Gln His Lys Phe Ser Cys Ser Ser Cys Gly His Leu
                325                 330                 335

Ala His Ser Asp Arg Asn Ala Ala Val Asn Leu Ala Lys Leu Ala Lys
            340                 345                 350

Ser Ile Gly Ile Ala Arg Leu Gly Val Ala Pro Ala His Val Ala Val
        355                 360                 365

Pro Thr His
    370
```

<210> 775

<211> 393
<212> PRT
<213> Thermococcus piezophilus

<400> 775

Met Pro Ser Val Thr Val Lys Leu Thr Ala Lys Phe Lys Leu Lys Thr
1 5 10 15

Ile Pro Glu Gly Leu Asp Gly Leu Phe Ser Thr Tyr Arg Glu Ile Val
20 25 30

Asn Phe Leu Ile Thr Tyr Ala Phe Glu Asn Asn Val Thr Ser Phe Tyr
35 40 45

Arg Leu Lys Lys Glu Thr Tyr Arg Glu Leu Arg Glu Lys Tyr Ser Gln
50 55 60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ser Ile
65 70 75 80

Phe Lys Ser Tyr Arg Lys Arg Lys Arg Lys Gly Lys Ala Asn Gly Lys
85 90 95

Pro Ile Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
100 105 110

Leu Asp Leu Glu Lys Gly Leu Ile Lys Leu Ser Thr Pro Asn Gly Arg
115 120 125

Ile Gln Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Gly Asp
130 135 140

Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe
145 150 155 160

Leu His Val Val Phe Ser Arg Ala Val Glu Val Arg Glu Pro Lys Ala
165 170 175

```
Phe Ile Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Leu Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Lys Ile Gln Arg Lys Ile Arg Ala Gly
    210                 215                 220

Lys Lys Arg Lys Glu Leu Leu Glu Lys Tyr Gly Gln Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Ile Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Glu Tyr Cys Gly Ile Ala Leu Glu Asp Leu Ser Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Cys Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Ile Lys Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Ile Cys Gly Gly Arg Leu Ser Pro Asn Gly Cys Arg Val Leu His
                325                 330                 335

Cys Glu Asn Cys Gly Phe Glu Ser Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350

Asn Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Ala Pro Pro
        355                 360                 365

Glu Arg Gln Pro Met Lys Met Gly Gly Trp Lys Val Thr His Tyr Asp
    370                 375                 380
```

Ser Phe Ile Cys Ser Lys Ser Ser Gly
385 390

<210> 776
<211> 413
<212> PRT
<213> Duodenibacillus massiliensis

<400> 776

Met Ser Val Gln Lys Arg Ser Lys Ala Thr Ser Lys Gly Leu Asn Thr
1 5 10 15

Ser Ala Asp Gly Val Arg Arg Val Glu Gly Ser Gly Lys Cys Val Arg
20 25 30

Thr Ala Cys Val Arg Leu Glu Leu Leu Asp Pro Ala Ala His Glu Lys
35 40 45

Leu Val Ala Thr Gln Arg Leu Tyr Ala Gln Val Cys Asn Phe Val Val
50 55 60

Pro Thr Val Ala Ala Asp Arg Thr Lys Arg Leu Trp Gln Arg Phe Thr
65 70 75 80

Leu His His Ala Val Tyr Asp Lys Ile Lys Ala Lys Phe Pro Asp Leu
85 90 95

Gly Ser Gln Tyr Ala Cys Asn Val Ile Arg Ser Val Ser Ala Ala Tyr
100 105 110

Lys Thr Glu Leu Ala Asn His Pro Ala Gln Leu Lys Ser Lys Asp Lys
115 120 125

Lys Leu Lys Thr Leu Val Phe Arg His Pro Ser Val His Val Asp Lys
130 135 140

Asn Thr Leu Thr Phe Phe Pro Asp Gly Thr Val Ser Ile Ser Thr Ile

```
145                 150                 155                 160

Ser Gly Arg Ile Arg Ala Arg Leu Phe Pro Gly Pro Phe Gln Lys Glu
                165                 170                 175

Leu Leu Ala Ser Gly Lys Arg Lys Glu Cys Asn Leu Val Leu His Pro
            180                 185                 190

Arg Arg Gly Arg Lys Glu Ala Phe Trp Glu Leu His Ile Ala Val Glu
        195                 200                 205

Ser Gln Gly Cys Ser Gly Glu Glu His Leu Lys Asn Leu Lys Ala Asp
    210                 215                 220

Glu Ile Met Gly Ile Asp Val Gly Glu Asn Asn Ile Ala Ala Val Ser
225                 230                 235                 240

Thr Gly Arg Ile Trp Lys Ala Gly Ala Leu Lys Asp Lys Arg Asp Arg
                245                 250                 255

Tyr Met Ser Gln Arg Lys Arg Leu Gln Arg Asn Gly Ser Gln Ser Ala
            260                 265                 270

Arg Gln His Leu Lys Lys Ala Ser Gly Arg Glu Arg Arg His Val Thr
        275                 280                 285

His Val Asn Asn Val Val Ser Lys Glu Ile Val Gln Glu Ala Ala Lys
    290                 295                 300

Arg Gly Ile Lys Leu Ile Ala Leu Glu Asp Leu Thr His Ile Arg Asp
305                 310                 315                 320

His Ile Lys Ala Gly Lys Arg Ile Arg Ser Arg Leu His Arg Trp Ser
                325                 330                 335

Phe Arg Glu Leu Gln Glu Met Ile Val Tyr Lys Ala Ala Ala Ala Gly
            340                 345                 350
```

```
Ile Arg Cys Val Phe Leu Asp Pro Arg Tyr Thr Ser Gln Thr Cys Ser
        355                 360                 365


Gln Cys Gly Ala Pro Gly Lys Arg His Lys His Gly Phe Arg Cys Ser
    370                 375                 380


Gln Cys Gly His Leu Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu
385                 390                 395                 400


Gln Gly Leu Cys Arg Gln Leu Ser Ala Gln Gly Leu Met
                405                 410


<210>  777
<211>  358
<212>  PRT
<213>  Bacillus cereus group

<400>  777

Met Tyr Gln Thr Val Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45


Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Gly Lys
65                  70                  75                  80


Cys Lys Ile Ile Pro Val Leu Lys Lys Thr Ile Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr Tyr Ile Arg Leu Pro Leu Met Ile
            100                 105                 110
```

```
Asp Gly Lys Thr Lys Lys Val Ser Val Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125

His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Ala Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Val Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300
```

```
Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320


Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335


Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350


Gly Asn Ser Gln Ser Ala
        355
```

<210> 778
<211> 413
<212> PRT
<213> Duodenibacillus massiliensis

<400> 778

```
Met Ser Val Gln Lys Arg Ser Lys Ala Thr Ser Lys Gly Leu Asn Thr
1               5                   10                  15


Ser Ala Asp Gly Val Arg Arg Val Glu Gly Ser Gly Lys Cys Val Arg
            20                  25                  30


Thr Ala Cys Val Arg Leu Glu Leu Leu Asp Pro Ala Ala His Glu Lys
        35                  40                  45


Leu Ala Ala Thr Gln Arg Leu Tyr Ala Gln Val Cys Asn Phe Val Val
    50                  55                  60


Pro Thr Val Ala Ala Asp Arg Thr Lys Arg Leu Trp Gln Arg Phe Thr
65                  70                  75                  80


Leu His His Ala Val Tyr Asp Lys Ile Lys Ala Lys Phe Pro Asp Leu
                85                  90                  95


Gly Ser Gln Tyr Ala Cys Asn Val Ile Arg Ser Val Ser Ala Ala Tyr
            100                 105                 110
```

```
Lys Thr Glu Leu Ala Asn His Pro Ala Gln Leu Lys Ser Glu Asp Lys
        115                 120                 125

Lys Leu Lys Thr Leu Val Phe Arg His Pro Ser Val His Val Asp Lys
    130                 135                 140

Asn Thr Leu Thr Phe Phe Pro Asp Gly Thr Val Ser Ile Ser Thr Ile
145                 150                 155                 160

Ser Gly Arg Ile Arg Ala Arg Leu Cys Pro Gly Pro Phe Gln Lys Glu
                165                 170                 175

Leu Leu Ala Ser Gly Lys Arg Lys Glu Cys Asn Leu Val Leu His Pro
            180                 185                 190

Arg Arg Gly Arg Lys Glu Ala Phe Trp Glu Leu His Ile Ala Val Glu
        195                 200                 205

Ser Gln Gly Cys Ser Gly Lys Glu His Leu Lys Asn Leu Lys Ala Asp
    210                 215                 220

Glu Ile Met Gly Ile Asp Val Gly Glu Asn Asn Ile Ala Ala Val Ser
225                 230                 235                 240

Thr Gly Arg Ile Trp Lys Ala Gly Ala Leu Lys Asp Lys Arg Asp Arg
                245                 250                 255

Tyr Met Ser Gln Arg Lys Arg Leu Gln Arg Asn Gly Ser Gln Ser Ala
            260                 265                 270

Arg Gln His Leu Lys Lys Ala Ser Gly Arg Glu Arg Arg His Val Thr
        275                 280                 285

His Val Asn Asn Val Val Ser Lys Glu Ile Val Gln Glu Ala Ala Lys
    290                 295                 300

Arg Gly Ile Lys Leu Ile Ala Leu Glu Asp Leu Thr His Ile Arg Asp
```

305 310 315 320

His Ile Lys Ala Gly Lys Arg Ile Arg Ser Arg Leu His Arg Trp Ser
325 330 335

Phe Arg Glu Leu Gln Glu Met Ile Val Tyr Lys Ala Ala Ala Ala Gly
340 345 350

Ile Arg Cys Val Phe Leu Asp Pro Arg Tyr Thr Ser Gln Thr Cys Ser
355 360 365

Gln Cys Gly Ala Pro Gly Lys Arg His Lys His Gly Phe Arg Cys Ser
370 375 380

Gln Cys Gly His Leu Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu
385 390 395 400

Gln Gly Leu Cys Arg Gln Leu Ser Ala Gln Gly Leu Met
405 410

<210> 779
<211> 413
<212> PRT
<213> Duodenibacillus massiliensis

<400> 779

Met Ser Val Gln Lys Arg Ser Lys Ala Thr Ser Lys Gly Leu Asn Thr
1 5 10 15

Ser Ala Asp Gly Val Arg Arg Val Glu Gly Ser Gly Lys Cys Val Arg
20 25 30

Thr Ala Cys Val Arg Leu Glu Leu Leu Asp Pro Ala Ala His Glu Lys
35 40 45

Leu Ala Ala Thr Gln Arg Leu Tyr Ala Gln Val Cys Asn Phe Val Val
50 55 60

```
Pro Thr Val Ala Ala Asp Arg Thr Lys Arg Leu Trp Gln Arg Phe Thr
65                  70                  75                  80

Leu His His Ala Val Tyr Asp Lys Ile Lys Ala Lys Phe Pro Asp Leu
                85                  90                  95

Gly Ser Gln Tyr Ala Cys Asn Val Ile Arg Ser Val Ser Ala Ala Tyr
            100                 105                 110

Lys Thr Glu Leu Ala Lys His Pro Ala Gln Leu Lys Ser Glu Asp Lys
        115                 120                 125

Lys Leu Lys Thr Leu Val Phe Arg His Pro Ser Val His Val Asp Lys
    130                 135                 140

Asn Thr Leu Thr Phe Phe Pro Asp Gly Thr Val Ser Ile Ser Thr Ile
145                 150                 155                 160

Ser Gly Arg Ile Arg Ala Arg Leu Cys Pro Gly Pro Phe Gln Lys Glu
                165                 170                 175

Leu Leu Ala Ser Gly Lys Arg Lys Glu Cys Asn Leu Val Leu His Pro
            180                 185                 190

Arg Arg Gly Arg Lys Glu Ala Phe Trp Glu Leu His Ile Ala Val Glu
        195                 200                 205

Thr Gln Gly Cys Ser Gly Glu Glu His Leu Lys Asn Leu Lys Ala Asp
    210                 215                 220

Glu Ile Met Gly Ile Asp Val Gly Glu Asn Asn Ile Ala Ala Val Ser
225                 230                 235                 240

Thr Gly Arg Ile Trp Lys Ala Gly Ala Leu Lys Asp Lys Arg Asp Arg
                245                 250                 255

Tyr Met Ser Gln Arg Lys Arg Leu Gln Arg Asn Gly Ser Gln Ser Ala
            260                 265                 270
```

```
Arg Gln His Leu Lys Lys Ala Ser Gly Arg Glu Arg Arg His Val Thr
        275                 280                 285

His Val Asn Asn Val Val Ser Lys Glu Ile Val Gln Glu Ala Ala Lys
    290                 295                 300

Arg Gly Ile Lys Leu Ile Ala Leu Glu Asp Leu Thr His Ile Arg Asp
305                 310                 315                 320

His Ile Lys Ala Gly Lys Arg Ile Arg Ser Arg Leu His Arg Trp Ser
                325                 330                 335

Phe Arg Glu Leu Gln Glu Met Ile Val Tyr Lys Ala Ala Ala Ala Gly
            340                 345                 350

Ile Arg Cys Val Phe Leu Asp Pro Arg Tyr Thr Ser Gln Thr Cys Ser
        355                 360                 365

Gln Cys Gly Ala Pro Gly Lys Arg His Lys His Gly Phe Arg Cys Ser
    370                 375                 380

Gln Cys Gly His Leu Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu
385                 390                 395                 400

Gln Gly Leu Cys Arg Gln Leu Ser Ala Gln Gly Leu Met
                405                 410
```

<210> 780
<211> 413
<212> PRT
<213> Duodenibacillus massiliensis

<400> 780

```
Met Ser Val Gln Lys Arg Ser Lys Ala Thr Ser Lys Gly Leu Asn Thr
1               5                   10                  15

Ser Ala Asp Gly Val Arg Arg Val Glu Gly Ser Gly Lys Cys Val Arg
```

```
            20                  25                  30

Thr Ala Cys Val Arg Leu Glu Leu Leu Asp Pro Ala Ala His Glu Lys
        35                  40                  45

Leu Ala Ala Thr Gln Arg Leu Tyr Ala Gln Val Cys Asn Phe Val Val
    50                  55                  60

Pro Thr Val Ala Ala Asp Arg Thr Lys Arg Leu Trp Gln Arg Phe Thr
65                  70                  75                  80

Leu His His Ala Val Tyr Asp Lys Ile Lys Ala Lys Phe Pro Asp Leu
                85                  90                  95

Gly Ser Gln Tyr Ala Cys Asn Val Ile Arg Ser Val Ser Ala Ala Tyr
            100                 105                 110

Lys Thr Glu Leu Ala Lys His Pro Ala Gln Leu Lys Ser Glu Asp Lys
        115                 120                 125

Lys Leu Lys Thr Leu Val Phe Arg His Pro Ser Val His Val Asp Lys
    130                 135                 140

Asn Thr Leu Thr Phe Phe Pro Asp Gly Thr Val Ser Ile Ser Thr Ile
145                 150                 155                 160

Ser Gly Arg Ile Arg Ala Arg Leu Cys Pro Gly Pro Phe Gln Lys Glu
                165                 170                 175

Leu Leu Ala Ser Gly Lys Arg Lys Glu Cys Asn Leu Val Leu His Pro
            180                 185                 190

Arg Arg Gly Arg Lys Glu Ala Phe Trp Glu Leu His Ile Ala Val Glu
        195                 200                 205

Ser Gln Gly Cys Ser Gly Glu Glu His Leu Lys Asn Leu Lys Ala Asp
    210                 215                 220
```

```
Glu Ile Met Gly Ile Asp Val Gly Glu Asn Asn Ile Ala Ala Val Ser
225                 230                 235                 240

Thr Gly Arg Ile Trp Lys Ala Gly Ala Leu Lys Asp Lys Arg Asp Arg
                245                 250                 255

Tyr Met Ser Gln Arg Lys Arg Leu Gln Arg Asn Gly Ser Gln Ser Ala
            260                 265                 270

Arg Gln His Leu Lys Lys Ala Ser Gly Arg Glu Arg Arg His Val Thr
        275                 280                 285

His Val Asn Asn Val Val Ser Lys Glu Ile Val Gln Glu Ala Ala Lys
    290                 295                 300

Arg Gly Ile Lys Leu Ile Ala Leu Glu Asp Leu Thr His Ile Arg Asp
305                 310                 315                 320

His Ile Lys Ala Gly Lys Arg Ile Arg Ser Arg Leu His Arg Trp Ser
                325                 330                 335

Phe Arg Glu Leu Gln Glu Met Ile Val Tyr Lys Ala Ala Ala Ala Gly
            340                 345                 350

Ile Arg Cys Val Phe Leu Asp Pro Arg Tyr Thr Ser Gln Thr Cys Ser
        355                 360                 365

Gln Cys Gly Ala Pro Gly Lys Arg His Lys His Gly Phe Arg Cys Ser
    370                 375                 380

Gln Cys Gly His Leu Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu
385                 390                 395                 400

Gln Gly Leu Cys Arg Gln Leu Ser Ala Gln Gly Leu Met
                405                 410
```

<210> 781

<211> 235
<212> PRT
<213> Halobiforma haloterrestris

<400> 781

```
Met Ser Glu Ala Pro Gly Glu Lys Thr Val Gly Val Asp Pro Gly Ile
1               5                   10                  15


Asn Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly His Ala Glu Leu Tyr
            20                  25                  30


Pro Leu Asn Cys Leu Lys Gln Asp Asp Tyr Tyr Phe Ser Lys Arg Ile
        35                  40                  45


Ala Arg Cys Asp Asp Ser Asp Ser Glu Gln Ala Thr Arg Leu Asp Gln
    50                  55                  60


Lys Lys Ser Arg Arg Arg Thr His Tyr Phe His Thr Leu Ser Lys His
65                  70                  75                  80


Ile Val Gln Arg Cys Val Asp Glu Gly Val Gly Thr Ile Val Val Gly
                85                  90                  95


Asp Leu Ser Gly Ile Arg Glu Asp Asp Glu Asn Gly Glu Ala Lys Asp
            100                 105                 110


Trp Gly Lys His Gly Asn Leu Asp Leu His Ser Trp Ala Phe Asp Arg
        115                 120                 125


Phe Thr Asp Leu Leu Glu Tyr Lys Ala Glu Met Glu Gly Ile Thr Val
    130                 135                 140


Glu Glu Val Ser Glu Arg Asp Thr Ser Lys Ser Cys Ser Cys Cys Gly
145                 150                 155                 160


Arg Lys Arg Asp Ala Asn Arg Val Glu Arg Gly Leu Tyr Val Cys Asp
                165                 170                 175
```

```
Glu Cys Asp Met Val Ala Asn Ala Asp Val Asn Gly Ala Glu Asn Ile
            180                 185                 190


Arg Gln Lys Val Ser Pro Ser Pro Ala Thr Asp Gly Gly Asp Arg Ser
        195                 200                 205


Asn Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu Phe Asp Lys Glu Thr
    210                 215                 220


Gly Ala Phe Ala Pro Gln Glu Pro Val Thr Ser
225                 230                 235


<210>  782
<211>  385
<212>  PRT
<213>  Streptomyces roseochromogenus

<400>  782

Met Lys Ile Val Thr Gln Val Lys Leu Met Pro Glu Ala Asp Gln Ala
1               5                   10                  15


Ala Ala Leu Leu Ala Thr Leu Arg Thr Val Asn Asp Leu Ala Cys Trp
            20                  25                  30


Val Ser Glu Val Ala Phe Ala Gln Gly Val Pro Arg Glu Tyr Glu Leu
        35                  40                  45


Arg Lys His Thr Tyr Pro Arg Leu Lys Ala Glu Gly Leu Gly Ala Gln
    50                  55                  60


Ala Ala Gln His Cys Ile Lys Lys Val Arg Asp Ala Tyr Thr Thr Leu
65                  70                  75                  80


His Ala Asn Ile Arg Ala Gly Asn Leu Gly Lys Pro Lys Ser Lys Arg
                85                  90                  95


Arg Ile Lys Ala Glu Ser Lys Pro Ile Thr Phe Arg Pro Asp Ala Ala
            100                 105                 110
```

```
Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Thr Gln Thr
        115                 120                 125

Val Ser Ile Trp Thr Thr Ala Gly Arg Ile Lys Asn Val Arg Phe Ala
    130                 135                 140

Cys Ser Ala Asp Ala Leu Lys Thr Leu Arg Glu Tyr Arg Lys Gly Glu
145                 150                 155                 160

Ser Asp Leu Ile Glu Arg Asp Gly Asp Phe Tyr Leu Ile Ala Thr Cys
                165                 170                 175

Glu Val Pro Glu Ala Glu Thr Tyr Glu Pro Asp Gly Phe Ile Gly Val
            180                 185                 190

Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Thr Asp His Gln Ala
        195                 200                 205

Ala Gly Arg Gly Leu Asn Arg Tyr Arg Lys Arg Gln Leu Ala Leu Arg
    210                 215                 220

Ala Lys Leu Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg Arg Leu Lys
225                 230                 235                 240

Glu Arg Ser Arg Arg Glu Gln Arg His Val Lys Asn Thr Asn His Ile
                245                 250                 255

Ile Ala Lys Thr Ile Ala Thr Glu Ala Glu Arg Thr Ser Ala Gly Ile
            260                 265                 270

Ser Leu Glu Glu Leu Lys Gly Ile Arg Gln Arg Val Arg Leu Arg Lys
        275                 280                 285

Pro Gln Arg Val Ala Leu His Ser Trp Ala Phe Ala Gln Leu Gly Asp
    290                 295                 300

Phe Ile Val Tyr Lys Ala Lys Arg Ala Gly Val Pro Leu Val Phe Val
```

305 310 315 320

Asp Pro Ala Tyr Ser Ser Arg Glu Cys Ala Glu Cys Gly His Ile Asp
325 330 335

Arg Leu Asn Arg Ile Ser Gln Ala Lys Phe Ala Cys Arg Ser Cys Gly
340 345 350

Val Val Ala His Ala Asp Arg Asn Ala Ser His Val Leu Ala Arg Arg
355 360 365

Gly Glu Thr Val Trp Asn Ala Gly Arg Glu Ser Arg Val Pro Ala Thr
370 375 380

Pro
385

<210> 783
<211> 359
<212> PRT
<213> Bacillus cereus

<400> 783

Met Ser Gln Thr Leu Thr Val Lys Val Lys Leu Ile Pro Thr Lys Glu
1 5 10 15

Gln Ser Arg Leu Leu Glu Glu Ser Ser Arg Glu Tyr Ile Lys Val Met
20 25 30

Asn Met Leu Val Ser Glu Met Val Glu Ala Lys Lys Ser Thr Lys Lys
35 40 45

Ser Thr Lys Asp Ile Glu Ala Asn Ile Pro Ser Ala Val Lys Asn Gln
50 55 60

Ala Ile Lys Asp Ala Lys Ser Leu Phe Ala Thr Lys Val Lys Lys Ser
65 70 75 80

```
Asn Tyr Lys Ile Ile Pro Ile Leu Lys Lys Pro Val Cys Val Trp Asn
                85                  90                  95

Asn Gln Asn Tyr Ser Phe Asp Ser Thr His Ile Ser Ile Pro Phe Lys
            100                 105                 110

Val Asn Gly Lys Ser Thr Arg Leu Lys Val Arg Ala Leu Leu Ile Asn
        115                 120                 125

Lys Lys Asn Arg Asn Leu Asp Leu Leu Lys His Lys Leu Gly Thr Leu
    130                 135                 140

Arg Ile Thr Lys Lys Ser Asn Lys Trp Met Ala Gln Ile Ser Val Thr
145                 150                 155                 160

Leu Pro Thr Asn Glu Arg Ala Gly Thr Lys Val Leu Gly Val Asp Leu
                165                 170                 175

Gly Leu Lys Val Pro Ala Val Ala Ile Thr Asp Asp Asp Lys Val Arg
            180                 185                 190

Phe Phe Gly Asn Gly Arg Gln Asn Lys Tyr Arg Lys Arg Lys Phe Arg
        195                 200                 205

Ser Val Arg Lys Lys Leu Gly Lys Asp Lys Lys Val Asn Ala Ile Arg
    210                 215                 220

Arg Phe Asp Asp Lys Glu Gln Arg Trp Met Gln Glu Lys Asp His Lys
225                 230                 235                 240

Ile Ser Arg Glu Ile Ile Asp Phe Ala Ile Ala Asn Gln Ile Ser Val
                245                 250                 255

Ile Arg Leu Glu Gln Leu Thr Asn Ile Arg Gln Thr Ala Arg Thr Ser
            260                 265                 270

Arg Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ala
        275                 280                 285
```

```
Gln Phe Ile Ala Tyr Lys Ala Thr Ile Ala Gly Ile Gln Ile Glu Tyr
    290                 295                 300

Val Asn Pro Ala Tyr Thr Ser Gln Ser Cys Pro Lys Cys Ala Glu Lys
305                 310                 315                 320

Asn Lys Ala Arg Asp Arg Lys Tyr Lys Cys Pro Cys Gly Phe Lys Thr
                325                 330                 335

His Arg Asp Ile Val Gly Ala Met Asn Ile Arg Tyr Thr Thr Val Ile
            340                 345                 350

Asp Gly Asn Ser Gln Ser Ala
        355
```

<210> 784
<211> 362
<212> PRT
<213> Paenibacillus sp. FSL R7-0333

<400> 784

```
Met Val Lys Asn Lys Lys Arg Gly Gly Glu Thr Leu Gln Thr Val Thr
1               5                   10                  15

Ile Gln Ile Arg Ile Phe Pro Thr Arg Pro Ser Val Leu Val Asp Met
            20                  25                  30

Gly Asn Glu Tyr Ile Arg Thr Val Asn Glu Leu Thr Glu Gln Ala Glu
        35                  40                  45

Arg Ser Gly Thr Phe Pro Lys Leu Thr Ser Lys Thr Ile His Ala Asn
    50                  55                  60

Leu Pro Ser Ala Val Lys Asn Gln Val Ile Arg Asp Ala Lys Ser Leu
65                  70                  75                  80

Phe Gln Arg Phe Lys Lys Thr Lys Lys Arg Pro Leu Leu Gln Lys Arg
```

```
                85                  90                  95

Val Tyr Tyr Val Asn Asn Gln Asn Tyr Thr Ile Trp Gly Asn His Ile
            100                 105                 110

Ser Phe Pro Val Ile Leu Asp Gly Lys Val Gln Arg Phe Val Val Pro
        115                 120                 125

Val Leu Leu Pro Asp Arg Glu Arg Asp Met Leu Ser Asn Gly Lys Pro
    130                 135                 140

Gly Leu Leu Arg Val Val Gln Lys Ser Ala Lys Trp Phe Val Gln Ile
145                 150                 155                 160

Ser Ile Glu Arg Pro Thr Glu Pro Ala Glu Gly His Glu Val Met Gly
                165                 170                 175

Ile Asp Leu Gly Leu Lys Val Pro Ala Val Val Val Thr Ser Ser Gly
            180                 185                 190

Lys Thr Lys Phe Cys Gly Asn Gly Arg Lys Asn Lys Phe Val Arg Arg
        195                 200                 205

Lys Tyr Ser Thr Tyr Arg Arg Lys Leu Gly Lys Leu Lys Lys Leu Ser
    210                 215                 220

Ala Ile Arg Lys Gln Asn Asp Lys Glu Ser Arg Tyr Met Lys Asp Gln
225                 230                 235                 240

Asn His Lys Ile Ser Arg Gln Ile Val Asn Met Ala Ile Gln Glu Gln
                245                 250                 255

Val Ser Val Ile Lys Leu Glu Lys Leu Thr Asp Ile Arg Lys Thr Thr
            260                 265                 270

Arg Thr Ser Arg Lys Asn Ala Lys Asn Leu His His Trp Ser Phe Tyr
        275                 280                 285
```

```
Gln Leu Gln Met Phe Ile Gly Tyr Lys Ala Thr Leu Ala Gly Ile Gln
    290                 295                 300

Val Val Glu Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys
305                 310                 315                 320

Gly Glu Arg Asn Lys Ala Lys Asp Arg Thr Tyr Gln Cys Asp Cys Gly
                325                 330                 335

Tyr Thr Ala His Arg Asp Arg Val Gly Ala Ile Asn Ile Met Arg Gln
            340                 345                 350

Pro Val Ala Asp Gly Asn Ser Leu Pro Ala
        355                 360
```

<210> 785
<211> 386
<212> PRT
<213> Peptococcaceae bacterium CEB3

<400> 785

```
Met Lys Gln Thr Asp Glu Glu Lys Gly Gln Val Ile Thr Ile Lys Leu
1               5                   10                  15

Lys Leu Phe Asn Ser Thr Lys Thr Lys Gln Asp Met Tyr Gln Thr Met
            20                  25                  30

Ala Asp Arg Thr Thr Asp Phe Ala Asn Arg Tyr Leu Gly Leu Asp Lys
        35                  40                  45

Pro Met Arg Pro Lys Ser Ser Gly Asp Ala Lys Leu His Ser Glu Pro
    50                  55                  60

Leu Pro Ala Ala Val Leu Cys Gln Ala Ile Arg Asp Ile Glu Ala Lys
65                  70                  75                  80

Lys Asn Ala Lys Ser Phe Lys Arg Leu Trp Pro Asp Phe Asn Asn Gln
                85                  90                  95
```

```
Asn Phe Arg Ile Glu Lys Glu Thr Met Gln Asp Gly Gly Ala Ala Trp
            100                 105                 110

Lys Val Ser Phe Pro Thr Leu Glu Lys Arg Val Gly Val Pro Ile Gln
        115                 120                 125

Ala Glu Lys Tyr Gln Val Lys Tyr Leu Glu Leu Leu Leu Ser Gly Gln
    130                 135                 140

Ala Lys Gln Gly Thr Ala Gln Leu Ile Lys Cys Gly Arg Gln Trp Tyr
145                 150                 155                 160

Ile His Leu Ala Leu Thr Val Ser Val Lys Ala Glu Lys Lys Pro Pro
                165                 170                 175

Lys Tyr Met Gly Val Asp Leu Gly Leu Ile Asp Leu Ala Val Ala Ser
            180                 185                 190

Ile Leu Gly Ser Thr Leu Phe Phe Ser Gly Ala Glu Leu Ala Tyr Ile
        195                 200                 205

Arg Arg His Tyr Ala Glu Leu Arg Lys Lys Leu Gln Lys Lys Gly Ala
    210                 215                 220

His Lys Ala Leu Arg Lys Leu Gly Asn Lys Glu His Arg Trp Ile Met
225                 230                 235                 240

Ala Ile Asn His Thr Ile Ser Arg Arg Ile Ile Glu Phe Ala Lys Ala
                245                 250                 255

His Gly Val Ser Val Ile Arg Leu Glu Asp Leu Arg Gly Ala Arg Trp
            260                 265                 270

Thr Lys Ser Gln Arg Lys Lys Gln Arg Lys Asp Ala Gly Arg Ser Leu
        275                 280                 285
```

```
His Ser Trp Ala Phe Phe Gln Leu Arg Gln Phe Ile Glu Tyr Lys Ala
    290                 295                 300

Ala Leu Ala Gly Ile Glu Val Glu Leu Val Asn Pro Glu Leu Thr Ser
305                 310                 315                 320

Leu Thr Cys Ser Arg Cys Gly Glu Val Arg Thr Ser Arg Pro Ala Gly
                325                 330                 335

Arg Trp Tyr Thr Cys Pro Arg Cys Gly Lys Val Lys His Ile Asp Ala
            340                 345                 350

Asn Ala Ala Asp Asn Ile Ala Gln Ala Ile Ser Gly Leu Ser Glu Glu
        355                 360                 365

Lys Arg Ala Lys Thr Ile Leu Lys Pro Lys Thr Arg Arg Arg Thr Thr
    370                 375                 380

Ala Ala
385
```

<210> 786
<211> 267
<212> PRT
<213> Halococcus sediminicola

<400> 786

```
Met Gly Thr Leu His Tyr Arg Glu Asp Glu Asp Ala Phe Tyr Leu His
1               5                   10                  15

Ile Val Val Met Lys Glu Val Glu Gln Arg Glu Gly Val Arg Val Leu
            20                  25                  30

Gly Val Asp Leu Asn Leu Lys Asn Val Ala Val Thr Ser Thr Gly Thr
        35                  40                  45

Phe Tyr Asp Gly Gly Arg Leu Leu Trp Gly Gln Asn His His Phe Arg
    50                  55                  60
```

```
Val Arg Arg Ser Leu Gln Asp Lys Asp Thr Arg Ser Ala Lys Gln Thr
65                  70                  75                  80


Leu Gln Gln Val Ser Gly Arg Glu Asn Arg Phe Val Leu Asp Arg Leu
                85                  90                  95


His Thr Leu Ser Arg Arg Leu Val Asp Glu Ala Arg Asn Tyr Asn Cys
            100                 105                 110


Ala Phe Ile Ala Val Glu Arg Leu Thr Asn Ile Arg Asp Arg Leu Asp
        115                 120                 125


Asn Gly Asn Asp Cys Ile Lys Arg Gln Met His Asn Trp Ala Phe Arg
    130                 135                 140


Glu Leu Arg Glu Met Leu Ala Tyr Lys Ala Ala Glu His Gly Ile Arg
145                 150                 155                 160


Val Glu Asp Val Asn Pro Ala Phe Thr Ser Gln Thr Cys Ser Arg Cys
                165                 170                 175


Gly His Gln Ser Ser Thr Asn Arg Asp Ser Ser Thr Gly Trp Phe Ser
            180                 185                 190


Cys Asn Glu Cys Gly Thr Glu Tyr Asp Gly Asp Tyr Asn Ala Ala Lys
        195                 200                 205


Asn Ile Gly Met Arg Leu Val Thr Leu Pro Ser Gly Lys Arg Pro Asp
    210                 215                 220


Gly Leu Gly Asn Gly Gln Leu Ala Leu Lys Ser Gly Thr Leu Asn Gly
225                 230                 235                 240


Ser Gly Asp Tyr Thr Ala His Asp Asp Val Ser Ala Asp Gln Glu Ser
                245                 250                 255


Thr Asp Lys Pro Thr Thr Ser Val Val Gly Arg
```

260 265

<210> 787
<211> 413
<212> PRT
<213> Duodenibacillus massiliensis

<400> 787

Met Ser Val Gln Lys Arg Ser Lys Ala Thr Ser Lys Gly Leu Asn Thr
1 5 10 15

Ser Ala Asp Gly Val Arg Arg Val Glu Gly Ser Gly Lys Cys Val Arg
20 25 30

Thr Ala Cys Val Arg Leu Glu Leu Leu Asp Pro Ala Ala His Glu Lys
35 40 45

Leu Ala Ala Thr Gln Arg Leu Tyr Ala Gln Val Cys Asn Tyr Val Val
50 55 60

Pro Thr Val Ala Ala Asp Arg Thr Lys Arg Leu Trp Gln Arg Phe Thr
65 70 75 80

Leu His His Ala Val Tyr Asp Lys Ile Lys Ala Lys Phe Pro Asp Leu
85 90 95

Gly Ser Gln Tyr Ala Cys Asn Val Ile Arg Ser Val Ser Ala Ala Tyr
100 105 110

Lys Thr Glu Leu Ala Lys His Pro Ala Gln Leu Lys Ser Glu Asp Lys
115 120 125

Lys Leu Lys Thr Leu Val Phe Arg His Pro Ser Val His Val Asp Lys
130 135 140

Asn Thr Leu Thr Phe Phe Pro Asp Gly Thr Val Ser Ile Ser Thr Ile
145 150 155 160

```
Ser Gly Arg Ile Arg Ala Arg Leu Cys Pro Gly Pro Phe Gln Lys Glu
                165                 170                 175

Leu Leu Ala Ser Gly Lys Arg Lys Glu Cys Asn Leu Val Leu His Pro
            180                 185                 190

Arg Arg Gly Arg Lys Glu Ala Phe Trp Glu Leu His Ile Ala Val Glu
        195                 200                 205

Ser Gln Gly Cys Ser Gly Glu Glu His Leu Lys Asn Leu Lys Ala Asp
    210                 215                 220

Glu Ile Met Gly Ile Asp Val Gly Glu Asn Asn Ile Ala Ala Val Ser
225                 230                 235                 240

Thr Gly Arg Ile Trp Lys Ala Gly Ala Leu Lys Asp Lys Arg Asp Arg
                245                 250                 255

Tyr Met Ser Gln Arg Lys Arg Leu Gln Arg Asn Gly Ser Gln Ser Ala
            260                 265                 270

Arg Gln His Leu Lys Lys Ala Ser Gly Arg Glu Arg Arg His Val Thr
        275                 280                 285

His Val Asn Asn Val Val Ser Lys Glu Ile Val Gln Glu Ala Ala Lys
    290                 295                 300

Arg Gly Ile Lys Leu Ile Ala Leu Glu Asp Leu Thr His Ile Arg Asp
305                 310                 315                 320

His Ile Lys Ala Gly Lys Arg Ile Arg Ser Arg Leu His Arg Trp Ser
                325                 330                 335

Phe Arg Glu Leu Gln Glu Met Ile Val Tyr Lys Ala Ala Ala Ala Gly
            340                 345                 350

Ile Arg Cys Val Phe Leu Asp Pro Arg Tyr Thr Ser Gln Thr Cys Ser
        355                 360                 365
```

```
Gln Cys Gly Ala Pro Gly Lys Arg His Lys His Gly Phe Arg Cys Ser
    370                 375                 380


Gln Cys Gly His Leu Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu
385                 390                 395                 400


Gln Gly Leu Cys Arg Gln Leu Ser Ala Gln Gly Leu Met
                405                 410


<210>  788
<211>  249
<212>  PRT
<213>  uncultured Clostridium sp.

<400>  788

Met Ile Asp Gly Lys Ser Lys Arg Ile Ser Val Lys Thr Lys Met Thr
1               5                   10                  15


Asp Lys Gln Lys Leu Ile Leu Ser Ser His Arg Leu Gly Thr Met Arg
            20                  25                  30


Ile Val Ile Lys Asn Ile Asn Thr Leu Val Ala Gln Phe Val Tyr Glu
        35                  40                  45


Ile Asn Glu Ile Glu Lys Val Asn Glu Ser Asn Asn Val Met Gly Val
    50                  55                  60


Asp Leu Gly Ile Lys Cys Pro Ala Val Ser Tyr Cys Thr Asp Gly Ser
65                  70                  75                  80


Val Lys Phe Tyr Gly Asn Gly Arg Lys Asn Lys Tyr Met Arg Arg His
                85                  90                  95


Tyr Ala Asn Leu Arg Lys Trp Phe Gln Lys Ala Lys Lys Pro Thr Val
            100                 105                 110


Val Lys Arg Ile Lys Asn Lys Glu Gln Arg Ile Met Lys Asp Ile Asp
```

```
        115                 120                 125

His Lys Ile Ser Arg Glu Ile Val Asn Thr Ala Lys Lys His Lys Ala
    130                 135                 140

Lys Val Ile Lys Leu Glu Arg Leu Glu Asn Ile Arg Ser Thr Thr Arg
145                 150                 155                 160

Thr Ser Cys Lys Asn Asn Pro Ser Leu His Thr Trp Ser Phe Tyr Arg
                165                 170                 175

Leu Ala Gln Tyr Ile Glu Tyr Lys Ala Lys Leu Val Gly Ile Glu Val
            180                 185                 190

Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Lys Cys Pro Gln Cys Gly
        195                 200                 205

Asn Ile His His Ala Lys Asp Arg Lys Tyr Ile Cys Lys Cys Gly Tyr
    210                 215                 220

His Thr His Arg Asp Leu Leu Gly Ala Ile Asn Ile Cys Asn Ser Thr
225                 230                 235                 240

Glu Tyr Ile Gly Asn Arg Cys Ile Ala
                245
```

<210> 789
<211> 386
<212> PRT
<213> Rhodococcus opacus

<400> 789

```
Met Lys Arg Val Val Lys Ile Lys Leu Ala Pro Thr Asp Ala Gln Ala
1               5                   10                  15

His Ala Leu His Glu Thr Leu Val Leu Cys Asn Thr Ala Ala Asp Val
            20                  25                  30
```

```
Val Ser Arg Val Ala Gln Ala Val Glu Asp Arg Arg Ala Phe Ala Leu
        35                  40                  45

Gln Lys Ala Val Tyr His Gln Leu Lys Ala Leu Gly Leu Ser Ala Gln
    50                  55                  60

Pro Ala Val Arg Thr Ile Lys Lys Val Ala Asp Ala Tyr Ala Thr Arg
65                  70                  75                  80

Gly Ala Asn Leu Glu Ala Gly Asn Tyr Gly Pro Arg Gly Gly Lys Arg
                85                  90                  95

Ala Thr Asp Ile Ala Ala Thr Ala Ile Gly Phe Arg Ala Leu Ala Ala
            100                 105                 110

Gln Pro Phe Asp Asp Arg Cys Leu Ser Trp Gln Gln Gln Asp Ser Thr
        115                 120                 125

Val Ser Ile Trp Thr Cys Glu Gly Arg Leu Lys Ala Val Arg Tyr Val
    130                 135                 140

Cys Ala Pro Trp Gln Arg Glu Leu Leu Glu His Arg Cys Gly Glu Thr
145                 150                 155                 160

Asp Leu Val Phe Arg Asp Asn Met Trp Phe Leu Tyr Ala Thr Val Asp
                165                 170                 175

Val Pro Thr Pro Glu Pro Val Val Val Gln Glu Phe Leu Gly Val Asp
            180                 185                 190

Leu Gly Ile Val Asn Leu Ala Val Thr Ser Asp Asp Thr Ala Ala Ser
        195                 200                 205

Ala Asp Trp Ser Gly Gly Ala Val Thr Ala Arg Arg Thr Lys Tyr Ala
    210                 215                 220

Arg Thr Arg Arg Ala Leu Gln Lys Val Gly Ser Lys Ser Ala Lys Arg
225                 230                 235                 240
```

```
Lys Leu Arg Gly Arg Arg Glu Lys Glu His Arg Tyr Ala Thr Asp Ile
                245                 250                 255

Asn His Gln Ile Ser Lys Thr Ile Val Ala Gln Ala Gln Arg Thr Gly
            260                 265                 270

Arg Gly Ile Val Leu Glu Asp Leu Ser Gly Ile Arg Glu Arg Val Arg
        275                 280                 285

Leu Ala Lys Thr Gln Arg Gln Gln Leu His Ser Trp Ala Tyr Ala Gln
    290                 295                 300

Leu Arg Asp Phe Val Thr Tyr Lys Ala Val Ser Val Gly Val Pro Leu
305                 310                 315                 320

Val Val Ile Asp Pro Arg Asn Thr Ser Arg Thr Cys Tyr Pro Cys Gly
                325                 330                 335

His Val Asp Lys Ala Asn Arg Thr Thr Gln Asp Arg Phe Val Cys Arg
            340                 345                 350

Met Cys Gly His Val Asp Gln Ala Asp His Asn Ala Ala Leu Asn Ile
        355                 360                 365

Ala Tyr Leu Gly Tyr Val Gln Tyr Thr Thr Thr Thr Arg Ser His Arg
    370                 375                 380

Ala Val
385
```

<210> 790
<211> 195
<212> PRT
<213> Methanotorris formicicus Mc-S-70

<400> 790

```
Met Ser Lys Val Lys Glu Lys Gly Pro Tyr Lys Gln Thr Leu Trp Phe
```

```
1               5                   10                  15

Gly Val Asp Leu Gly Val Tyr Asn Leu Val Val Ile Ala Asp Asn Lys
            20                  25                  30

Gly Glu Ser Leu Arg Phe Asp Gly Glu Ile Val Lys Gly His Lys Arg
        35                  40                  45

Arg Leu Lys Lys Lys Glu Phe Asn Lys Tyr Thr Lys Val Gly Asn Lys
    50                  55                  60

Ile Ser Asn Tyr Ser Arg Tyr Ile Asn His Val Ile Ser Lys Glu Ile
65                  70                  75                  80

Val Lys Lys Ala Lys Gln Tyr Asn Ala Gly Ile Val Leu Glu Lys Leu
                85                  90                  95

Lys Gly Leu Lys Lys Ser Lys Leu Asn Asn Ser Thr Pro Lys Asn Ile
            100                 105                 110

Arg Arg Val Leu His Ile Trp Ser Tyr Ala Asp Leu Ile Glu Lys Ile
        115                 120                 125

Glu Tyr Lys Ala Asn Leu Glu Gly Val Pro Val Val Glu Val Ser Pro
    130                 135                 140

Arg Asn Thr Ser Lys Thr Cys Ser Arg Cys Gly Tyr Val Asn Arg Arg
145                 150                 155                 160

Leu Lys Asn Glu Arg Ile Phe Ile Cys Ser Lys Cys Gly Leu Glu Ile
                165                 170                 175

Asp Arg Asp Leu Asn Ala Ala Ile Asn Ile Ala Lys Lys Val Ala Ser
            180                 185                 190

Lys Gln Val
        195
```

<210> 791
<211> 392
<212> PRT
<213> Thermococcus barophilus

<400> 791

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                  10                  15


Ala Pro Glu Ser Leu Asp Tyr Leu Phe Ser Thr Tyr Arg Lys Ile Val
            20                  25                  30


Asn Phe Leu Ile Ile His Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Lys Gly Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60


Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80


Phe Lys Ser Phe Arg Lys Arg Lys Lys Lys Gly Lys Ala Asn Gly Arg
                85                  90                  95


Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asn Leu Glu Ala Gly Val Val Lys Leu Leu Thr Leu Lys Gly Arg
        115                 120                 125


Ile Leu Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Asp
    130                 135                 140


Trp Lys Val Gly Gln Ala Trp Leu Val Arg Met Pro Lys Gly Val Phe
145                 150                 155                 160


Leu Asn Val Val Phe Ser Lys Glu Val Glu Val Ser Glu Pro Lys Ala
                165                 170                 175
```

```
Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Ile Arg Ala
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Gln Lys Ile Arg Ala Gly
    210                 215                 220

Arg Lys Arg Arg Glu Leu Leu Glu Lys Tyr Gly Glu Arg Lys Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Leu Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Arg Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Gly Lys Leu Ser Pro Asn Gly His Arg Val Leu Ser
                325                 330                 335

Cys Lys Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350

Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Pro Val Pro Pro Glu
        355                 360                 365
```

```
Ser Gln Pro Met Lys Thr Gly Gly Trp Lys Val Ser Arg Asn Asp Ile
    370                 375                 380


Tyr Lys Leu Tyr Lys Ser Tyr Gly
385                 390
```

<210> 792
<211> 358
<212> PRT
<213> Exiguobacterium sp. ZWU0009

<400> 792

```
Met Ser Gln Val Val Thr Val Glu Val Arg Ile Tyr Ala Thr Arg Arg
1               5                   10                  15


Gln Asp Ala Ile Leu Lys Arg Met Gly Lys Thr Tyr Ile Gln Thr Ala
            20                  25                  30


Asn Arg Val Val Ala Asn Met Val Ala Ser Glu Asp Gly Lys Arg Trp
        35                  40                  45


Ser Ser Lys Asp Ile Asp Thr Pro Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Leu Ala Gly Asp Ala Val Gly Ile Tyr Lys Lys Ala Arg Lys Glu Asp
65                  70                  75                  80


Phe Lys Arg Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile Ser Phe Pro Val Trp Met
            100                 105                 110


Asp Gly Lys Ser Val Lys Met Arg Phe Arg Ala Ala Met Val Asp Lys
        115                 120                 125


Asp Asn Arg Asn Thr Arg Leu Leu Ala Asn Lys Leu Gly Thr Leu Arg
    130                 135                 140
```

```
Val Thr Lys Lys Gly Arg Lys Trp Ile Ala Gln Ile Ser Val His Val
145                 150                 155                 160

Pro Thr Val Pro Arg Thr Gly Val Arg Leu Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Thr Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met Lys Arg Lys Phe Arg Ala
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Pro Lys Ala Ile Lys Arg
    210                 215                 220

Arg Asn Gln Lys Glu Gln Arg Trp Met Arg Asp Lys Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asp Phe Ala Arg Gln Lys Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Asn Gln Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ala Ser
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys Ser Val Arg Asn
305                 310                 315                 320

Lys Val Arg Asp Arg Val Tyr Thr Cys Ala Cys Gly Phe Lys Gly His
                325                 330                 335

Arg Asp Ala Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Met Met Asp
```

```
            340                 345                 350


Gly Asn Ser Pro Ser Ala
        355


<210>  793
<211>  358
<212>  PRT
<213>  Bacillus cereus group

<400>  793

Met Tyr Gln Thr Val Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45


Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Ala Lys
65                  70                  75                  80


Cys Lys Ile Ile Pro Val Leu Lys Lys Pro Ile Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr Tyr Ile Arg Leu Pro Leu Met Ile
            100                 105                 110


Asp Gly Lys Thr Lys Lys Val Ser Val Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125


His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140
```

```
Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Ala Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Asn Ala Ile Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Val Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Asn Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350
```

Gly Asn Ser Gln Ser Ala
        355

<210> 794
<211> 425
<212> PRT
<213> Thermococcus guaymasensis DSM 11113

<400> 794

Met Ser Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1   5   10   15

Thr Pro Glu Gly Leu Gly Ala Leu Phe Gln Thr Tyr Arg Glu Ile Val
            20   25   30

Asn Phe Leu Ile Thr His Ala Phe Glu Asn Thr Val Thr Ser Phe Tyr
        35   40   45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Gln Glu Tyr Pro Glu
    50   55   60

Leu Pro Ser His Tyr Leu Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65   70   75   80

Phe Lys Ser Phe Arg Lys Arg Lys Lys Lys Gly Lys Ala Lys Gly Lys
                85   90   95

Pro Val Phe Lys Arg Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100   105   110

Leu Asp Leu Glu Asn Lys Thr Val Lys Leu Ser Thr Pro Asn Arg Arg
        115   120   125

Ile Gln Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Asp
    130   135   140

Trp Lys Val Gly Gln Ala Trp Leu Val Lys Thr Pro Lys Gly Val Phe

```
145                 150                 155                 160

Leu Asn Val Val Phe Ser Arg Glu Val Glu Val Glu Glu Leu Lys Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Ile Thr His Glu Arg Glu Val Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Lys Ile Gln Arg Lys Ile Arg Ala Gly
    210                 215                 220

Lys Arg Arg Arg Gly Leu Leu Glu Lys Tyr Gly Arg Arg Glu Lys Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Cys His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Ala Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Arg
    290                 295                 300

Gly Val Arg Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Glu Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350
```

```
Asn Val Arg Leu Arg Ala Leu Lys Met Trp Gly Val Thr Val Pro Pro
        355                 360                 365


Glu Ser Pro Pro Met Lys Thr Gly Val Gly Lys Val Ile Arg Tyr Asp
    370                 375                 380


Trp Phe Thr Ser Ser Lys Ser Ser Gly Gln Pro Glu Arg Trp Ala Asn
385                 390                 395                 400


Leu Asp Ala Ala Phe Pro Ser Ala Pro Gln Val Pro Gln Arg Val Pro
                405                 410                 415


Gln Ser Thr Asp Arg Ala Arg Ser Pro
            420                 425


<210>  795
<211>  358
<212>  PRT
<213>  Exiguobacterium sp. ZWU0009

<400>  795

Met Ser Gln Val Val Thr Val Glu Val Arg Ile Tyr Ala Thr Arg Arg
1               5                   10                  15


Gln Asp Ala Ile Leu Lys Arg Met Gly Lys Thr Tyr Ile Gln Thr Ala
            20                  25                  30


Asn Arg Val Val Ala Asn Met Val Ala Ser Glu Asp Gly Lys Arg Trp
        35                  40                  45


Ser Ser Lys Asp Ile Asp Thr Pro Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Leu Ala Gly Asp Ala Val Gly Ile Tyr Lys Lys Ala Arg Lys Glu Asp
65                  70                  75                  80


Phe Lys Arg Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn Asn
                85                  90                  95
```

```
Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile Ser Phe Pro Val Trp Met
            100                 105                 110

Asp Gly Lys Ser Val Lys Met Arg Phe Arg Ala Ala Met Val Asp Lys
        115                 120                 125

Asp Asn Arg Asn Thr Arg Leu Leu Ala Asn Lys Leu Gly Thr Leu Arg
    130                 135                 140

Val Thr Lys Lys Gly Arg Lys Trp Ile Ala Gln Ile Ser Val His Val
145                 150                 155                 160

Pro Thr Val Pro Arg Thr Gly Val Arg Leu Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Thr Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met Lys Arg Lys Phe Arg Ala
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Pro Lys Ala Ile Lys Arg
    210                 215                 220

Arg Asn Gln Lys Glu Gln Arg Trp Met Arg Asp Lys Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asp Phe Ala Arg Gln Lys Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Asn Gln Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ala Ser
        275                 280                 285
```

```
Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys Ser Val Arg Asn
305                 310                 315                 320

Lys Val Arg Asp Arg Val Tyr Thr Cys Ala Cys Gly Phe Lys Gly His
                325                 330                 335

Arg Asp Thr Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Met Asp
            340                 345                 350

Gly Asn Ser Pro Ser Ala
        355
```

<210> 796
<211> 212
<212> PRT
<213> Methanotorris formicicus

<400> 796

```
Met Leu Phe Phe Ile Tyr Asn Lys Lys Glu Gly Asn Asp Tyr Tyr Ala
1               5                   10                  15

Tyr Leu Ser Lys Val Lys Glu Lys Gly Pro Tyr Lys Gln Thr Leu Trp
            20                  25                  30

Phe Gly Val Asp Leu Gly Val Tyr Asn Leu Val Val Ile Ala Asp Asn
        35                  40                  45

Lys Gly Glu Ser Leu Arg Phe Asp Gly Glu Ile Val Lys Gly His Lys
    50                  55                  60

Arg Arg Leu Lys Lys Lys Glu Phe Asn Lys Tyr Thr Lys Val Gly Asn
65                  70                  75                  80

Lys Ile Ser Asn Tyr Ser Arg Tyr Ile Asn His Val Ile Ser Lys Glu
                85                  90                  95
```

```
Ile Val Lys Lys Ala Lys Gln Tyr Asn Ala Gly Ile Val Leu Glu Lys
            100                 105                 110

Leu Lys Gly Leu Lys Lys Ser Lys Leu Asn Asn Ser Thr Pro Lys Asn
        115                 120                 125

Ile Arg Arg Val Leu His Ile Trp Ser Tyr Ala Asp Leu Ile Glu Lys
    130                 135                 140

Ile Glu Tyr Lys Ala Asn Leu Glu Gly Val Pro Val Val Glu Val Ser
145                 150                 155                 160

Pro Arg Asn Thr Ser Lys Thr Cys Ser Arg Cys Gly Tyr Val Asn Arg
                165                 170                 175

Arg Leu Lys Asn Glu Arg Ile Phe Ile Cys Ser Lys Cys Gly Leu Glu
            180                 185                 190

Ile Asp Arg Asp Leu Asn Ala Ala Ile Asn Ile Ala Lys Lys Val Ala
        195                 200                 205

Ser Lys Gln Val
    210
```

<210> 797
<211> 396
<212> PRT
<213> Peptococcaceae bacterium CEB3

<400> 797

```
Met Arg Arg Leu Phe Phe Met Trp Arg Gly Gly Glu Asn Val Glu Glu
1               5                   10                  15

Asn Thr Glu Gln Val Val Thr Ile Lys Leu Lys Leu Phe Glu Pro Thr
            20                  25                  30

Lys Thr Lys Gln Asp Met Tyr Gln Thr Met Ala Asp Arg Thr Thr Asp
        35                  40                  45
```

```
Phe Ala Asn Arg Tyr Leu Gly Val Glu Lys Pro Met Arg Pro Lys Ser
    50                  55                  60

Ser Ala Asp Ala Lys Leu Tyr Thr Glu Pro Leu Pro Ala Ile Val Leu
65                  70                  75                  80

Asn Gln Ala Ile Arg Asp Ile Glu Ala Lys Lys Asn Ala Lys Ser Phe
                85                  90                  95

Lys Arg Leu Trp Pro Asp Phe Asn Asn Gln Asn Phe Arg Val Glu Lys
            100                 105                 110

Glu Thr Leu Gln Asp Gly Gly Ala Ala Trp Lys Val Ser Phe Pro Thr
        115                 120                 125

Leu Glu Lys Arg Val Gly Val Pro Ile Gln Val Glu Lys Tyr Gln Ile
    130                 135                 140

Lys Tyr Leu Glu Leu Leu Leu Ser Gly Gln Ala Lys Gln Gly Thr Ala
145                 150                 155                 160

Gln Leu Ile Lys Cys Gly Arg Gln Trp Tyr Ile His Leu Ala Leu Thr
                165                 170                 175

Val Ser Val Lys Ala Glu Lys Lys Pro Pro Lys Tyr Met Gly Val Asp
            180                 185                 190

Leu Gly Leu Ile Asp Leu Ala Val Ala Ser Ile Leu Gly Ser Thr Leu
        195                 200                 205

Phe Phe Ser Gly Ala Glu Leu Ala Tyr Val Arg Arg His Tyr Ala Glu
    210                 215                 220

Leu Arg Lys Lys Leu Gln Lys Lys Gly Ala His Lys Ala Leu Arg Lys
225                 230                 235                 240
```

```
Leu Gly Asn Lys Glu His Arg Trp Ile Met Ala Ile Asn His Thr Ile
                245                 250                 255

Ser Arg Arg Ile Ile Glu Phe Ala Lys Ala His Gly Val Ser Val Ile
            260                 265                 270

Arg Leu Glu Asp Leu Arg Gly Ala Arg Trp Thr Lys Ser Gln Arg Lys
        275                 280                 285

Lys Gln Arg Lys Asp Ala Gly Arg Ser Leu His Ser Trp Ala Phe Phe
    290                 295                 300

Gln Leu Arg Gln Phe Ile Glu Tyr Lys Ala Ala Leu Ala Gly Ile Glu
305                 310                 315                 320

Val Glu Leu Val Asn Pro Glu Leu Thr Ser Leu Thr Cys Ser Arg Cys
                325                 330                 335

Gly Glu Val Arg Thr Ser Arg Pro Ala Gly Arg Trp Tyr Thr Cys Pro
            340                 345                 350

Arg Cys Gly Lys Val Lys His Ile Asp Ala Asn Ala Ala Asp Asn Ile
        355                 360                 365

Ala Gln Ala Ile Ser Gly Leu Ser Glu Glu Lys Arg Ala Lys Thr Ile
    370                 375                 380

Leu Lys Pro Lys Thr Arg Arg Arg Thr Thr Ala Ala
385                 390                 395


<210>  798
<211>  166
<212>  PRT
<213>  Nitrosococcus watsonii

<400>  798

Met Gln Ser Lys Gly Thr Arg Gly Ala Arg Arg Val Leu Lys Arg Leu
1               5                   10                  15
```

```
Ser Gly Arg Glu Ser Arg His Ile Arg His Glu Asn His Leu Leu Ser
            20                  25                  30

Lys Ala Leu Val Asp Glu Ala Gln Met His Gln Cys Gly Thr Ile Arg
        35                  40                  45

Leu Glu Lys Leu Thr Gly Ile Arg Ala Arg Thr Lys Val Arg Asn Lys
    50                  55                  60

His Leu Asn Arg Met Val Asn Gly Trp Ser Phe Gly Glu Leu Gln Lys
65                  70                  75                  80

Phe Val Glu Tyr Lys Ala Thr Arg Ala Gly Ile Lys Thr Glu His Val
                85                  90                  95

Asn Pro Ala Tyr Thr Ser Lys Thr Cys Ser Cys Cys Gly Lys Arg Gly
            100                 105                 110

Ser Arg Gln Gln Asp Val Phe Arg Cys Ala Thr Cys Gly Glu Ser His
        115                 120                 125

Ser Asp Ile Asn Ala Ala Ala Asn Ile Ala Gly Gly Gly Val Cys Lys
    130                 135                 140

Pro Ser Arg Ile Asn Ala Asp Cys Glu Ile Asn Phe Ser His Asp Val
145                 150                 155                 160

Val Glu Ser Cys Leu Leu
                165
```

<210> 799
<211> 130
<212> PRT
<213> Rhodococcus opacus PD630

<400> 799

```
Met Ala Gly Gly Ser Arg Ser Ala Leu Arg Gly Arg Ala Gly Thr Ala
1               5                   10                  15
```

```
Arg Gly Ile Val Leu Glu Asp Leu Ser Gly Ile Arg Glu Arg Val Arg
            20                  25                  30

Leu Ala Lys Ala Gln Arg Gln Gln Leu His Ser Trp Ala Tyr Ala Gln
        35                  40                  45

Leu Arg Asp Phe Val Thr Tyr Lys Ala Ala Ser Val Gly Val Pro Val
    50                  55                  60

Glu Val Ile Asn Pro Arg Asn Thr Ser Arg Thr Cys Tyr Pro Cys Gly
65                  70                  75                  80

His Val Asp Lys Ala Asn Arg Ile Thr Gln Asp Arg Phe Val Cys Arg
                85                  90                  95

Val Cys Gly His Val Asp Gln Ala Asp His Asn Ala Ala Leu Asn Ile
            100                 105                 110

Gly Tyr Leu Gly Tyr Val Lys Tyr Met Thr Thr Thr His Gly Tyr Trp
        115                 120                 125

Ala Ala
    130
```

<210> 800
<211> 339
<212> PRT
<213> Trichococcus palustris

<400> 800

```
Met Lys Thr Val Gln Ile Lys Leu Lys Pro Thr Lys Thr Gln Ala Leu
1               5                   10                  15

Glu Leu Lys Arg Leu Ser Leu Glu Tyr Ile Trp Gln Ala Asn Val Leu
            20                  25                  30

Val Gln Gln Ala Ile Ser Glu Glu Gly Phe Pro Lys Val Thr Ser Lys
```

```
        35                  40                  45

Asp Ile Glu Ala Asp Ile Pro Ser Val Leu Lys Asn Glu Leu Ile Arg
    50                  55                  60

Tyr Ala Lys Ser Lys Leu Lys Gln Phe Gly Lys Cys Val Phe Lys Lys
65                  70                  75                  80

Pro Met Leu Ser Tyr Asn Asn Gln Asn Phe Ser Val Asp Glu Lys Ala
                85                  90                  95

Ile Arg Phe Pro Leu Met Val Glu Gly Lys Ala Lys Lys Thr Ala Ile
            100                 105                 110

Lys Ala Ile Ile Pro Glu Glu Val Phe Ala Leu Leu Ser Gly Ser Lys
        115                 120                 125

Leu Gly Ala Leu Arg Ile Thr Lys Lys Gly Phe His Trp Met Ala Gln
    130                 135                 140

Ile Ser Val His Thr Glu Ala Glu Glu Phe Leu Gly Asp Gly Ile Leu
145                 150                 155                 160

Gly Val Asp Leu Gly Ile Leu Cys Pro Ala Val Gly Val Val Ala Ser
                165                 170                 175

Asn Gly Lys Thr Gln Phe Phe Gly Asn Gly Arg Gln Asn Lys Cys Leu
            180                 185                 190

Arg Arg Lys Tyr Lys Glu Leu Arg Arg Gln Leu Gly Lys Lys Lys Lys
        195                 200                 205

Leu Asn Ala Ile Arg Asn Ile Asn Asp Lys Glu Ser Arg Ile Met Arg
    210                 215                 220

Asp Ile Asn His Lys Leu Ser Arg Gln Ile Val Thr Phe Ala Val Glu
225                 230                 235                 240
```

```
Lys Asn Cys Gly Thr Ile His Leu Glu Lys Leu Ser Gly Ile Arg Arg
                245                 250                 255

Thr Ser Arg Leu Arg Gly Lys Asn Lys Ala Asn Leu His Ser Trp Thr
            260                 265                 270

Phe His Glu Leu Ser Ser Phe Ile Glu Tyr Lys Ala Arg Glu Leu Gly
        275                 280                 285

Ile Lys Val Val Tyr Ile Asn Pro Glu Tyr Thr Ser Gln Ile Cys Pro
    290                 295                 300

Met Cys Gly Glu Arg Asn Lys Val Lys Asp Arg Asn Tyr Asn Cys Gly
305                 310                 315                 320

Cys Gly Tyr His Ser His Arg Asp Arg Val Gly Ala Leu Asn Ile Ala
                325                 330                 335

Arg Thr Ile
```

<210> 801
<211> 358
<212> PRT
<213> Exiguobacterium

<400> 801

```
Met Ser Gln Val Val Thr Val Glu Val Arg Ile Tyr Ala Thr Arg Arg
1               5                   10                  15

Gln Asp Ala Ile Leu Lys Arg Met Gly Lys Thr Tyr Ile Gln Thr Ala
            20                  25                  30

Asn Arg Val Val Ala Asn Met Val Ala Ser Glu Asp Gly Lys Arg Trp
        35                  40                  45

Ser Ser Lys Asp Ile Asp Thr Pro Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60
```

```
Leu Ala Gly Asp Ala Val Gly Ile Tyr Lys Lys Ala Arg Lys Glu Asp
65                  70                  75                  80

Phe Lys Arg Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn Asn
                85                  90                  95

Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile Ser Phe Pro Val Trp Met
            100                 105                 110

Asp Gly Lys Ser Val Lys Met Arg Phe Arg Ala Ala Met Val Asp Lys
        115                 120                 125

Asp Asn Arg Asn Thr Gly Leu Leu Ala Asn Lys Leu Gly Thr Leu Arg
    130                 135                 140

Val Thr Lys Lys Gly Arg Lys Trp Ile Ala Gln Ile Ser Val His Val
145                 150                 155                 160

Pro Thr Val Pro Arg Thr Gly Val Arg Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Thr Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met Lys Arg Lys Phe Arg Ala
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Pro Lys Ala Ile Lys Arg
    210                 215                 220

Arg Asn Gln Lys Glu Gln Arg Trp Met Arg Asp Lys Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asp Phe Ala Arg Gln Lys Lys Ile Ser Val Ile
                245                 250                 255
```

```
Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Asn Gln Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ala Ser
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly Ile Lys Val Glu Tyr Ala
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys Ser Val Arg Asn
305                 310                 315                 320

Lys Val Arg Asp Arg Val Tyr Thr Cys Ala Cys Gly Phe Lys Gly His
                325                 330                 335

Arg Asp Ala Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Met Asp
            340                 345                 350

Gly Asn Ser Pro Ser Ala
        355
```

<210> 802
<211> 351
<212> PRT
<213> Paenibacillus chondroitinus

<400> 802

```
Met Gln Thr Leu Thr Ile Gln Ile Arg Ile Phe Pro Ser Asn Pro Ser
1               5                   10                  15

Val Leu Val Asp Met Gly Asn Glu Tyr Ile Arg Thr Val Asn Glu Leu
            20                  25                  30

Thr Glu Gln Thr Glu Ala Ser Gly Thr Phe Pro Lys Leu Thr Ser Lys
        35                  40                  45

Thr Val Asn Ala Asn Leu Pro Ser Ala Val Lys Asn Gln Leu Ile Arg
    50                  55                  60
```

```
Asp Ala Lys Ser Ile Phe Gln Lys Ser Lys Lys Glu Lys Lys Arg Pro
65                  70                  75                  80

Ile Leu Lys Lys Arg Val Tyr Tyr Val Asn Asn Gln Asn Tyr Ala Ile
                85                  90                  95

Gly Asp Asp Ser Val Ser Phe Pro Val Val Met Asp Gly Lys Val Gln
            100                 105                 110

Arg Leu Val Val Pro Ala Val Ile Ala Asp Arg Glu Lys Thr Met Leu
        115                 120                 125

Ser Asn Ser Lys His Gly Ile Leu Arg Val Val Gln Lys Ser Ala Lys
    130                 135                 140

Trp Phe Val Gln Val Ser Ile Glu Arg Pro Thr Glu Gln Ala Glu Gly
145                 150                 155                 160

Asp Val Val Met Gly Ile Asp Leu Gly Leu Lys Val Pro Ala Val Val
                165                 170                 175

Val Thr Ser Ser Gly Lys Thr Lys Phe Val Gly Asn Gly Arg Lys Asn
            180                 185                 190

Lys Tyr Ile Arg Arg Met Tyr Asn Asp Asn Arg Arg Lys Leu Gly Lys
        195                 200                 205

Leu Lys Lys Leu Ser Ala Ile Arg Lys Gln Arg Asp Lys Glu Ser Arg
    210                 215                 220

Tyr Met Lys Asp Gln Asn His Lys Ile Ser Arg Gln Ile Val Asn Met
225                 230                 235                 240

Ala Ile Lys Glu Asn Val Ser Val Ile Lys Leu Glu Lys Leu Ala Asp
                245                 250                 255

Ile Arg Lys Thr Thr Arg Thr Ser Arg Lys Asn Ala Lys Asn Leu His
```

260 265 270

Asn Trp Ser Phe Tyr Gln Leu Gln Met Phe Ile Ala Tyr Lys Ala Ala
275 280 285

Ile Ala Gly Ile Lys Val Val Glu Val Asn Pro Ser Tyr Thr Ser Gln
290 295 300

Thr Cys Pro Ser Cys Gly Gln Arg Asn Lys Ala Lys Asp Arg Thr Tyr
305 310 315 320

Gln Cys Thr Cys Gly Tyr Thr Ala His Arg Asp Arg Val Gly Ala Ile
325 330 335

Asn Ile Met Arg Gln Pro Val Ala Asp Gly Asn Ser Leu Ser Ala
340 345 350

<210> 803
<211> 53
<212> PRT
<213> Scytonema sp. HK-05

<400> 803

Met Phe Leu Val Ser Thr Leu Gln Glu Leu Gln Thr Val Val Leu Glu
1 5 10 15

Leu Leu Val Pro Ile Phe Gln Ile Lys Gln Met Cys Glu Ala Leu Lys
20 25 30

Asn Asp Pro Arg Phe Ile Gly Gln Pro Arg Arg Phe Tyr Thr Ser Thr
35 40 45

Gly Ser Thr Asn Ala
50

<210> 804
<211> 385
<212> PRT
<213> Streptomyces mirabilis

<400> 804

```
Met Lys Ile Val Val Gln Val Lys Leu Val Pro Asp Ala Ala Gln Ala
1               5                   10                  15


Ser Ala Val Gly Ala Thr Leu His Thr Val Asn Asp Arg Ala Asn Trp
            20                  25                  30


Val Ser Gly Val Ala Phe Ala Arg Gly Val Pro Arg Glu Tyr Glu Leu
        35                  40                  45


Arg Lys His Thr Tyr Ala Glu Leu Lys Ala Ala Gly Leu Gly Ala Gln
    50                  55                  60


Ala Ala Gln His Thr Ile Lys Lys Val Val Asp Ala Tyr Thr Thr Leu
65                  70                  75                  80


Arg Ala Asn Leu Arg Ala Gly Asn Leu Gly Lys Leu Gly Ser Lys Arg
                85                  90                  95


Arg Lys Lys Ala Glu Ser Lys Pro Val Ala Phe Arg Pro Glu Ala Ala
            100                 105                 110


His Pro Phe Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Ala Gln Thr
        115                 120                 125


Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Lys Asn Val Arg Phe Ala
    130                 135                 140


Cys Ser Pro Asp Ala Leu Lys Thr Leu Arg Glu Tyr Arg Lys Gly Glu
145                 150                 155                 160


Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Ile Ala Val Cys
                165                 170                 175


Glu Val Pro Glu Ala Glu Gln Tyr Glu Pro Gly Gln Phe Ile Gly Val
            180                 185                 190
```

```
Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Thr Gly Tyr Arg Ala
        195                 200                 205

Ala Gly Arg Gly Leu Asn Arg His Arg Lys Arg Gln Leu Asp Leu Arg
    210                 215                 220

Lys Lys Leu Gln Ala Lys Gly Thr Lys Ser Ala Arg Arg Arg Leu Lys
225                 230                 235                 240

Asn Arg Arg Arg Lys Glu Ala Arg His Ala Gly His Val Asn His Ile
                245                 250                 255

Ile Ala Lys Gln Ile Val Thr Glu Ala Glu Arg Thr Ser Ser Gly Ile
            260                 265                 270

Ala Leu Glu Asp Leu Gly Gly Ile Arg Gln Arg Val Arg Leu Arg Lys
        275                 280                 285

Pro Gln Arg Val Thr Leu His Ser Trp Ala Phe His Gln Leu Gly Gln
    290                 295                 300

Phe Val Glu Tyr Lys Ala Arg Arg Ala Gly Val Pro Leu Val Tyr Val
305                 310                 315                 320

Asp Pro Ala Tyr Thr Ser Gln Glu Cys Ala Glu Cys Pro His Ile Glu
                325                 330                 335

Lys Lys Asn Arg Val Asp Gln Ala Leu Phe Ile Cys Arg Lys Cys Gly
            340                 345                 350

Val Val Ala His Ala Asp Arg Asn Ala Ser His Asn Ile Ala Ala Arg
        355                 360                 365

Gly Glu Ala Val Trp Ile Ala Gly Arg Glu Ser Arg Val Pro Ala Pro
    370                 375                 380

Phe
```

385

<210> 805
<211> 342
<212> PRT
<213> Trichococcus palustris

<400> 805

Met Ser Lys Met Lys Thr Val Gln Ile Lys Leu Lys Pro Thr Lys Thr
1 5 10 15

Gln Ala Leu Glu Leu Lys Arg Leu Ser Leu Glu Tyr Ile Trp Gln Ala
20 25 30

Asn Val Leu Val Gln Gln Ala Ile Ser Glu Glu Gly Phe Pro Lys Val
35 40 45

Thr Ser Lys Asp Ile Glu Ala Asp Ile Pro Ser Val Leu Lys Asn Glu
50 55 60

Leu Ile Arg Tyr Ala Lys Ser Lys Leu Lys Gln Phe Gly Lys Cys Val
65 70 75 80

Phe Lys Lys Pro Met Leu Ser Tyr Asn Asn Gln Asn Phe Ser Val Asp
85 90 95

Glu Lys Ala Ile Arg Phe Pro Leu Met Val Glu Gly Lys Ala Lys Lys
100 105 110

Thr Ala Ile Lys Ala Ile Ile Pro Glu Glu Val Phe Ala Leu Leu Ser
115 120 125

Gly Ser Lys Leu Gly Ala Leu Arg Ile Thr Lys Lys Gly Phe His Trp
130 135 140

Met Ala Gln Ile Ser Val His Thr Glu Ala Glu Glu Phe Leu Gly Asp
145 150 155 160

```
Gly Ile Leu Gly Val Asp Leu Gly Ile Leu Cys Pro Ala Val Gly Val
                165                 170                 175

Val Ala Ser Asn Gly Lys Thr Gln Phe Phe Gly Asn Gly Arg Gln Asn
            180                 185                 190

Lys Cys Leu Arg Arg Lys Tyr Lys Glu Leu Arg Arg Gln Leu Gly Lys
        195                 200                 205

Lys Lys Lys Leu Asn Ala Ile Arg Asn Ile Asn Asp Lys Glu Ser Arg
    210                 215                 220

Ile Met Arg Asp Ile Asn His Lys Leu Ser Arg Gln Ile Val Thr Phe
225                 230                 235                 240

Ala Val Glu Lys Asn Cys Gly Thr Ile His Leu Glu Lys Leu Ser Gly
                245                 250                 255

Ile Arg Arg Thr Ser Arg Leu Arg Gly Lys Asn Lys Ala Asn Leu His
            260                 265                 270

Ser Trp Thr Phe His Glu Leu Ser Ser Phe Ile Glu Tyr Lys Ala Arg
        275                 280                 285

Glu Leu Gly Ile Lys Val Val Tyr Ile Asn Pro Glu Tyr Thr Ser Gln
    290                 295                 300

Ile Cys Pro Met Cys Gly Glu Arg Asn Lys Val Lys Asp Arg Asn Tyr
305                 310                 315                 320

Asn Cys Gly Cys Gly Tyr His Ser His Arg Asp Arg Val Gly Ala Leu
                325                 330                 335

Asn Ile Ala Arg Thr Ile
            340
```

<210> 806
<211> 358

<212> PRT
<213> Bacillus mycoides

<400> 806

```
Met Tyr Gln Thr Val Ala Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45


Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Val Lys
65                  70                  75                  80


Cys Glu Ile Ile Pro Val Leu Lys Lys Thr Ile Cys Leu Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr Tyr Ile Arg Leu Pro Leu Met Ile
            100                 105                 110


Asp Gly Lys Thr Lys Lys Val Ser Val Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125


His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140


Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160


Pro Thr Ala Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175


Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
```

```
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Asn Ala Met Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Val Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350

Gly Asn Ser Gln Ser Ala
        355
```

<210> 807
<211> 358
<212> PRT

<213> Bacillus cereus group

<400> 807

```
Met Tyr Gln Thr Val Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15


Gln Ala Ser Ile Leu Asn Ala Met Gly Lys Glu Tyr Ile Ser Thr Ile
            20                  25                  30


Asn Ala Leu Val Ser Glu Met Val Ala Glu Lys Lys Thr Thr Lys Lys
        35                  40                  45


Thr Thr Lys Asp Val Pro Val Asn Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Ala Ile Lys Asp Ala Lys Ser Val Phe Gln Lys Val Lys Lys Val Lys
65                  70                  75                  80


Cys Glu Ile Ile Pro Val Leu Lys Lys Thr Ile Cys Leu Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr Tyr Ile Arg Leu Pro Leu Met Ile
            100                 105                 110


Asp Gly Lys Thr Lys Lys Val Ser Val Arg Ala Leu Leu Ile Asp Lys
        115                 120                 125


His Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140


Ile Thr Lys Lys Ser Asn Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160


Pro Thr Ala Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175


Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Thr Arg Phe
            180                 185                 190
```

```
Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Arg Arg Met Phe Lys Ser
        195                 200                 205

Lys Arg Lys Lys Leu Gly Glu Ser Lys Lys Leu Asn Ala Met Arg Asn
    210                 215                 220

Phe Asp Asp Lys Glu Gln Arg Tyr Met Lys Asp Gln Asp His Lys Ile
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Val Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Glu Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Asn Cys Ser Lys Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Ile Asp
            340                 345                 350

Gly Asn Ser Gln Ser Ala
        355
```

<210> 808
<211> 358
<212> PRT
<213> Caryophanon latum

<400> 808

```
Met Gly Gln Thr Ile Met Ile Asn Ile Lys Leu Leu Pro Thr Lys Glu
1               5                  10                  15


Gln Ala Thr Ile Leu Glu Glu Met Ser Lys Ser Tyr Ile Thr Ala Ile
            20                  25                  30


Asn Glu Leu Val Ala Glu Met Val His Ala Lys Gln Leu Leu Lys Lys
        35                  40                  45


Thr Ser Lys Asn Val Phe Val Pro Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60


Leu Ile Gln Asp Ala Lys Ser Val Phe Asn Lys Ala Lys Lys Thr Asn
65                  70                  75                  80


Tyr His Cys Ile Pro Val Leu Lys Lys Pro Leu Cys Val Trp Asn Asn
                85                  90                  95


Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Ser Leu Pro Ile Met Val
            100                 105                 110


Asn Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Arg
        115                 120                 125


Glu Asn Arg Asn Phe Thr Leu Leu Asn His Lys Leu Gly Thr Leu Arg
    130                 135                 140


Ile Thr Lys Lys Asn His Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160


Pro Thr Ile Gln Lys Ala Gly Met Arg Ile Met Gly Val Asp Leu Gly
                165                 170                 175


Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu His Val Arg Phe
            180                 185                 190
```

```
Phe Gly Asn Gly Arg Gln Asn Lys Tyr Met Lys Arg Lys Phe Arg Ser
        195                 200                 205

Lys Arg Lys Glu Leu Gly Gln Lys Lys Lys Leu Lys Ala Ile Arg Thr
    210                 215                 220

Leu Asn Asn Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Glu Phe Ala Lys Glu Gln Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Lys Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ala Asn
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Asn Leu Val Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Gln Cys Gly Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Asn Tyr Lys Cys Lys Cys Gly Phe Lys Lys His
                325                 330                 335

Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Val Asp
            340                 345                 350

Gly Asn Ser Pro Ser Ala
        355
```

<210> 809
<211> 388
<212> PRT
<213> Nocardiopsis synnemataformans

<400> 809

```
Met Lys Ala Thr Val Gln Ile Lys Leu Leu Pro Ser Pro Glu Gln Ala
1               5                   10                  15

Glu Ala Leu Ser Ala Thr Leu His Ala Cys Asn Gln Ala Ala Asn Ser
            20                  25                  30

Ala Ser Gln Val Ala Phe Ala Thr Gly Ala Thr His Lys Phe Ala Leu
        35                  40                  45

Gln Lys Arg Ile Tyr Glu His Leu Lys Val Glu Tyr Gly Leu Ser Ala
    50                  55                  60

Gln Pro Thr Val Arg Val Ile Gly Lys Val Ala Asp Ala Tyr Thr Thr
65                  70                  75                  80

Arg Ala Ser Asn Leu Arg Ala Gly Asn Leu Gly Pro Pro Gly Ser Gln
                85                  90                  95

Arg Arg Lys Lys Ala Thr Ser Gly Pro Val Ser Phe Thr Gln Asp Ser
            100                 105                 110

Ala Gln Pro Phe Asp Asn Arg Cys Leu Ser Trp Gln Leu Asp Ala Arg
        115                 120                 125

Thr Val Ser Ile Trp Thr Val Arg Gly Arg Met Lys Gln Val Pro Phe
    130                 135                 140

Thr Gly Ser Thr Asp Gln Leu Lys Thr Val Ala Glu His Arg Arg Gly
145                 150                 155                 160

Glu Ser Asp Leu Ala Tyr Arg Asp Gly Met Trp Phe Leu His Ala Thr
                165                 170                 175

Cys Asp Ile Pro Glu Glu Pro Leu Asn Val Asn Pro Glu Gly Phe Val
            180                 185                 190
```

```
Gly Val Asp Leu Gly Ile Val Asn Ile Ala Thr Thr Ser Asp Gly His
        195                 200                 205

Arg His Ala Gly Arg Gly Leu Asn Arg His Arg Arg Arg Met Asn Gln
    210                 215                 220

Leu Arg Ala Lys Leu Gln Arg Lys Arg Thr Lys Ser Thr Lys Arg Gly
225                 230                 235                 240

Leu Lys Arg Val Arg Arg Arg Glu Ala Arg Arg Ala Arg Asp Val Asn
                245                 250                 255

His Gln Ile Ser Lys Gln Ile Val Glu Arg Ala Glu Arg Thr Gly Arg
            260                 265                 270

Gly Ile Ala Leu Glu Asp Leu Gln Gly Ile Arg Glu Arg Val Arg Gln
        275                 280                 285

Ala Lys Ala Gln Arg Ala Ala Leu His Ser Trp Ala Phe Ala Gln Leu
    290                 295                 300

Arg Asn Phe Ile Thr Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Ala
305                 310                 315                 320

Val Val Asp Pro Ala Tyr Ser Ser Gln Ser Cys Ser Glu Cys Asp His
                325                 330                 335

Thr Ser Arg Arg Asn Arg Thr Ala Gln Ala Arg Phe Val Cys Leu Ser
            340                 345                 350

Cys Gly Val Ile Met His Ala Asp Ala Asn Ala Ser Arg Asn Leu Ala
        355                 360                 365

His Arg Gly Glu Val Ala Trp Asn Ala Gly Arg Leu Ser Ala Ala Pro
    370                 375                 380

Thr Pro Leu Pro
385
```

<210> 810
<211> 349
<212> PRT
<213> Microtetraspora glauca

<400> 810

```
Met Ala Phe Ala Lys Gly Leu Lys Arg Arg Asn Val Leu Gln Lys Glu
1               5                  10                  15


Val Tyr Phe Ala Leu Lys Ala Asp Tyr Asp Leu Gly Ala Gln Pro Ala
            20                  25                  30


Val Arg Val Val Lys Lys Val Cys Asp Ala Tyr Ala Thr Leu Lys Gly
        35                  40                  45


Asn Ile Asn Ala Gly Asn Leu Gly Arg Glu Gly Ser Lys Arg Arg Leu
    50                  55                  60


Arg Ala Glu Ser Lys Pro Ile Arg Phe Arg Glu Asp Ala Ala Gln Pro
65                  70                  75                  80


Phe Asp Asp Arg Ile Leu Thr Trp Asn Leu Asp Ala Arg Thr Val Ser
                85                  90                  95


Ile Trp Thr Val Ala Gly Arg Ile Lys His Ile Pro Phe Val Cys Ser
            100                 105                 110


Ser Glu Thr Leu Lys Leu Leu Ala Ser Arg Lys Gly Glu Ser Asp Leu
        115                 120                 125


Val Met Arg Asp Gly Met Phe Phe Leu Ile Ala Thr Ile His Val Pro
    130                 135                 140


Glu Pro Asp Val Ser Glu Pro Asp Gly Phe Leu Gly Val Asp Leu Gly
145                 150                 155                 160


Ile Val Asn Ile Ala Thr Thr Ser Asp Gly Gln Ile Met Ser Gly Arg
```

```
                165                 170                 175

Arg Leu Asn His Tyr Arg Arg Arg Met Leu Asn Leu Arg Ser Lys Leu
            180                 185                 190

Gln Lys Lys Arg Thr Lys Ser Ala Lys Arg Ala Leu Lys Arg Ile Arg
        195                 200                 205

Arg Arg Glu Ser Arg His Ala Ala Asn Ala Asn His Ile Ile Ala Asn
    210                 215                 220

Arg Leu Val Ala Thr Ala Glu Arg Thr Ser Arg Gly Ile Ala Leu Glu
225                 230                 235                 240

Asp Leu Ser Gly Ile Arg Gln Arg Val Thr Ala Lys Lys Asp Gln Arg
                245                 250                 255

Ala Arg Leu His Ser Trp Ala Phe Ala Gln Leu Gly Gly Phe Val Glu
            260                 265                 270

Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val Phe Val Asp Pro Arg
        275                 280                 285

Asn Thr Ser Arg Gln Cys Ser Glu Cys Trp His Thr His Arg Thr Asn
    290                 295                 300

Arg Val Asp Gln Ala Arg Phe Val Cys Arg Ser Cys Gly Thr Val Met
305                 310                 315                 320

His Ala Asp His Asn Gly Ser Arg Asn Ile Ala His Arg Gly Glu Ala
                325                 330                 335

Ala Trp Lys Arg Gly Ala Val Asn Arg Pro Arg Thr Ala
            340                 345

<210>  811
<211>  229
<212>  PRT
```

<213> uncultured Clostridium sp.

<400> 811

```
Met Lys Cys Lys Ser Asn Asn Asn Val Ile Tyr Ser Tyr Lys Tyr His
1               5                  10                  15


Val Val Phe Cys Pro Lys Tyr Arg Arg Pro Val Leu Val Asp Gly Val
            20                  25                  30


Val Asp Ala Phe Ser Asn Asp Asn Val Met Gly Val Asp Leu Gly Ile
        35                  40                  45


Lys Cys Pro Ala Val Ser Tyr Cys Pro Asp Gly Ser Val Lys Phe Tyr
    50                  55                  60


Gly Asn Gly Arg Lys Asn Lys Tyr Ile Arg Arg His Tyr Asn Asn Leu
65                  70                  75                  80


Arg Lys Arg Phe Gln Lys Ala Lys Lys Pro Lys Ala Val Val Lys Ile
                85                  90                  95


Asn Asn Lys Glu Gln Arg Ile Met Lys Asp Ile Asp His Lys Leu Ser
            100                 105                 110


Arg Glu Ile Val Asn Thr Ala Lys Ala His Asp Val Ser Val Ile Lys
        115                 120                 125


Leu Glu Arg Leu Gln Asn Ile Arg Ser Ala Thr Arg Thr Ser Arg Lys
    130                 135                 140


Asn Asn His Ser Leu His Thr Trp Ser Phe Tyr Arg Leu Ala Thr Phe
145                 150                 155                 160


Ile Glu Tyr Lys Ala Lys Leu Ala Gly Ile Glu Val Glu Tyr Val Asp
                165                 170                 175


Pro Ala Tyr Thr Ser Gln Ile Cys Pro Ile Cys Gly Ser Val His His
            180                 185                 190
```

```
Ala Asn Asp Arg Asn Tyr Thr Cys Arg Cys Gly Phe His Thr His Arg
        195                 200                 205


Asp Leu Leu Gly Ala Ile Asn Ile Cys Asn Ser Thr Glu Tyr Ile Gly
    210                 215                 220


Asn Arg Tyr Thr Ala
225
```

<210> 812
<211> 393
<212> PRT
<213> Thermococcus sibiricus MM 739

<400> 812

```
Met Pro Ser Glu Thr Ile Lys Leu Ala Ser Lys Phe Lys Leu Lys Glu
1               5                   10                  15


Thr Pro Glu Gly Leu Asn Glu Leu Phe Ser Thr Tyr Arg Asp Ile Val
            20                  25                  30


Asn Phe Leu Ile Thr His Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Ile Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60


Leu Pro Ser His Tyr Ile Tyr Thr Ala Cys Gln Met Ala Ala Ser Ile
65                  70                  75                  80


Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Arg Gly Lys Ala Ser Gly Arg
                85                  90                  95


Pro Val Phe Lys Lys Glu Ala Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Glu Lys Gly Ile Ile Lys Leu Ser Thr Pro Asn Gly Arg
```

```
        115                 120                 125

Ile Thr Leu Lys Phe Tyr Pro Ala Lys His His Glu Lys Phe Lys Asn
    130                 135                 140

Trp Lys Val Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Lys Glu Val Glu Val Lys Glu Pro Glu Asp
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Ser
            180                 185                 190

Asp Gly Glu Phe Val Gln Ile Ile Thr His Glu Lys Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Val Lys Val Gly
    210                 215                 220

Lys Lys Arg Gln Glu Leu Leu Glu Lys Tyr Gly Glu Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asn Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Glu Val Val Phe Val Asp Pro Ala Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320
```

```
Pro Val Cys Gly Glu Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Leu Asn Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350

Asn Val Arg Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser Pro Pro Met Lys Met Gly Gly Gly Lys Ala Ser Arg Gly Asp
    370                 375                 380

Val Tyr Glu Leu Tyr Thr Asn Tyr Gly
385                 390
```

<210> 813
<211> 383
<212> PRT
<213> Peptococcaceae bacterium CEB3

<400> 813

```
Met Glu Glu Asn Thr Glu Gln Val Val Thr Ile Lys Leu Lys Leu Phe
1               5                   10                  15

Glu Pro Thr Lys Thr Lys Gln Asp Met Tyr Gln Thr Met Ala Asp Arg
            20                  25                  30

Thr Thr Asp Phe Ala Asn Arg Tyr Leu Gly Val Glu Lys Pro Met Arg
        35                  40                  45

Pro Lys Ser Ser Ala Asp Ala Lys Leu Tyr Thr Glu Pro Leu Pro Ala
    50                  55                  60

Ile Val Leu Asn Gln Ala Ile Arg Asp Ile Glu Ala Lys Lys Asn Ala
65                  70                  75                  80

Lys Ser Phe Lys Arg Leu Trp Pro Asp Phe Asn Asn Gln Asn Phe Arg
                85                  90                  95
```

```
Val Glu Lys Glu Thr Leu Gln Asp Gly Gly Ala Ala Trp Lys Val Ser
            100                 105                 110

Phe Pro Thr Leu Glu Lys Arg Val Gly Val Pro Ile Gln Val Glu Lys
        115                 120                 125

Tyr Gln Ile Lys Tyr Leu Glu Leu Leu Leu Ser Gly Gln Ala Lys Gln
    130                 135                 140

Gly Thr Ala Gln Leu Ile Lys Cys Gly Arg Gln Trp Tyr Ile His Leu
145                 150                 155                 160

Ala Leu Thr Val Ser Val Lys Ala Glu Lys Lys Pro Pro Lys Tyr Met
                165                 170                 175

Gly Val Asp Leu Gly Leu Ile Asp Leu Ala Val Ala Ser Ile Leu Gly
            180                 185                 190

Ser Thr Leu Phe Phe Ser Gly Ala Glu Leu Ala Tyr Val Arg Arg His
        195                 200                 205

Tyr Ala Glu Leu Arg Lys Lys Leu Gln Lys Lys Gly Ala His Lys Ala
    210                 215                 220

Leu Arg Lys Leu Gly Asn Lys Glu His Arg Trp Ile Met Ala Ile Asn
225                 230                 235                 240

His Thr Ile Ser Arg Arg Ile Ile Glu Phe Ala Lys Ala His Gly Val
                245                 250                 255

Ser Val Ile Arg Leu Glu Asp Leu Arg Gly Ala Arg Trp Thr Lys Ser
            260                 265                 270

Gln Arg Lys Lys Gln Arg Lys Asp Ala Gly Arg Ser Leu His Ser Trp
        275                 280                 285
```

```
Ala Phe Phe Gln Leu Arg Gln Phe Ile Glu Tyr Lys Ala Ala Leu Ala
    290                 295                 300

Gly Ile Glu Val Glu Leu Val Asn Pro Glu Leu Thr Ser Leu Thr Cys
305                 310                 315                 320

Ser Arg Cys Gly Glu Val Arg Thr Ser Arg Pro Ala Gly Arg Trp Tyr
                325                 330                 335

Thr Cys Pro Arg Cys Gly Lys Val Lys His Ile Asp Ala Asn Ala Ala
            340                 345                 350

Asp Asn Ile Ala Gln Ala Ile Ser Gly Leu Ser Glu Glu Lys Arg Ala
        355                 360                 365

Lys Thr Ile Leu Lys Pro Lys Thr Arg Arg Arg Thr Thr Ala Ala
    370                 375                 380
```

<210> 814
<211> 351
<212> PRT
<213> Paenibacillus sp. FSL R7-269

<400> 814

```
Met Gln Ser Val Thr Ile Lys Ile Arg Phe Phe Pro Asn Asn Ser Ile
1               5                   10                  15

Glu Leu Lys Ser Leu Ser Lys Glu Tyr Ile Arg Val Ile Asn Leu Leu
            20                  25                  30

Thr Glu Gln Ala Glu Gln Glu Gly Ala Phe Pro Lys Leu Thr Thr Lys
        35                  40                  45

His Val Glu Ala Thr Leu Pro Ser Ala Val Ile Asn Gln Ala Ile Arg
    50                  55                  60

Asp Ala Lys Ser Ile Phe Lys Lys Val Lys Lys Asp Arg Lys Arg Pro
65                  70                  75                  80
```

```
Ile Leu Lys Lys Pro Thr Tyr Tyr Ile Asn Asn Gln Asn Tyr Ser Ile
                85                  90                  95

Arg Asp Ser Ser Ile Ala Phe Pro Ile Ile Thr Asn Asn Ile Val Lys
            100                 105                 110

Lys Thr Val Phe Pro Ala Val Leu Thr Glu Arg His Lys Lys Tyr Leu
        115                 120                 125

Gln His Ala Lys Cys Gly Leu Met Arg Ile Val Glu Lys Ser Gly Lys
    130                 135                 140

Trp Phe Ala Gln Val Ser Leu Glu Val Pro Thr Glu Ile Ala Thr Gly
145                 150                 155                 160

Glu His Val Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Ala
                165                 170                 175

Val Thr Ser Gly Gly Lys Thr Gly Phe Phe Gly Asn Gly Arg Glu Asn
            180                 185                 190

Lys Tyr Arg Lys Arg Lys Phe Arg Ser Glu Arg Lys Val Leu Gly Lys
        195                 200                 205

Lys Lys Lys Leu His Ala Ile Arg Arg Leu Asp Asn Lys Glu Gln Arg
    210                 215                 220

Trp Met Lys Asp Lys Asp His Lys Ala Ser Arg Gln Ile Ile Asn Phe
225                 230                 235                 240

Ala Thr Lys Asn Gln Val Ser Val Ile His Leu Glu Lys Leu Thr Asn
                245                 250                 255

Ile Arg Lys Thr Thr Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu His
            260                 265                 270

Thr Trp Ser Phe Tyr Arg Leu Ser Gln Phe Ile Glu Tyr Lys Ala Asn
```

```
        275                 280                 285

Ile Ala Gly Ile Lys Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln
    290                 295                 300

Lys Cys Pro Ser Cys Ser Ala Leu Asn Lys Ala Thr Asp Arg Lys Tyr
305                 310                 315                 320

Ser Cys Leu Cys Gly Phe Gln Thr His Arg Asp Lys Val Gly Ala Val
                325                 330                 335

Asn Ile Ile His Ala Pro Val Ile Gly Gly Ser Ser Gln Ser Ala
            340                 345                 350
```

<210> 815
<211> 386
<212> PRT
<213> Rhodococcus jostii

<400> 815

```
Met Lys Arg Val Val Lys Ile Asn Leu Ala Pro Thr Asp Ala Gln Ala
1               5                   10                  15

His Ala Leu His Glu Thr Leu Val Leu Cys Asn Thr Ala Ala Asp Val
            20                  25                  30

Val Ser Arg Val Ala Gln Ala Val Glu Asp Arg Arg Ala Phe Ala Leu
        35                  40                  45

Gln Lys Ala Val Tyr His Gln Leu Lys Ala Leu Gly Leu Ser Ala Gln
    50                  55                  60

Pro Ala Val Arg Thr Ile Lys Lys Val Ala Asp Ala Tyr Ala Thr Arg
65                  70                  75                  80

Gly Ala Asn Leu Glu Ala Gly Asn Tyr Gly Pro Arg Gly Gly Lys Arg
                85                  90                  95
```

```
Thr Thr Asp Ile Ala Ala Thr Ala Ile Gly Phe Arg Ala Leu Ala Ala
            100                 105                 110

Gln Pro Phe Asp Asp Arg Cys Leu Ser Trp Gln Gln Gln Asp Ser Thr
        115                 120                 125

Val Ser Ile Trp Thr Cys Glu Gly Arg Leu Lys Ala Val Arg Tyr Val
    130                 135                 140

Cys Ala Pro Trp Gln Arg Glu Leu Leu Glu His Arg Cys Gly Glu Thr
145                 150                 155                 160

Asp Leu Val Phe Arg Asp Asn Met Trp Phe Leu Tyr Ala Thr Val Asp
                165                 170                 175

Val Pro Thr Pro Glu Pro Val Val Val Gln Glu Phe Leu Gly Val Asp
            180                 185                 190

Leu Gly Ile Val Asn Leu Ala Val Thr Ser Asp Asp Thr Ala Ala Ser
        195                 200                 205

Ala Asp Trp Ser Gly Gly Ala Val Thr Ala Arg Arg Thr Lys Tyr Ala
    210                 215                 220

Arg Thr Arg Arg Ala Leu Gln Lys Val Gly Ser Lys Ser Ala Lys Arg
225                 230                 235                 240

Lys Leu Arg Gly Arg Arg Glu Lys Glu His Arg Tyr Ala Thr Asp Ile
                245                 250                 255

Asn His Gln Ile Ser Lys Thr Ile Val Ala Gln Ala Gln Arg Thr Gly
            260                 265                 270

Arg Gly Ile Val Leu Glu Asp Leu Ser Gly Ile Arg Glu Arg Val Arg
        275                 280                 285

Leu Ala Lys Thr Gln Arg Gln Gln Leu His Ser Trp Ala Tyr Ala Gln
    290                 295                 300
```

```
Leu Arg Asp Phe Leu Thr Tyr Lys Ala Val Ser Val Gly Val Pro Leu
305                 310                 315                 320


Val Val Ile Asp Pro Arg Asn Thr Ser Arg Thr Cys Tyr Pro Cys Gly
                325                 330                 335


His Val Asp Lys Ala Asn Arg Thr Thr Gln Asp Arg Phe Val Cys Arg
            340                 345                 350


Met Cys Gly His Val Asp Gln Ala Asp His Asn Ala Ala Leu Asn Ile
        355                 360                 365


Ala Tyr Leu Gly Tyr Val Gln Tyr Thr Thr Thr Thr Arg Ser His Arg
    370                 375                 380


Ala Val
385


<210>  816
<211>  391
<212>  PRT
<213>  Bacillus cereus BAG6O-2

<400>  816

Met Gln Ser Leu Trp Thr Arg Ser Tyr Phe Val Ser Thr Ala Lys Asn
1               5                   10                  15


Val Ala Asn Glu Asn Met Leu Lys Ile Lys Lys Gln Gly Val Lys Arg
            20                  25                  30


Met Ser Gln Thr Leu Thr Val Lys Val Lys Leu Ile Pro Thr Lys Glu
        35                  40                  45


Gln Ser Arg Leu Leu Glu Glu Ser Ser Arg Glu Tyr Ile Lys Val Met
    50                  55                  60


Asn Met Leu Val Ser Glu Met Val Glu Ala Lys Lys Ser Thr Lys Lys
```

```
65                  70                  75                  80

Ser Thr Lys Asp Ile Glu Ala Asn Ile Pro Ser Ala Val Lys Asn Gln
                85                  90                  95

Ala Ile Lys Asp Ala Lys Ser Leu Phe Ala Thr Lys Val Lys Lys Ser
            100                 105                 110

Asn Tyr Lys Ile Ile Pro Ile Leu Lys Lys Pro Val Cys Val Trp Asn
        115                 120                 125

Asn Gln Asn Tyr Ser Phe Asp Ser Thr His Ile Ser Ile Pro Phe Lys
    130                 135                 140

Val Asn Gly Lys Ser Thr Arg Leu Lys Val Arg Ala Leu Leu Ile Asn
145                 150                 155                 160

Lys Lys Asn Arg Asn Leu Asp Leu Leu Lys His Lys Leu Gly Thr Leu
                165                 170                 175

Arg Ile Thr Lys Lys Ser Asn Lys Trp Met Ala Gln Ile Ser Val Thr
            180                 185                 190

Leu Pro Thr Asn Glu Arg Ala Gly Thr Lys Val Leu Gly Val Asp Leu
        195                 200                 205

Gly Leu Lys Val Pro Ala Val Ala Ile Thr Asp Asp Asp Lys Val Arg
    210                 215                 220

Phe Phe Gly Asn Gly Arg Gln Asn Lys Tyr Arg Lys Arg Lys Phe Arg
225                 230                 235                 240

Ser Val Arg Lys Lys Leu Gly Lys Asp Lys Lys Val Asn Ala Ile Arg
                245                 250                 255

Arg Phe Asp Asp Lys Glu Gln Arg Trp Met Gln Glu Lys Asp His Lys
            260                 265                 270
```

```
Ile Ser Arg Glu Ile Ile Asp Phe Ala Ile Ala Asn Gln Ile Ser Val
        275                 280                 285


Ile Arg Leu Glu Gln Leu Thr Asn Ile Arg Gln Thr Ala Arg Thr Ser
    290                 295                 300


Arg Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ala
305                 310                 315                 320


Gln Phe Ile Ala Tyr Lys Ala Thr Ile Ala Gly Ile Gln Ile Glu Tyr
                325                 330                 335


Val Asn Pro Ala Tyr Thr Ser Gln Ser Cys Pro Lys Cys Ala Glu Lys
            340                 345                 350


Asn Lys Ala Arg Asp Arg Lys Tyr Lys Cys Pro Cys Gly Phe Lys Thr
        355                 360                 365


His Arg Asp Ile Val Gly Ala Met Asn Ile Arg Tyr Thr Thr Val Ile
    370                 375                 380


Asp Gly Asn Ser Gln Ser Ala
385                 390
```

<210> 817
<211> 418
<212> PRT
<213> Thermotoga naphthophila

<400> 817

```
Met Ala Arg Gly Ala Gln Asn Met Thr Lys His Met Lys Thr Tyr Lys
1               5                   10                  15


Phe Pro Ala Pro Pro Glu Tyr His Thr Lys Cys Lys Glu Leu Ser Lys
            20                  25                  30


Leu Ala Gly Arg Val Tyr Ser Lys Thr Val Ser Leu Val Arg Lys Ile
        35                  40                  45
```

```
His Arg Lys Lys Asn Val Trp Leu Ser Glu Gly Thr Val Lys Lys Tyr
    50                  55                  60

Ile Ser Gln Trp Ala Gln Asn Ile Pro Leu His Ser Gln Thr Lys Gln
65                  70                  75                  80

Ala Leu Val Glu Arg Tyr Phe Glu Ala Leu Lys Ser Tyr Phe Lys Ala
                85                  90                  95

Ser Lys Thr Asn Pro Ala Leu Arg Pro Pro Phe Arg Thr Pro Lys Tyr
            100                 105                 110

Thr Asn Val Val Trp Lys Asn Gln Ala Val Lys Leu Leu Glu Asp Gly
        115                 120                 125

Thr Leu Arg Leu Ala Met Ala Asn Lys Glu Glu Pro Leu Tyr Ile Pro
    130                 135                 140

Thr Thr Leu Pro Lys Lys Val Asp Ile Arg Arg Val Glu Leu Val Tyr
145                 150                 155                 160

Asp Lys Arg Gln Asp Lys Tyr Phe Phe His Val Thr Val Ser Phe Glu
                165                 170                 175

Ser Gln Thr Asn Ile Ser Gly Ser Lys Val Val Gly Val Asp Leu Gly
            180                 185                 190

Val Val His Pro Ile Thr Ala Ser Thr Glu Asp Lys Ala Val Leu Tyr
        195                 200                 205

Asn Gly Gly Val Leu Asn Ser Lys Leu Arg Tyr Arg Asn Lys Lys Leu
    210                 215                 220

Ala Glu Leu Gln Lys Lys Leu Ser Arg Lys Lys Val Gly Ser Arg Arg
225                 230                 235                 240
```

```
Tyr Arg Lys Leu Val Arg Ala Lys Arg Arg Leu Leu Gly Lys Ile Gln
                245                 250                 255

Asn Gln Ile Lys Asp Ile Leu His Lys Tyr Thr Thr His Phe Val Gly
            260                 265                 270

Trp Cys Leu Thr Glu Gly Val Gly Thr Ile Ala Ile Gly Asp Leu Arg
        275                 280                 285

Gly Ile Arg Asp Arg Val Asp Tyr Ser Thr Lys Val Asn Gln Lys Ile
    290                 295                 300

His Gln Trp Leu Phe Arg Lys Ile Ser Asp Leu Ile Lys Thr Lys Ala
305                 310                 315                 320

Glu Ala Leu Gly Ile Glu Val Val Phe Val Asp Glu Ser Tyr Thr Ser
                325                 330                 335

Gln Thr Cys Pro Val Cys Gly Lys Arg His Lys Thr Ser Thr Arg Asn
            340                 345                 350

Phe Arg Cys Leu Gly Cys Gly Phe Glu Trp His Arg Asp Ala Val Gly
        355                 360                 365

Ala Leu Asn Ile Lys Arg Lys Tyr Thr Gly Glu Ser Leu Val Val Gly
    370                 375                 380

Ala Leu Ala Ser Pro Val Gly Val Met Tyr Asn Ser His Leu Arg Cys
385                 390                 395                 400

Pro Val Val Met Trp Ser Pro Trp Lys Pro Thr Phe Glu Trp Val Lys
                405                 410                 415

Thr Ser
```

<210> 818
<211> 390

<212> PRT
<213> Streptomyces griseus

<400> 818

```
Met Lys Leu Val Val Gln Val Lys Leu Leu Pro Thr Pro Glu Gln Ala
1               5                  10                  15


Ser Ala Leu Gln Ala Thr Leu His Ala Cys Asn Gln Ala Ala Asn His
            20                  25                  30


Val Ser Thr Ile Ala His Ala Thr Gly Thr Lys Asp Asn Arg Ala Leu
        35                  40                  45


Arg Ala Glu Thr Tyr Thr Gln Val Lys Ser Thr Trp Gly Leu Gly Ala
    50                  55                  60


Gln Ala Ala Gln His Val Ile Lys Lys Thr Cys Asp Ala Tyr Ala Ala
65                  70                  75                  80


Leu Lys Gly Ser Leu Arg Ala Gly Ile Leu Gly Arg Pro Gly Ser Lys
                85                  90                  95


Pro Tyr Lys Ala Ala Thr Gly Lys Pro Val Val Phe Arg Pro Thr Ala
            100                 105                 110


Ala Gln Pro Tyr Asp Asp Arg Met Leu Ser Trp Gln Thr Glu Gln Arg
        115                 120                 125


Thr Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Lys Arg Leu Pro Tyr
    130                 135                 140


Thr Gly Ser Glu His Gln Leu Gln Leu Leu Asp Gln Tyr Arg Arg Gly
145                 150                 155                 160


Glu Ser Asp Leu Ile Thr Arg Gly Gly Gln Trp Tyr Leu Leu Ala Thr
                165                 170                 175


Leu Asp Ile Pro Glu Pro Ala Val Asn Pro Asp Pro Gln Gly Phe Ile
```

```
            180                 185                 190

Gly Val Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Thr Gly His
        195                 200                 205

Arg His Ser Gly Arg Arg Leu Asn Arg Thr Arg Glu Asn Asp Arg Lys
    210                 215                 220

Leu Arg Thr Arg Leu Gln Gln Lys Gly Thr Arg Ser Ala Lys Arg Arg
225                 230                 235                 240

Ala Lys Arg His Ala Gly Lys Glu Ala Arg Arg Thr Arg Asp Ile Asn
                245                 250                 255

His Lys Ile Ser Lys His Ile Val Ala Glu Ala Gln Arg Thr Gly Arg
            260                 265                 270

Gly Ile Ala Leu Glu Asp Leu Gly Gly Ile Arg Glu Arg Ala Arg Leu
        275                 280                 285

Lys Lys Pro Gln Arg Val Thr Met Asn Ser Trp Ala Phe Gly Gln Leu
    290                 295                 300

Ala Glu Phe Ile Ala Tyr Lys Ala Arg Arg Ala Gly Val Pro Val Val
305                 310                 315                 320

Tyr Val Asn Pro Ala Tyr Thr Ser Gln Glu Cys Ser Arg Cys His His
                325                 330                 335

Ile Asp Lys Arg Asn Arg Pro Arg Gln Ala Val Phe Thr Cys Arg Ser
            340                 345                 350

Cys Gly Phe Val Glu His Ala Asp Leu Asn Ala Ser His Thr Ile Ser
        355                 360                 365

Leu Arg Gly Trp Ser Ala Trp Val Arg Gly Ala Glu Ser Gln Val Pro
    370                 375                 380
```

Ala Leu Thr Leu Thr Ala
385 390

<210> 819
<211> 358
<212> PRT
<213> Exiguobacterium acetylicum

<400> 819

Met Ser Gln Val Val Thr Val Glu Val Arg Ile Tyr Ala Thr Arg Arg
1 5 10 15

Gln Asp Ala Ile Leu Lys Arg Met Gly Lys Thr Tyr Ile Gln Thr Ala
20 25 30

Asn Arg Val Val Ala Asn Met Val Ala Ser Glu Asp Gly Lys Arg Trp
35 40 45

Ser Ser Lys Asp Ile Asp Thr Pro Leu Pro Ser Ala Val Lys Asn Gln
50 55 60

Leu Ala Gly Asp Ala Val Gly Ile Tyr Lys Lys Ala Arg Lys Glu Asp
65 70 75 80

Phe Lys Arg Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn Asn
85 90 95

Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile Ser Phe Pro Val Trp Met
100 105 110

Asp Gly Lys Ser Val Lys Met Arg Phe Arg Ala Ala Met Val Asp Lys
115 120 125

Asp Asn Arg Asn Thr Arg Leu Leu Ala Asn Lys Leu Gly Thr Leu Arg
130 135 140

Val Thr Lys Lys Gly Arg Lys Trp Ile Ala Gln Ile Ser Val His Val
145 150 155 160

```
Pro Thr Val Pro Arg Thr Gly Met Arg Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Thr Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met Lys Arg Lys Phe Arg Ala
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Pro Lys Ala Ile Lys Arg
    210                 215                 220

Arg Asn Gln Lys Glu Gln Arg Trp Met Arg Asp Lys Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asp Phe Ala Arg Gln Lys Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Asn Gln Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ala Ser
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly Ile Lys Val Glu Tyr Val
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys Ser Val Arg Asn
305                 310                 315                 320

Lys Val Arg Asp Arg Val Tyr Thr Cys Ala Cys Gly Phe Lys Gly His
                325                 330                 335

Arg Asp Ala Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Met Asp
            340                 345                 350
```

Gly Asn Ser Pro Ser Ala
355

<210> 820
<211> 358
<212> PRT
<213> Exiguobacterium indicum

<400> 820

Met Ser Gln Val Val Thr Val Glu Val Arg Ile Tyr Ala Thr Arg Arg
1 5 10 15

Gln Asp Ala Ile Leu Lys Arg Met Gly Lys Thr Tyr Ile Gln Thr Ala
20 25 30

Asn Arg Val Val Ala Asn Met Val Ala Ser Glu Asp Gly Lys Arg Trp
35 40 45

Ser Ser Lys Asp Ile Asp Thr Pro Leu Pro Ser Ala Val Lys Asn Gln
50 55 60

Leu Ala Gly Asp Ala Val Gly Ile Tyr Lys Lys Ala Arg Lys Glu Asp
65 70 75 80

Phe Lys Arg Ile Pro Val Leu Lys Lys Pro Val Cys Val Trp Asn Asn
85 90 95

Gln Asn Tyr Ser Phe Asp Phe Glu Ser Ile Ser Phe Pro Val Trp Met
100 105 110

Asp Gly Lys Ser Val Lys Met Arg Phe Arg Ala Ala Met Val Asp Lys
115 120 125

Asp Asn Arg Asn Thr Arg Leu Leu Ala Asn Lys Leu Gly Thr Leu Arg
130 135 140

Val Thr Lys Lys Gly Arg Lys Trp Ile Ala Gln Ile Ser Val His Val
145 150 155 160

```
Pro Thr Val Pro Arg Thr Gly Val Arg Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Thr Thr Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Lys Asn Lys Tyr Met Lys Arg Lys Phe Arg Ala
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Pro Lys Ala Ile Lys Arg
    210                 215                 220

Arg Asn Gln Lys Glu Gln Arg Trp Met Arg Asp Lys Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asp Phe Ala Arg Gln Lys Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Leu Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270

Lys Asn Asn Gln Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ala Ser
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Ala Leu Ser Gly Ile Lys Val Glu Tyr Ala
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Ser Cys Ser Val Arg Asn
305                 310                 315                 320

Lys Val Arg Asp Arg Val Tyr Thr Cys Ala Cys Gly Phe Lys Gly His
                325                 330                 335

Arg Asp Ala Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Met Asp
            340                 345                 350

Gly Asn Ser Pro Ser Ala
```

355

<210> 821
<211> 350
<212> PRT
<213> Thermococcus sp. PK

<400> 821

Ile Thr Ser Phe Tyr Arg Leu Lys Lys Glu Thr Tyr Lys Gly Leu Arg
1 5 10 15

Arg Glu Tyr Pro Asp Leu Pro Ser His Tyr Ile His Thr Ala Cys Gln
20 25 30

Met Ala Thr Ser Ile Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Arg Gly
35 40 45

Lys Ala Asn Gly Lys Pro Val Phe Lys Lys Lys Val Ile Met Leu Asp
50 55 60

Asp His Leu Phe Lys Leu Asp Leu Glu Gly Gly Phe Ile Lys Leu Ser
65 70 75 80

Thr Pro Ser Gly Arg Leu Lys Leu Glu Phe Tyr Pro Ala Lys Tyr His
85 90 95

Glu Lys Phe Arg Glu Trp Lys Ile Gly Gln Ala Trp Leu Val Lys Asn
100 105 110

Gln Met Gly Ile Phe Leu His Val Val Phe Ser Lys Glu Val Glu Val
115 120 125

Arg Glu Pro Lys Val Ile Val Gly Val Asp Leu Asn Glu Asn Asn Val
130 135 140

Thr Leu Ser Leu Pro Asp Gly Glu Phe Ile Gln Ile Ile Thr His Glu
145 150 155 160

```
Arg Glu Ile Arg Thr Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Arg
                165                 170                 175

Lys Leu Arg Ala Gly Lys Lys Arg Glu Glu Leu Leu Glu Lys Tyr Gly
            180                 185                 190

Arg Arg Glu Arg Asn Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn
        195                 200                 205

Lys Ile Val Glu Leu Ala Glu Lys Tyr Gly Gly Ile Thr Leu Glu Asp
    210                 215                 220

Leu Thr Glu Ile Arg Asn Thr Ile Arg Tyr Ser Ala Glu Met Asn Gly
225                 230                 235                 240

Arg Leu His Arg Trp Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr
                245                 250                 255

Lys Ala Lys Leu Lys Gly Val Ser Val Val Phe Val Asp Pro Ala Tyr
            260                 265                 270

Ser Ser Ser Leu Cys Pro Ile Cys Gly Gly Lys Leu Ser Pro Asn Gly
        275                 280                 285

His Arg Val Leu Lys Cys Ser Asn Cys Gly Phe Glu Ala Asp Arg Asp
    290                 295                 300

Val Val Gly Ser Trp Asn Ile Arg Leu Lys Ala Leu Lys Met Trp Gly
305                 310                 315                 320

Val Ser Val Pro Pro Glu Ser Pro Pro Met Lys Thr Gly Gly Gly Lys
                325                 330                 335

Pro Thr Arg Tyr Glu Ile Asn Ala Leu His Ala Leu Tyr Trp
            340                 345                 350
```

<210> 822
<211> 377

<212> PRT
<213> Escherichia coli

<400> 822

Met Leu Arg Thr Ala Cys Ile Arg Leu Asp Val Lys Val Glu Gln Ser
1 5 10 15

Lys Gln Leu Ser Val Leu Arg Glu Val Tyr Ala Asp Ala Cys Asn Arg
20 25 30

Leu Val Ser Val Val Cys Glu His Arg Ile Trp Asn Arg Val Gly Leu
35 40 45

His Asn Met Val Tyr Arg Asp Leu Arg Glu His Thr Pro Leu Gly Ser
50 55 60

Gln Met Cys Cys Asn Val Ile Phe Ser Val Cys Lys Ala Tyr Lys Ser
65 70 75 80

Gln Lys Glu Arg Gly His Ile His Lys Ala Lys Ala Val Pro Thr Ile
85 90 95

Arg Phe Asn Gly Thr Ser Val His Phe Asp Lys Lys Thr Tyr Ser Leu
100 105 110

Arg Asp Asn Ser Leu Ser Leu Tyr Thr Leu Asn Gly Arg Ile Arg Val
115 120 125

Pro Met Ile Ile Gly Glu His Gln Gln Arg Met Leu Ser Ser Gly His
130 135 140

Pro Lys Glu Ala Glu Leu Val Phe Arg Lys Gly Leu Trp Phe Phe Asn
145 150 155 160

Leu Val Val Glu Ile Thr Asp Thr Thr Met Val Val Ser Glu Lys Thr
165 170 175

Met Gly Val Asp Met Gly Glu Asn Asn Leu Ala Ala His Ser Leu Gly

```
            180                 185                 190

Glu Leu Phe Gly Gly Glu Gln Leu Arg Asp Glu Arg Asp Arg His Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Met Arg Arg Val Lys Gln Thr
225                 230                 235                 240

Asn His Glu Thr Ser Lys Val Ile Val Ala Ala Ala Ala Glu Ala Gly
                245                 250                 255

Ile Gly Thr Ile Ile Leu Glu Asp Leu Thr His Ile Arg Asp Arg Ile
            260                 265                 270

Lys Ala Gly Lys Arg Val Arg Ser Arg Leu His Arg Trp Ala Trp Arg
        275                 280                 285

Gln Leu Gln Thr Phe Ile Glu Tyr Lys Ala Arg Ala Val Gly Ile Met
    290                 295                 300

Val Lys Tyr Val Asn Pro Ala Tyr Ser Ser Gln Ser Cys Ser Cys Cys
305                 310                 315                 320

Gly Cys Leu Gly Lys Arg His Lys His Arg Phe Glu Cys Pro His Cys
                325                 330                 335

Gly Phe Arg Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Trp
            340                 345                 350

Ile Gly Glu Thr Ala Val Leu Pro Arg Ala Ser Val Asn Thr Pro Asp
        355                 360                 365

Val Gly Ser Pro Ser Leu Ala Pro Gln
    370                 375
```

<210> 823
<211> 377
<212> PRT
<213> Enterobacteriaceae

<400> 823

```
Met Leu Arg Thr Ala Cys Ile Arg Leu Asp Val Lys Val Glu Gln Ser
1               5                   10                  15


Lys Gln Leu Ser Val Leu Arg Glu Val Tyr Ala Asp Ala Cys Asn Arg
            20                  25                  30


Leu Val Ser Val Val Cys Glu His Arg Ile Trp Asn Arg Val Gly Leu
        35                  40                  45


His Asn Met Val Tyr Arg Asp Leu Arg Glu His Thr Pro Leu Gly Ser
    50                  55                  60


Gln Met Cys Cys Asn Val Ile Phe Ser Val Cys Lys Ala Tyr Lys Ser
65                  70                  75                  80


Gln Lys Glu Arg Gly His Ile His Lys Ala Lys Ala Val Pro Thr Ile
                85                  90                  95


Arg Phe Asn Gly Thr Ser Val His Phe Asp Lys Lys Thr Tyr Ser Leu
            100                 105                 110


Arg Asp Asn Ser Leu Ser Leu Tyr Thr Leu Asn Gly Arg Ile Arg Val
        115                 120                 125


Pro Met Ile Ile Gly Glu His Gln Gln Arg Met Leu Ser Ser Gly His
    130                 135                 140


Pro Lys Glu Ala Glu Leu Val Phe Arg Lys Gly Leu Trp Phe Phe Asn
145                 150                 155                 160


Leu Val Val Glu Ile Thr Asp Thr Thr Met Val Val Ser Glu Lys Thr
                165                 170                 175
```

```
Met Gly Val Asp Met Gly Glu Asn Asn Leu Ala Ala His Ser Leu Gly
            180                 185                 190

Lys Leu Phe Gly Gly Glu Gln Leu Arg Asp Glu Arg Asp Arg His Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Met Arg Arg Val Lys Gln Thr
225                 230                 235                 240

Asn His Glu Thr Ser Lys Val Ile Val Ala Ala Ala Ala Glu Ala Gly
                245                 250                 255

Ile Gly Thr Ile Ile Leu Glu Asp Leu Thr His Ile Arg Asp Arg Ile
            260                 265                 270

Lys Ala Gly Lys Arg Val Arg Ser Arg Leu His Arg Trp Ala Trp Arg
        275                 280                 285

Gln Leu Gln Thr Phe Ile Glu Tyr Lys Ala Arg Ala Val Gly Ile Met
    290                 295                 300

Val Lys Tyr Val Asn Pro Ala Tyr Ser Ser Gln Ser Cys Ser Cys Cys
305                 310                 315                 320

Gly Cys Leu Gly Lys Arg His Lys His Arg Phe Glu Cys Pro His Cys
                325                 330                 335

Gly Phe Arg Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Trp
            340                 345                 350

Ile Gly Glu Thr Ala Val Leu Pro Arg Ala Ser Val Asn Thr Pro Asp
        355                 360                 365
```

Val Gly Ser Pro Ser Leu Ala Pro Gln
370 375

<210> 824
<211> 358
<212> PRT
<213> Bacillus sp. T33-2

<400> 824

Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1 5 10 15

Gln Ala Leu Ile Leu Thr Glu Met Ser Lys Thr Tyr Ile Ser Thr Ile
20 25 30

Asn Glu Leu Val Ser Glu Met Val Lys Glu Lys Lys Ala Thr Lys Lys
35 40 45

Ser Ser Lys Asn Val Asp Val Ser Leu Pro Ser Ala Val Lys Asn Gln
50 55 60

Ala Val Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Thr Lys
65 70 75 80

Phe Glu Thr Val Pro Val Leu Lys Lys Pro Met Cys Ile Trp Asn Asn
85 90 95

Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Ser Leu Pro Ile Met Val
100 105 110

Asp Gly Lys Ala Lys Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Lys
115 120 125

Asp Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
130 135 140

Ile Thr Lys Lys Ser Asp Lys Trp Ile Ala Gln Ile Ser Ile Thr Ile
145 150 155 160

```
Pro Thr Val Gln Lys Thr Gly Leu Lys Val Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Glu Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg His Asn Lys Tyr Lys Lys Arg Lys Phe Arg Ser
        195                 200                 205

Val Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg His
    210                 215                 220

Ser Lys Asn Lys Glu Gln Arg Trp Met Glu Asp Gln Asp His Lys Val
225                 230                 235                 240

Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255

Arg Leu Glu Gln Leu Ala Asn Ile Arg Gln Thr Thr Arg Thr Ser Arg
            260                 265                 270

Lys Asn Glu Lys Asn Leu His Thr Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285

Phe Ile Glu Tyr Lys Ala Glu Leu Glu Gly Ile Lys Val Glu Tyr Ala
    290                 295                 300

Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Lys Cys Ser Glu Lys Asn
305                 310                 315                 320

Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335

Arg Asp Ile Ile Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Val Asp
            340                 345                 350

Gly Lys Ser Gln Ser Ala
```

355

<210> 825
<211> 426
<212> PRT
<213> Halorubrum distributum

<400> 825

Met Ala Lys Gln Val Val Thr Arg Thr Tyr Thr Ala Ser Ile Arg Asn
1 5 10 15

Gln Ser Arg Val Gln Asp Asp Leu Asp Ser Leu Gly Phe Ala Ala Ser
20 25 30

Lys Leu Trp Asn Val Gly Arg Trp Thr Cys Ser Arg Ile Trp Asp Glu
35 40 45

Ile Asp His Ile Pro Asn His Asn Glu Leu Thr Thr Tyr Leu Lys Thr
50 55 60

His Glu Arg Tyr Asp Asp Leu His Ser Gln Ser Ser Gln Arg Val Leu
65 70 75 80

Gln Glu Leu Thr Glu Ala Phe Asn Gly Trp Tyr Gly Lys Arg Arg Ser
85 90 95

Gly Asp Thr Arg Ala Asn Pro Pro Gly Tyr Arg Lys His Gly Asp Glu
100 105 110

His Pro Arg Ser Thr Val Thr Phe Lys Ala Ala Gly Phe Lys Leu Asp
115 120 125

Thr Gln Tyr Asn Arg Val Arg Leu Ser Lys Gly Ser Asn Leu Lys Glu
130 135 140

Tyr Trp Ser Asp Phe Ile Leu Cys Glu Tyr Gln Thr Arg Pro Asp Val
145 150 155 160

```
Asp Leu Ser Ile Val Glu Asn Val Gln Gln Val Arg Thr Val Trp Thr
                165                 170                 175

Gly Glu Lys Trp Glu Leu His Phe Val Cys Lys Val Glu Ile Asp Val
            180                 185                 190

Ala Glu Ala Pro Gly Glu Lys Thr Val Gly Val Asp Leu Gly Ile Asn
        195                 200                 205

Asn Phe Ala Ala Leu Ala Tyr Glu Asp Gly His Ser Glu Leu Tyr Pro
    210                 215                 220

Leu Asn Cys Leu Lys Gln Asp Asp Tyr Tyr Phe Ser Lys Arg Ile Ala
225                 230                 235                 240

Arg Cys Asp Asp Ser Asn Ser Glu Gln Ala Thr Arg Leu Asn Gln Lys
                245                 250                 255

Lys Ser Ala Arg Arg Thr His Tyr Phe His Thr Leu Ser Lys Asn Ile
            260                 265                 270

Val Glu Arg Cys Val Glu Glu Gly Val Gly Thr Ile Val Val Gly Asp
        275                 280                 285

Leu Ser Gly Ile Arg Glu Asp Asp Asp Thr Asp Glu Ser Lys Asn Trp
    290                 295                 300

Gly Lys His Gly Asn Leu Asp Leu His Ser Trp Ala Phe Asp Arg Phe
305                 310                 315                 320

Thr Asp Leu Leu Glu Tyr Lys Ala Glu Met Glu Gly Ile Val Val Glu
                325                 330                 335

Glu Val Ser Glu Glu Asp Thr Ser Lys Ser Cys Ser Cys Cys Gly Arg
            340                 345                 350

Lys Arg Asp Ala Asn Arg Val Glu Arg Gly Leu Tyr Val Cys Asp Glu
        355                 360                 365
```

```
Cys Gly Thr Val Ala Asn Ala Asp Val Asn Gly Ala Glu Asn Ile Arg
    370                 375                 380

Gln Lys Val Ser Pro Ser Ser Pro Thr Leu Ser Val Asn Arg Ser Asn
385                 390                 395                 400

Gly Trp Leu Ala Gln Pro Ser Thr Phe Leu Phe Asp Lys Glu Thr Gly
                405                 410                 415

Ala Phe Ala Pro Gln Glu Arg Ala Thr Ser
            420                 425
```

<210> 826
<211> 392
<212> PRT
<213> Thermococcus sp. PK

<400> 826

```
Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Thr
1               5                   10                  15

Glu Pro Glu Gly Leu Glu Asp Leu Phe Thr Leu Tyr Gln Glu Ile Val
            20                  25                  30

Asn Phe Leu Ile Thr Tyr Ala Phe Glu Asn Asn Ile Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Glu Gln Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr Ile His Thr Ala Cys Gln Met Ala Thr Ser Ile
65                  70                  75                  80

Tyr Lys Ser Tyr Arg Lys Arg Lys Arg Lys Gly Lys Ala Asn Gly Lys
                85                  90                  95

Pro Ile Phe Lys Lys Gln Val Ile Met Leu Asp Asp His Leu Phe Lys
```

```
            100                 105                 110

Leu Asp Leu Glu Glu Gly Ile Ile Lys Leu Ser Thr Pro Ser Gly Arg
        115                 120                 125

Leu Glu Leu Glu Phe Tyr Pro Ala Lys His His Glu Lys Phe Arg Glu
    130                 135                 140

Trp Lys Ile Gly Gln Ala Trp Leu Val Lys Asn Pro Lys Gly Val Phe
145                 150                 155                 160

Leu His Val Val Phe Ser Lys Glu Val Glu Val Arg Glu Ser Lys Ala
                165                 170                 175

Val Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asp Gly Glu Phe Ile Gln Ile Ile Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Arg Ile Gln Lys Lys Ile Arg Ser Gly
    210                 215                 220

Lys Lys Arg Lys Trp Ile Leu Glu Lys Tyr Gly Met Arg Glu Arg Asn
225                 230                 235                 240

Arg Ile Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Thr Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asn Thr Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Arg Leu Gln Ala Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300
```

```
Gly Val Ser Val Val Phe Val Asp Pro Ala Arg Thr Ser Ser Leu Cys
305                 310                 315                 320


Pro Ile Cys Gly Gly Lys Leu Val Pro Asn Gly Arg Arg Val Leu Lys
                325                 330                 335


Cys Glu Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp Asn
            340                 345                 350


Ile Arg Leu Lys Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro Glu
        355                 360                 365


Ser Gln Pro Met Lys Thr Gly Gly Trp Lys Pro Thr Arg Tyr Glu Ile
    370                 375                 380


Asn Ala Leu His Ala Leu Tyr Trp
385                 390


<210>  827
<211>  390
<212>  PRT
<213>  Actinomadura sp. CNU-125

<400>  827

Met Val Thr Ile Val Lys Val Met Val Gln Val Lys Leu Leu Pro Asp
1               5                   10                  15


Ala Val Gln Ala Ala Ala Leu Lys Arg Thr Leu Pro Glu Ile Asn Glu
            20                  25                  30


Ala Ala Asn Trp Val Ser Ala Val Ser Phe Glu Asn Leu Ala Leu Lys
        35                  40                  45


Ala Cys Val Arg Asp Leu Arg Asn Leu Cys Tyr Gly Glu Leu Lys Ala
    50                  55                  60


Arg Gly Phe Gly Ala Gln Ala Ala Gln His Ile Ile Lys Arg Val Ala
65                  70                  75                  80
```

```
Asp Ala Tyr Thr Ser Leu Arg Ala Ala Ile Arg Ala Gly Asn Phe Gly
                85                  90                  95

Pro Asn Gly Ser Arg Ser Arg Arg Lys Val Asp Ser Arg Pro Ile Met
            100                 105                 110

Phe Arg Pro His Ala Ala His Thr Tyr Asp Asp Arg Cys Leu Ser Trp
        115                 120                 125

Asn Tyr Asp Arg Arg Thr Val Ser Ile Trp Thr Leu Asp Gly Arg Val
    130                 135                 140

Lys Asn Val Arg Phe Ala Cys Ser Ser Ser Ala Leu Arg Gln Leu Ala
145                 150                 155                 160

Asp Tyr Arg Arg Gly Glu Ser Asp Leu Leu Phe Arg Asp Gly Lys Trp
                165                 170                 175

Leu Leu Ala Ala Thr Cys Glu Met Pro Glu Ala Arg Gln Tyr Glu Pro
            180                 185                 190

Ser Gly Phe Ile Gly Val Asp Arg Gly Ile Thr Asn Leu Ala Thr Thr
        195                 200                 205

Ser Asp Gly His Asp His Ser Gly Arg Arg Leu Gly Arg Tyr Arg Arg
    210                 215                 220

Trp Gln Ala Arg Lys Arg Ala Glu Leu Gln Ala Lys Lys Thr Arg Ser
225                 230                 235                 240

Ala Arg Gln Ala Leu Lys Lys Arg Ser Arg Arg Glu Ala Arg His Ala
                245                 250                 255

Ala His Ile Asn His Lys Ile Ala Lys Thr Val Val Ala Val Ala Gln
            260                 265                 270
```

```
Arg Thr Glu Arg Gly Ile Ala Leu Glu Glu Leu Gly Gly Ile Arg Glu
        275                 280                 285

Arg Val Thr Val Pro Arg Asp Gln Arg Ala Arg Leu Ser Ser Trp Pro
    290                 295                 300

Phe His Arg Leu Gly Ala Phe Ile Ala Tyr Lys Ala Lys Arg Ala Gly
305                 310                 315                 320

Val Pro Phe Ile Glu Val Asp Pro Ala His Thr Ser Gln Arg Cys Pro
                325                 330                 335

Arg Cys Gly His Thr Gly Arg Ala Asn Arg Arg Thr Arg Asp His Phe
            340                 345                 350

Ser Cys Arg Arg Cys Gly Leu Ala Gly Pro Ala Asp His Val Ala Ala
        355                 360                 365

Val Asn Ile Ala Glu Arg Ala Ala Thr Ala Trp Val Phe Val Asn Met
    370                 375                 380

Pro Gln Pro Ala Pro Thr
385                 390
```

<210> 828
<211> 360
<212> PRT
<213> Armatimonadetes bacterium 13_1_40CM_64_14

<400> 828

```
Met Asn Gln Val Glu Thr Ile Arg Leu His Pro Thr Asp Pro Ala Gln
1               5                   10                  15

Leu Ile Ala Trp Leu Glu Arg Phe Asn Ala Ala Ala Asn Trp Leu Ser
            20                  25                  30

Gly Val Ala Phe Arg Glu Arg Leu Trp His Trp Leu Pro Leu Gln Arg
        35                  40                  45
```

```
Arg Ala Tyr Arg Glu Val Arg Glu Arg Phe Gln Leu Pro Ala Ala Ala
    50                  55                  60

Thr Val Val Val Ile Arg Lys Val Ala Tyr Val Tyr Arg Asn Lys Lys
65                  70                  75                  80

Arg Arg Gln His Gln Ala Thr Phe Arg Arg Arg Gly Ala Ile Pro Val
                85                  90                  95

Tyr Gln His Arg Tyr Lys Arg Asp Gly Thr Val Ser Val Tyr Gly Phe
            100                 105                 110

Arg Ile Pro Phe Thr Ala Arg Pro Gln Ala Trp Leu Ser Ser Arg Gln
        115                 120                 125

Gln Ala Val Leu Cys Tyr Arg Arg Gly Lys Phe Ile Leu His Gln Val
    130                 135                 140

Val Glu Val Asp Val Pro Ala Pro Val Pro Val Gln Glu Tyr Leu Gly
145                 150                 155                 160

Cys Asp Leu Gly Thr Val Asn Leu Leu Thr Asp Ser Glu Thr Glu Ala
                165                 170                 175

Tyr Ser Gly Gln Ala Val Glu Glu Lys Arg Arg Ile Tyr Val His Arg
            180                 185                 190

Arg Ala Arg Leu Gln Lys Arg Gly Thr Arg Ala Ala Arg Arg Lys Leu
        195                 200                 205

Arg Ala Leu Ser Gly Arg Gln Arg Arg Tyr Gln Arg Asp Val Asn His
    210                 215                 220

Gly Ile Ala Lys Arg Val Val Ala Lys Ala Gln Arg Leu Cys Cys Gly
225                 230                 235                 240

Ile Ala Leu Glu Asp Leu Arg Gly Ile Arg Asp Arg Ile Lys Ala Arg
```

```
                245                 250                 255

Arg Arg Gln Arg Ala Arg Leu His Asn Trp Ala Phe Gly Gln Leu Arg
            260                 265                 270

Gln Phe Ile Val Tyr Lys Ala Ala Lys Ala Gly Val Pro Val Val Phe
        275                 280                 285

Val Asp Pro Ala Asn Thr Ser Arg Thr Cys Pro Val Cys Gly His Val
    290                 295                 300

Asp Lys Arg Asn Arg Arg Ser Gln Ala Glu Phe Ser Cys Arg Arg Cys
305                 310                 315                 320

Gly His Ala Gly Pro Ala Asp Val Ile Ala Ala Arg Asn Val Arg Ala
                325                 330                 335

Trp Ala His Gly Asp Ala Pro Met Val Ala Ser Ala Arg Ala Ala Thr
            340                 345                 350

Ser Pro Tyr Pro Thr Ser Arg Gly
        355                 360
```

<210> 829
<211> 410
<212> PRT
<213> Natrinema versiforme

<400> 829

```
Met Val Ala Thr Thr Thr Lys Thr Leu Glu Ala Thr Leu Ala Pro Pro
1               5                   10                  15

Thr Ala Asn Lys Glu Gln Arg Leu Glu Arg Thr Val Ala Thr Tyr Arg
            20                  25                  30

Arg Ala Leu Leu Asp Ala Phe Glu Ser Gly Ala Glu Thr Gln Thr Ala
        35                  40                  45
```

```
Val Asn Asp Ile Val Thr Pro Tyr Thr Leu Thr Ser Tyr Ala Lys Asp
    50                  55                  60

Ala Leu Lys Ser Tyr Val Pro Gln Leu Arg Asn Thr Tyr Asn Thr Ser
65                  70                  75                  80

Glu Leu Glu Gly Asn His Pro Val Arg Phe Thr Asn Arg Gly Phe Arg
                85                  90                  95

Ile Asp His Ser Asp Glu Arg Glu His Glu Phe Cys Trp Arg Val Pro
            100                 105                 110

Gln Ala Gly Arg Gly Asn Ala Phe Trp Ile Pro Leu Arg Ile Asn Pro
        115                 120                 125

Glu Gln Glu Ser Leu Trp Phe Asp Leu Leu Asp Glu Ser Val Thr Val
    130                 135                 140

Gly Glu Phe Arg Leu Gln Gln His Arg Thr Asn Trp Met Leu His Val
145                 150                 155                 160

Thr Val Glu Tyr Glu Val Ala Glu Pro Glu Ile Ser Asp Glu Pro Thr
                165                 170                 175

Arg Val Gly Phe Asp Ile Gly Glu Ser Lys Leu Leu Thr Gly Cys Ala
            180                 185                 190

Cys Gln Asn Asp Thr Pro Thr Gln Pro Phe Ile Tyr Asp Gly Gly Arg
        195                 200                 205

Ser Arg Ala Leu Arg Lys Glu Met His Thr Thr Leu Lys Arg Leu Gln
    210                 215                 220

Glu Arg Asp Ala Glu Gln Trp Arg Val Asp Glu Arg Phe Asp His Tyr
225                 230                 235                 240

Gln Asn Ala Leu Thr Asp Ile Val Glu Lys Ala Ser Arg Glu Ala Val
                245                 250                 255
```

```
Glu Tyr Ala Gln Gln Phe Glu Asp Pro Val Ile Val Leu Glu Asp Leu
            260                 265                 270

Ser Tyr Ile Arg Glu Asn Leu Asp Tyr Gly Lys Tyr Met Asn Arg Arg
        275                 280                 285

Leu His Ser Trp Ala Phe Ala Arg Leu Thr Glu Arg Ile Glu Asp Lys
    290                 295                 300

Ala Leu Glu Ala Gly Ile Pro Ile Glu Phe Val Asn Pro Arg Tyr Thr
305                 310                 315                 320

Ser Gln Thr Cys His Ala Cys Gly His Ile Gly Arg Arg Gly Ser Gln
                325                 330                 335

Ala Glu Phe Thr Cys Thr Asn Pro Glu Cys Trp Val Ser Glu Tyr Gln
            340                 345                 350

Ala Asp Ile Asn Ala Ala Ala Asn Ile Ala Gly Arg Val Asp Pro Trp
        355                 360                 365

Gly Glu Ser Val Ser Trp Lys Ser Asp Arg Asp Asp Ser Pro Arg Asp
    370                 375                 380

Gly Ser Thr Leu Asp Ser Ala Thr Ala Arg Arg Glu Pro Ser Ala Lys
385                 390                 395                 400

Leu Ala Gln Thr Thr Leu Ala Glu Trp Gly
                405                 410
```

<210> 830
<211> 144
<212> PRT
<213> Rhodococcus opacus

<400> 830

```
Met Arg His Phe Thr Ser Ala Ser Ala Glu Ala Gly Pro Phe Met Ala
```

1 5 10 15

Gly Gly Ser Arg Ser Ala Leu Arg Gly Arg Ala Gly Thr Ala Arg Gly
20 25 30

Ile Val Leu Glu Asp Leu Ser Gly Ile Arg Glu Arg Val Arg Leu Ala
35 40 45

Lys Ala Gln Arg Gln Gln Leu His Ser Trp Ala Tyr Ala Gln Leu Arg
50 55 60

Asp Phe Val Thr Tyr Lys Ala Ala Ser Val Gly Val Pro Val Glu Val
65 70 75 80

Ile Asn Pro Arg Asn Thr Ser Arg Thr Cys Tyr Pro Cys Gly His Val
85 90 95

Asp Lys Ala Asn Arg Ile Thr Gln Asp Arg Phe Val Cys Arg Val Cys
100 105 110

Gly His Val Asp Gln Ala Asp His Asn Ala Ala Leu Asn Ile Gly Tyr
115 120 125

Leu Gly Tyr Val Lys Tyr Met Thr Thr Thr His Gly Tyr Trp Ala Ala
130 135 140

<210> 831
<211> 411
<212> PRT
<213> Candidatus Methanoperedenaceae archaeon HGW-Methanoperedenaceae-1

<400> 831

Met Ile Lys Ser Tyr Ile Tyr Ile Pro His Lys Leu Thr Lys Ile Lys
1 5 10 15

Glu Glu Thr Leu Asp Glu Met Cys Leu Glu Phe Met Lys Val Cys Asn
20 25 30

```
Asp Phe Thr Lys Leu Leu Pro Ser Ile Gln Lys Lys Arg Val Leu Lys
        35                  40                  45

Asn Asp Arg Val Lys Trp Ser Leu Pro Ser Thr Thr Ser Lys Asp Asn
    50                  55                  60

Ala Tyr Asn Lys Trp Val Lys Asn Gly Thr Ile Lys Ser Asn Leu Asn
65                  70                  75                  80

Ser Leu Ala Ile His Ser Ala Lys Val Glu Ala Val Gly Lys Phe Lys
                85                  90                  95

Met Trp Leu Glu Asp Lys Thr Ala Glu Lys Pro Leu Phe Lys Thr Pro
            100                 105                 110

Phe Ile Asp Phe Asn Asn Gln Ser Tyr Phe Ile Ile Arg Lys Asn Glu
        115                 120                 125

Asn Thr Phe Ile Leu Asp Val Pro Ser Phe Lys Asn Glu Lys Gly Tyr
    130                 135                 140

Pro Arg Leu Leu Ile Pro Phe Asn Val Asp Ser Asn Arg Ser Leu Ser
145                 150                 155                 160

Lys Tyr Leu Lys Lys Ser Ile Ile Ile Gly Glu Arg Lys Arg Ala Asp
                165                 170                 175

Glu Leu Lys Leu Ser Glu Ser Lys Tyr Ala Asn Ser His Ile Ile Ile
            180                 185                 190

Pro Phe Asp Asp Gly Ile Asn Glu Pro Asp Glu Tyr Thr Pro His Thr
        195                 200                 205

Phe Ile Gly Ile Asp Arg Gly Ile Asn Asn Ile Ile Ala Leu Ser Val
    210                 215                 220

Cys Asp Asn Ser Gly Lys Val Leu Arg Thr Lys Leu Phe Gly Gly Asn
225                 230                 235                 240
```

```
Glu Leu Arg His Tyr Arg Thr Lys His Gln His Arg Arg Glu Lys Leu
                245                 250                 255

Gln Ala Ile Tyr Gly Lys Asp Lys Gly Met Ile Arg Arg Thr Leu Gly
            260                 265                 270

Lys His Glu Ser Lys Phe Ala Lys Thr Leu Asn His Gln Ile Ser His
        275                 280                 285

Glu Val Val Glu Ile Ser Lys Lys Tyr Pro Ser Pro Val Ile Val Ile
    290                 295                 300

Glu Asp Leu His Arg Phe Ala Lys Asn Leu Arg Trp Ser Phe Tyr Gln
305                 310                 315                 320

Leu Glu Glu Phe Ile Thr Tyr Lys Ala Lys Ile Asn Gly Ile Val Thr
                325                 330                 335

Lys Lys Val Lys Ala Gln Tyr Thr Ser Gln Thr Cys Ser Arg Cys Gly
            340                 345                 350

His Val Asp Lys Ala Asn Arg Tyr Gly Val Lys Phe Ala Cys Asp Lys
        355                 360                 365

Cys Gly His Arg Asp Asn Ala Asp Ile Asn Ala Ala Ile Asn Ile Ser
    370                 375                 380

Arg Ser Tyr Ile Asn Glu Val Ala Gly Lys Gln Val Leu Pro Val Thr
385                 390                 395                 400

Gly Gly Val Ser Leu Pro Leu Ser Pro Ala Arg
                405                 410
```

<210> 832
<211> 377
<212> PRT
<213> Escherichia coli

<400> 832

```
Met Leu Arg Thr Ala Cys Ile Arg Leu Asp Val Lys Val Glu Gln Ser
1               5                   10                  15


Lys Gln Leu Ser Val Leu Arg Glu Val Tyr Ala Asp Ala Cys Asn Arg
            20                  25                  30


Leu Val Ser Val Val Cys Glu His Arg Ile Trp Asn Arg Val Gly Leu
        35                  40                  45


His Asn Met Val Tyr Arg Asp Leu Arg Glu His Thr Pro Leu Gly Ser
    50                  55                  60


Gln Met Cys Cys Asn Val Ile Phe Ser Val Cys Lys Ala Tyr Lys Ser
65                  70                  75                  80


Gln Lys Glu Arg Gly His Ile His Lys Ala Lys Ala Val Pro Thr Ile
                85                  90                  95


Arg Phe Asn Gly Thr Ser Val His Phe Asp Lys Lys Thr Tyr Ser Leu
            100                 105                 110


Arg Asp Asn Ser Leu Ser Leu Tyr Thr Leu Asn Gly Arg Ile Arg Val
        115                 120                 125


Pro Met Ile Ile Gly Glu His Gln Gln Arg Met Leu Ser Ser Gly His
    130                 135                 140


Pro Lys Glu Ala Glu Leu Val Phe Arg Lys Gly Leu Trp Phe Phe Asn
145                 150                 155                 160


Leu Val Val Glu Ile Thr Asp Thr Thr Met Val Val Ser Glu Lys Thr
                165                 170                 175


Met Gly Val Asp Met Gly Glu Asn Asn Leu Ala Ala His Arg Leu Gly
            180                 185                 190
```

```
Lys Leu Phe Gly Gly Glu Gln Leu Arg Asp Glu Arg Asp Arg His Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Lys Gln
    210                 215                 220

Lys Leu Arg Gln Val Ser Gly Lys Glu Met Arg Arg Val Lys Gln Thr
225                 230                 235                 240

Asn His Glu Thr Ser Lys Val Ile Val Ala Ala Ala Ala Glu Ala Gly
                245                 250                 255

Ile Gly Thr Ile Ile Leu Glu Asp Leu Thr His Ile Arg Asp Arg Ile
            260                 265                 270

Lys Ala Gly Lys Arg Val Arg Ser Arg Leu His Arg Trp Ala Trp Arg
        275                 280                 285

Gln Leu Gln Thr Phe Ile Glu Tyr Lys Ala Arg Ala Val Gly Ile Met
    290                 295                 300

Val Lys Tyr Val Asn Pro Ala Tyr Ser Ser Gln Ser Cys Ser Cys Cys
305                 310                 315                 320

Gly Cys Leu Gly Lys Arg His Lys His Arg Phe Glu Cys Pro His Cys
                325                 330                 335

Gly Phe Arg Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Trp
            340                 345                 350

Ile Gly Glu Thr Ala Val Leu Pro Arg Ala Ser Val Asn Thr Pro Asp
        355                 360                 365

Val Gly Ser Pro Ser Leu Ala Pro Gln
    370                 375
```

<210> 833

<211> 411
<212> PRT
<213> Streptomyces sp. Ag82_O1-15

<400> 833

Met Lys Ile Val Val Gln Val Arg Leu Met Pro Thr Pro Glu Val Ala
1 5 10 15

Ser Ala Leu Glu Cys Thr Leu Arg Thr Ala Asn Glu Ser Ala Asn Trp
20 25 30

Leu Ser Gly Gln Ala Tyr Glu Arg Gly Glu Thr Ser Arg Lys Ala Leu
35 40 45

Gln Gly Phe Ala Tyr His Asp Leu Lys Ser Arg Gly Leu Ser Ala Gln
50 55 60

Pro Ala Leu His Val Leu Arg Lys Val Ala Asp Ala Tyr Thr Thr Leu
65 70 75 80

His Ala Asn Ile Arg Ala Gly Asn Leu Gly Lys Pro Gly Ser Lys Arg
85 90 95

Arg Ala Lys Ala Glu Ser Gln Pro Ile Ala Phe Arg Leu Asp Ala Ala
100 105 110

Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Val Asp Glu Arg Thr
115 120 125

Val Ser Ile Trp Thr Thr Ala Gly Arg Ile Arg Gly Val Arg Phe Ala
130 135 140

Cys Ser Glu Gln Ala Arg Lys Leu Leu Ala Asp His Arg Lys Gly Glu
145 150 155 160

Ser Asp Leu Val His Arg Asp Gly Met Trp Leu Leu Ile Ala Thr Cys
165 170 175

```
Glu Ile Pro Glu Pro Asp Val Phe Glu Pro Asp Gly Phe Ile Gly Val
            180                 185                 190

Asp Leu Gly Ile Ala Asn Ile Ala Thr Thr Ser Thr Gly Tyr Leu Ala
        195                 200                 205

Ala Gly Arg Gly Leu Asn Arg His Arg Lys Arg Gln Leu Asp Leu Arg
    210                 215                 220

Arg Lys Leu Gln Ala Lys Gly Thr Lys Ser Ala Lys Arg Arg Leu Lys
225                 230                 235                 240

His Arg Ser Arg Lys Glu Ser Arg His Ala Ala Asn Val Asn His Ile
                245                 250                 255

Ile Ser Lys Lys Ile Val Thr Glu Ala Glu Arg Thr Ser His Gly Ile
            260                 265                 270

Ala Leu Glu Asp Leu Gly Gly Ile Arg Gln Arg Val Arg Leu Arg Lys
        275                 280                 285

Pro Gln Arg Val Thr Leu His Ser Trp Ala Phe Ala Gln Leu Gly Gln
    290                 295                 300

Phe Leu Glu Tyr Lys Ala Arg Arg Ala Gly Val Pro Leu Val Tyr Ala
305                 310                 315                 320

Gly Pro Ala Tyr Thr Ser Gln Glu Cys Ala Glu Cys His His Ile Glu
                325                 330                 335

Lys Lys Asn Arg Val Asp Gln Ala Arg Phe Ile Cys Arg Arg Cys Gly
            340                 345                 350

Val Val Ala His Ala Asp Arg Asn Ala Ser Arg Asn Ile Ala Ala Arg
        355                 360                 365

Gly Glu Ala Ala Trp Ile Ala Gly Arg Glu Ser Arg Val Pro Ala Pro
    370                 375                 380
```

```
His Asn Arg Val Ser Gly Arg Arg Ser Gln Pro Ser Ser Gln Leu Gly
385                 390                 395                 400


Thr Thr Ser Lys Pro Gly Pro Leu Gly Leu Gly
                405                 410
```

<210> 834
<211> 383
<212> PRT
<213> Actinomadura sp. CNU-125

<400> 834

```
Met Val Gln Val Lys Leu Leu Pro Asp Ala Val Gln Ala Ala Ala Leu
1               5                   10                  15


Lys Arg Thr Leu Pro Glu Ile Asn Glu Ala Ala Asn Trp Val Ser Ala
            20                  25                  30


Val Ser Phe Glu Asn Leu Ala Leu Lys Ala Cys Val Arg Asp Leu Arg
        35                  40                  45


Asn Leu Cys Tyr Gly Glu Leu Lys Ala Arg Gly Phe Gly Ala Gln Ala
    50                  55                  60


Ala Gln His Ile Ile Lys Arg Val Ala Asp Ala Tyr Thr Ser Leu Arg
65                  70                  75                  80


Ala Ala Ile Arg Ala Gly Asn Phe Gly Pro Asn Gly Ser Arg Ser Arg
                85                  90                  95


Arg Lys Val Asp Ser Arg Pro Ile Met Phe Arg Pro His Ala Ala His
            100                 105                 110


Thr Tyr Asp Asp Arg Cys Leu Ser Trp Asn Tyr Asp Arg Arg Thr Val
        115                 120                 125


Ser Ile Trp Thr Leu Asp Gly Arg Val Lys Asn Val Arg Phe Ala Cys
```

```
    130                 135                 140

Ser Ser Ser Ala Leu Arg Gln Leu Ala Asp Tyr Arg Arg Gly Glu Ser
145                 150                 155                 160

Asp Leu Leu Phe Arg Asp Gly Lys Trp Leu Leu Ala Ala Thr Cys Glu
                165                 170                 175

Met Pro Glu Ala Arg Gln Tyr Glu Pro Ser Gly Phe Ile Gly Val Asp
            180                 185                 190

Arg Gly Ile Thr Asn Leu Ala Thr Thr Ser Asp Gly His Asp His Ser
        195                 200                 205

Gly Arg Arg Leu Gly Arg Tyr Arg Arg Trp Gln Ala Arg Lys Arg Ala
    210                 215                 220

Glu Leu Gln Ala Lys Lys Thr Arg Ser Ala Arg Gln Ala Leu Lys Lys
225                 230                 235                 240

Arg Ser Arg Arg Glu Ala Arg His Ala Ala His Ile Asn His Lys Ile
                245                 250                 255

Ala Lys Thr Val Val Ala Val Ala Gln Arg Thr Glu Arg Gly Ile Ala
            260                 265                 270

Leu Glu Glu Leu Gly Gly Ile Arg Glu Arg Val Thr Val Pro Arg Asp
        275                 280                 285

Gln Arg Ala Arg Leu Ser Ser Trp Pro Phe His Arg Leu Gly Ala Phe
    290                 295                 300

Ile Ala Tyr Lys Ala Lys Arg Ala Gly Val Pro Phe Ile Glu Val Asp
305                 310                 315                 320

Pro Ala His Thr Ser Gln Arg Cys Pro Arg Cys Gly His Thr Gly Arg
                325                 330                 335
```

```
Ala Asn Arg Arg Thr Arg Asp His Phe Ser Cys Arg Arg Cys Gly Leu
            340                 345                 350


Ala Gly Pro Ala Asp His Val Ala Ala Val Asn Ile Ala Glu Arg Ala
        355                 360                 365


Ala Thr Ala Trp Val Phe Val Asn Met Pro Gln Pro Ala Pro Thr
    370                 375                 380


<210>  835
<211>  393
<212>  PRT
<213>  Thermococcus celericrescens

<400>  835

Met Ser Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Glu
1               5                   10                  15


Thr Ser Glu Gly Leu Asp Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30


Asn Tyr Leu Ile Asn Tyr Ala Phe Glu Asn Ser Ile Thr Ser Phe Tyr
        35                  40                  45


Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Ser Glu
    50                  55                  60


Leu Pro Ser His Tyr His Tyr Thr Ala Cys Gln Met Ala Thr Ala Ile
65                  70                  75                  80


Phe Lys Ser Tyr Arg Lys Arg Lys Lys Lys Gly Lys Ala Lys Gly Lys
                85                  90                  95


Pro Val Phe Lys Lys Glu Val Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110


Leu Asp Leu Glu Ala Gly Ile Ile Lys Leu Ser Thr Pro Ser Arg Arg
        115                 120                 125
```

```
Val Arg Leu Glu Phe Tyr Pro Ala Lys Tyr His Glu Lys Phe Lys Gly
    130                 135                 140

Trp Lys Ile Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Arg Glu Val Glu Val Arg Glu Pro Lys Thr
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Ile Gln Ile Ile Thr His Glu Arg Lys Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Val Lys Arg Arg Lys Ile Gln Lys Lys Leu Arg Ala Gly
    210                 215                 220

Lys Asn Arg Lys Glu Leu Leu Glu Lys Tyr Gly Gln Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asn Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Lys Tyr Gly Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asn Ser Ile Arg Tyr Ser Ala Glu Met Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Ser Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Val Arg Val Val Phe Val Asn Pro Ala Phe Thr Ser Ser Leu Cys
305                 310                 315                 320
```

```
Pro Ile Cys Gly Glu Lys Leu Ser Pro Lys Gly His Arg Val Leu Lys
                325                 330                 335

Cys Pro Lys Cys Gly Phe Glu Ala Asp Arg Asp Val Val Gly Ser Trp
            340                 345                 350

Asn Ile Arg Leu Arg Ala Leu Lys Met Trp Gly Val Thr Val Pro Pro
        355                 360                 365

Glu Ser Pro Thr Met Lys Met Gly Val Gly Lys Val Ser Arg Asn Asp
    370                 375                 380

Val Tyr Glu Leu Tyr Lys Ser Tyr Gly
385                 390
```

<210> 836
<211> 403
<212> PRT
<213> Streptomyces sp. NRRL B-24720

<400> 836

```
Met Leu Gly Phe Gly Ser His Cys Gly Asp Ile Gly Gln Cys Thr Ile
1               5                   10                  15

Thr Ala Val Lys Ile Val Thr Gln Val Lys Leu Leu Pro Glu Ala Gly
            20                  25                  30

Gln Ala Ala Ala Leu Gly Ala Thr Leu Arg Thr Val Asn Glu Ala Ala
        35                  40                  45

Cys Trp Val Ser Gly Val Ala Phe Glu Arg Gly Val Pro Arg Glu Tyr
    50                  55                  60

Glu Leu Arg Lys His Thr Tyr Ala Glu Leu Lys Ala Arg Gly Leu Gly
65                  70                  75                  80

Ala Gln Ala Ala Gln His Val Ile Lys Lys Thr Arg Asp Ala Tyr Thr
                85                  90                  95
```

```
Thr Leu Lys Ala Thr Ile Arg Ala Gly Asn Leu Gly Lys Pro Gly Ser
            100                 105                 110

Lys Arg Arg Asp Lys Ala Arg Ser Lys Pro Ile Thr Phe Arg Pro Gln
        115                 120                 125

Ala Ala Gln Pro Phe Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Ala
    130                 135                 140

Lys Thr Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Arg Gly Val Arg
145                 150                 155                 160

Phe Leu Cys Ser Pro Asp Ala Leu Lys Met Leu Arg Glu His Arg Lys
                165                 170                 175

Gly Glu Ser Asp Leu Ile Glu Arg Asp Gly Val Phe Tyr Leu Ile Ala
            180                 185                 190

Val Cys Asp Ile Pro Glu Ala Glu Gln Tyr Glu Pro Ser Gly Phe Ile
        195                 200                 205

Gly Val Asp Leu Gly Ile Thr Asn Ile Val Thr Thr Ser Thr Gly Tyr
    210                 215                 220

Arg Ala Ala Gly Arg Gly Leu Asn Arg His Arg Lys Arg Gln Leu Asp
225                 230                 235                 240

Leu Arg Lys Lys Leu Gln Ala Lys Gly Thr Lys Ser Ala Lys Arg Leu
                245                 250                 255

Leu Lys Lys Arg Ser Arg Lys Glu Ala Arg His Ser Ala Asn Thr Asn
            260                 265                 270

His Ile Val Ser Lys Thr Ile Val Thr Thr Ala Glu Arg Thr Gly Ser
        275                 280                 285

Gly Ile Ala Leu Glu Asp Leu Thr Gly Ile Arg Ser Arg Val Arg Leu
```

```
    290                 295                 300

Arg Lys Asp Gln Arg Thr Pro Leu His Ser Trp Ser Phe His Gln Leu
305                 310                 315                 320

Gly Gln Tyr Ile Glu Tyr Lys Ala Lys Arg Ala Gly Val Pro Leu Ile
                325                 330                 335

Tyr Val Asp Pro Ala Tyr Thr Ser Gln Gln Cys Ser Glu Cys Gly His
            340                 345                 350

Ile Asp Arg Arg Asn Arg Gln Ser Gln Ser Thr Phe Ala Cys Arg Ser
        355                 360                 365

Cys Gly Ala Phe Met His Ala Asp Asp Asn Ala Ser His Asn Ile Gly
    370                 375                 380

Arg Lys Gly Glu Thr Met Trp Thr Ala Gly Arg Glu Ser Arg Val Pro
385                 390                 395                 400

Ala Thr Pro
```

<210> 837
<211> 385
<212> PRT
<213> Streptomyces griseus

<400> 837

```
Met Lys Ile Val Thr Gln Val Lys Leu Ile Pro Lys Ala Asp Gln Ala
1               5                   10                  15

Ala Ala Leu Arg Ser Thr Leu Arg Thr Val Asn Glu Ala Ala Asn Trp
            20                  25                  30

Val Ser Gly Val Ala Phe Glu Arg Ser Val Pro Arg Glu Tyr Glu Leu
        35                  40                  45
```

```
Arg Lys His Thr Tyr Ala Glu Leu Lys Ala Gln Gly Leu Gly Ala Gln
    50                  55                  60

Ala Ala Gln His Val Ile Lys Lys Thr Arg Asp Ala Tyr Thr Thr Leu
65                  70                  75                  80

Lys Ala Asn Ile Lys Ala Gly Asn Leu Gly Lys Pro Ala Ser Lys Arg
                85                  90                  95

Arg Arg Lys Ala Glu Ser Lys Pro Ile Val Phe Arg Pro Glu Ala Ala
            100                 105                 110

Gln Pro Tyr Asp Asp Arg Cys Leu Ser Trp Gln Tyr Asp Gln Gln Thr
        115                 120                 125

Val Ser Ile Trp Thr Thr Ala Gly Arg Leu Arg Gly Val Arg Phe Ala
    130                 135                 140

Cys Ser Pro Asp Ala Leu Arg Met Leu Arg Glu His Arg Lys Gly Glu
145                 150                 155                 160

Ser Asp Leu Ile Glu Arg Asp Gly Ala Phe Tyr Leu Ile Ala Val Cys
                165                 170                 175

Asp Ile Pro Glu Pro Glu Val Tyr Glu Pro Ala Gly Phe Val Gly Val
            180                 185                 190

Asp Leu Gly Ile Val Asn Ile Ala Thr Ala Ser Thr Gly Tyr Arg Ala
        195                 200                 205

Ala Gly Arg Gly Leu Asn Arg His Arg Lys Arg Gln Leu Asp Leu Arg
    210                 215                 220

Lys Lys Leu Gln Ala Lys Gly Thr Lys Ser Ala Lys Arg Leu Leu Lys
225                 230                 235                 240

Lys Pro Ser Arg Lys Glu Ala Arg His Thr Ala Asn Val Asn His Ile
                245                 250                 255
```

```
Ile Ser Lys Thr Ile Val Thr Thr Ala Glu Arg Thr Gly Ser Gly Ile
            260                 265                 270

Ala Leu Glu Asp Leu Thr Gly Ile Arg Ser Arg Val Arg Leu Arg Lys
        275                 280                 285

Asp Gln Arg Thr Ser Leu His Ser Trp Ser Phe His Gln Leu Gly Gln
    290                 295                 300

Tyr Ile Glu Tyr Lys Ala Lys Arg Ala Gly Val Pro Leu Val Tyr Val
305                 310                 315                 320

Asp Pro Ala Tyr Thr Ser Gln Gln Cys Ser Glu Cys Gly His Ile Asp
                325                 330                 335

Arg Lys Asn Arg Val Asp Gln Ala Thr Phe Ala Cys Arg Ser Cys Gly
            340                 345                 350

Ala Leu Met His Ala Asp Asp Asn Ala Ser His Asn Ile Gly Arg Met
        355                 360                 365

Ala Lys Thr Val Trp Thr Ala Gly Arg Glu Ser Arg Val Pro Ala Ile
    370                 375                 380

Pro
385
```

<210> 838
<211> 358
<212> PRT
<213> Bacillus clausii

<400> 838

```
Met Ser Gln Thr Ile Thr Val Lys Ile Lys Leu Leu Pro Thr Lys Glu
1               5                   10                  15

Gln Ala Ser Ile Leu Arg Glu Met Ser Gln Ala Tyr Ile Ser Thr Ile
```

```
            20                  25                  30

Asn Thr Leu Val Ser Glu Met Val Ala Glu Lys Lys Ser Thr Arg Lys
        35                  40                  45

Ser Ser Lys Asp Ile Ser Ala Ser Leu Pro Ser Ala Val Lys Asn Gln
    50                  55                  60

Ala Ile Lys Asp Ala Lys Ser Val Phe Lys Lys Ala Lys Lys Asn Lys
65                  70                  75                  80

Phe Thr Ile Val Pro Met Leu Lys Lys Pro Val Cys Ile Trp Asn Asn
                85                  90                  95

Gln Asn Tyr Ser Phe Asp Phe Thr His Ile Ser Met Pro Ile Met Ile
            100                 105                 110

Asp Gly Lys Ala Thr Lys Thr Pro Ile Arg Ala Leu Leu Val Asp Lys
        115                 120                 125

Asp Asn Arg Asn Phe Asp Leu Leu Lys His Lys Leu Gly Thr Leu Arg
    130                 135                 140

Ile Thr Gln Lys Ser Gly Lys Trp Ile Ala Gln Ile Ser Val Thr Ile
145                 150                 155                 160

Pro Thr Ser Glu Lys Thr Gly Thr Lys Ile Met Gly Val Asp Leu Gly
                165                 170                 175

Leu Lys Val Pro Ala Val Ala Val Thr Asp Asp Asp Lys Val Arg Phe
            180                 185                 190

Phe Gly Asn Gly Arg Gln Asn Lys Tyr Val Lys Arg Lys Phe Arg Ser
        195                 200                 205

Glu Arg Lys Ala Leu Gly Lys Lys Lys Lys Leu Asn Ala Ile Arg Arg
    210                 215                 220
```

```
Leu Lys Asp Lys Glu Gln Arg Trp Met Lys Asp Gln Asp His Lys Val
225                 230                 235                 240


Ser Arg Ala Ile Val Asn Phe Ala Lys Glu Asn Lys Ile Ser Val Ile
                245                 250                 255


Arg Leu Glu Arg Leu Ala Asn Ile Arg Gln Thr Ala Arg Thr Ser Arg
            260                 265                 270


Lys Asn Glu Lys Asn Leu His Ser Trp Ser Phe Tyr Arg Leu Ser Gln
        275                 280                 285


Phe Ile Glu Tyr Lys Ala Asn Leu Asp Gly Ile Lys Val Glu Tyr Val
    290                 295                 300


Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro Lys Cys His Glu Lys Asn
305                 310                 315                 320


Lys Ala Gln Asp Arg Lys Tyr Lys Cys Lys Cys Gly Phe Glu Lys His
                325                 330                 335


Arg Asp Leu Val Gly Ala Met Asn Ile Arg Tyr Ala Pro Val Val Asp
            340                 345                 350


Gly Asn Ser Gln Pro Ala
        355


<210>  839
<211>  382
<212>  PRT
<213>  Verrucomicrobium sp. 3C

<400>  839

Met Met Arg Thr Ala Ser Ile Lys Leu Asp Ala Ser Pro Glu Gln Arg
1               5                   10                  15


Ala Ala Leu Ala Ala Leu Gln Ser Asp Phe Ala Asn Ala Cys Gln Arg
            20                  25                  30
```

```
Leu Ser Ala Val Val Arg Glu His Arg Val Trp Asn Arg Val Ala Leu
        35                  40                  45

His Gln Arg Thr Tyr Ser Asp Leu Arg Ser Ser Thr Pro Leu Gly Ser
    50                  55                  60

Gln Met Cys Cys Asn Ala Ile Phe Ser Val Cys Lys Ala Tyr Lys Ala
65                  70                  75                  80

Leu Lys Val Thr Gly Arg Ile Pro Lys Asp Thr Pro Val Pro Ala Ile
                85                  90                  95

Ser Phe Gln Arg Ala Ser Val His Phe Asp Lys Arg Thr Tyr Ala Leu
            100                 105                 110

Lys Lys Asn Ala Val Ser Leu Tyr Thr Leu Gly Gly Arg Val Ile Val
        115                 120                 125

Pro Met Arg Leu Gly Glu His Gln Arg Arg Ile Leu Ser Phe Gly Arg
    130                 135                 140

Pro Lys Glu Ala Glu Leu Val Phe Arg Lys Gly Asn Trp Tyr Phe Asn
145                 150                 155                 160

Leu Val Val Glu Ser Asp Asp Lys Glu Pro Ile Ala Ser Gly Pro Val
                165                 170                 175

Met Gly Val Asp Val Gly Glu Asn Asn Leu Ala Ala His Ser Leu Gly
            180                 185                 190

Gly Ile Phe Gly Gly Gly Arg Leu Cys Asp Arg Arg Asp Arg His Leu
        195                 200                 205

Ala Leu Arg Arg Arg Leu Gln Ser Asn Gly Ser Arg Ser Ala Lys Gln
    210                 215                 220
```

```
Lys Leu Arg Gln Val Ser Gly Lys Glu Arg Arg His Val Thr His Val
225                 230                 235                 240


Asn His Glu Thr Ser Lys Ala Ile Val Arg Glu Ala Leu Glu Ala Gly
                245                 250                 255


Val Ala Lys Ile Met Met Glu Asp Leu Thr His Ile Arg Asp Arg Ile
            260                 265                 270


Lys Ala Gly Lys Arg Met Arg Gly Arg Leu His Arg Trp Ala Phe Arg
        275                 280                 285


Gln Leu Gln Arg Phe Val Glu Tyr Lys Ala Lys Ser Ala Gly Ile Ala
    290                 295                 300


Val Glu Tyr Val Asp Pro Ala Tyr Thr Ser Gln Thr Cys Ser Ser Cys
305                 310                 315                 320


Lys Gln Leu Gly Arg Arg Thr Lys His Arg Phe Ala Cys Pro His Cys
                325                 330                 335


Gly Leu Arg Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Arg
            340                 345                 350


Ile Gly Gly Thr Met Val Pro Pro Arg Ala Ala Val Ser Thr Ser Asn
        355                 360                 365


Val Gly Gly Ala Asp Val Gly Asn His Val Cys Ala Ser Arg
    370                 375                 380


<210>  840
<211>  393
<212>  PRT
<213>  Thermococcus kodakarensis KOD1

<400>  840

Met Pro Ser Glu Thr Ile Lys Leu Thr Ala Lys Phe Lys Leu Lys Asn
1               5                   10                  15
```

```
Pro Pro Glu Glu Leu Asn Asp Leu Phe Ser Thr Tyr Arg Glu Ile Val
            20                  25                  30

Asn His Leu Ile Ser Tyr Ala Phe Glu Asn Asn Val Thr Ser Phe Tyr
        35                  40                  45

Arg Leu Lys Lys Glu Thr Tyr Lys Ser Leu Arg Lys Glu Tyr Pro Glu
    50                  55                  60

Leu Pro Ser His Tyr His Tyr Thr Ala Thr Gln Met Ala Thr Met Ile
65                  70                  75                  80

Tyr Lys Ser Tyr Arg Lys Arg Lys Lys Lys Gly Lys Ala Asn Gly Arg
                85                  90                  95

Pro Val Phe Lys Lys Asp Ala Ile Met Leu Asp Asp His Leu Phe Lys
            100                 105                 110

Leu Asp Leu Glu Ala Gly Val Ile Lys Leu Ser Thr Pro Ser Gly Arg
        115                 120                 125

Val Glu Leu Glu Phe Tyr Pro Ser Lys Tyr His Glu Lys Phe Arg Asp
    130                 135                 140

Trp Lys Ile Gly Gln Ala Trp Leu Val Arg Thr Pro Lys Gly Val Phe
145                 150                 155                 160

Ile Asn Val Val Phe Ser Arg Glu Val Glu Val Arg Glu Pro Glu Ala
                165                 170                 175

Phe Val Gly Val Asp Leu Asn Glu Asn Asn Val Thr Leu Ser Leu Pro
            180                 185                 190

Asn Gly Glu Phe Val Gln Ile Leu Thr His Glu Arg Glu Ile Arg Thr
        195                 200                 205

Gly Tyr Phe Leu Lys Arg Arg Lys Ile Gln Lys Lys Leu Arg Thr Arg
```

```
    210                 215                 220

Lys Lys Arg Lys Glu Leu Leu Glu Lys Tyr Gly Gln Arg Glu Arg Asn
225                 230                 235                 240

Arg Leu Asp Asp Leu Tyr His Lys Leu Ala Asn Lys Ile Val Glu Leu
                245                 250                 255

Ala Glu Arg Tyr Ser Gly Ile Ala Leu Glu Asp Leu Thr Glu Ile Arg
            260                 265                 270

Asp Ser Ile Arg Tyr Ser Ala Glu Val Asn Gly Arg Leu His Arg Trp
        275                 280                 285

Ser Phe Arg Lys Leu Gln Asn Ile Ile Glu Tyr Lys Ala Lys Leu Lys
    290                 295                 300

Gly Ile Lys Val Val Phe Val Asn Pro Ala Tyr Thr Ser Ser Leu Cys
305                 310                 315                 320

Pro Val Cys Gly Arg Lys Leu Ser Pro Asn Gly His Arg Val Leu Lys
                325                 330                 335

Cys Pro Lys Cys Gly Phe Glu Ala Asp Arg Asp Val Ile Gly Ser Trp
            340                 345                 350

Asn Ile Ser Leu Arg Ala Leu Lys Met Trp Gly Val Ser Val Pro Pro
        355                 360                 365

Glu Ser Pro Thr Met Lys Thr Gly Val Gly Lys Val Gly Arg Ser Asp
    370                 375                 380

Val Tyr Glu Leu Tyr Thr Asn Tyr Gly
385                 390
```

<210> 841
<211> 427
<212> PRT

<213> Sutterella wadsworthensis

<400> 841

```
Met Ser Val Arg Lys Pro Ser Gly Ile Thr Leu Lys Gly Leu Asn Ile
1               5                   10                  15


Ser Lys Gly Ala Gly Lys Leu Val Arg Arg Lys Val Asp Val Arg Thr
            20                  25                  30


Val Cys Ile Ala Leu Glu Val Asp Ala Asp Ala Ser Glu Lys Met His
        35                  40                  45


Gln Thr Arg Arg Leu Tyr Gly Gln Ala Cys Asn Leu Leu Val Pro Ile
    50                  55                  60


Val Val Ser Asp Thr Asp Arg Lys Lys Arg Leu Trp Gln Arg Tyr Asn
65                  70                  75                  80


Leu His Lys Ala Ala Tyr Pro Met Val Arg Thr Lys Met Ser Val Leu
                85                  90                  95


Gly Ala Gln Leu Ala Cys Asn Val Met Arg Ser Val Ser Ser Met Tyr
            100                 105                 110


Gln Ser Trp Ile Ser Asn His Pro Asn Phe Ser Lys Asp Lys Lys Met
        115                 120                 125


Val Leu Pro Ser Ile Ser Phe Arg Asn Pro Val Val His Leu Asp Lys
    130                 135                 140


Asn Thr Ile Arg Phe Phe Asn Asn Tyr Thr Glu Ala Ser Val Tyr Thr
145                 150                 155                 160


Val Asn Gly Arg Val Gly Val Arg Leu Arg Pro Gly Lys Phe Gln Leu
                165                 170                 175


Ser Gln Leu Ala Gly Phe Leu Ala Glu Glu Leu Ala Gly Thr Ser Lys
            180                 185                 190
```

```
Glu Asn Arg Ile Tyr Arg Leu Gly Glu Cys Asn Leu Val Trp Lys Cys
        195                 200                 205

Gly Ile Lys Gly Thr Pro Ser Arg Trp Glu Leu His Ile Ala Ile Glu
    210                 215                 220

Lys Lys Leu Glu Glu Val Ser Leu Asp Asn Leu Ser Leu Asn Gln Val
225                 230                 235                 240

Met Gly Val Asp Val Gly Glu Asn Asn Ala Ala Ala Leu Ser Thr Gly
                245                 250                 255

Arg Ile Phe Lys Ala Gly Lys Met Lys Asp Asp Arg Asp Lys Tyr Leu
            260                 265                 270

Ser Ser Arg Ala Arg Phe Gln Arg Asn Gly Ser Arg Ser Ala Arg Gln
        275                 280                 285

Ala Leu Arg Lys Ala Ser Gly Arg Glu Lys Arg His Val Glu Gln Ile
    290                 295                 300

Asn Asp Glu Ile Ser Lys Ser Ile Ile Glu Asp Val Ala Glu Arg Asn
305                 310                 315                 320

Ile Arg Leu Ile Val Leu Glu Asp Leu Thr Asp Ile Arg Glu Arg Ile
                325                 330                 335

Lys Ala Gly Gln Lys Val Arg Ala Arg Leu His Arg Trp Pro Phe Arg
            340                 345                 350

Glu Leu Gln Gln Lys Ile Val Asp Lys Ala Cys Arg Ala Gly Ile Glu
        355                 360                 365

Val Ile Phe Val Asp Pro Arg Tyr Thr Ser Gln Thr Cys Pro His Cys
    370                 375                 380
```

```
Asn Ala Ile Gly Thr Arg Gln Lys His Arg Phe Val Cys Lys Asn Cys
385                 390                 395                 400


Gly Tyr Arg Ala His Ser Asp Leu Asn Gly Gly Arg Asn Leu Gln Arg
                405                 410                 415


Leu Gly Cys Leu Leu Ile Thr Gln Gly Leu Val
            420                 425


<210>  842
<211>  188
<212>  PRT
<213>  Ornithinibacillus halophilus

<400>  842

Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Ala Val Thr Asp
1               5                   10                  15


Asp Glu Lys Val Arg Phe Phe Gly Asn Gly Arg Glu Asn Lys Tyr Lys
            20                  25                  30


Lys Arg Asn Phe Arg Ser Phe Arg Lys Ala Leu Gly Lys Lys Lys Lys
        35                  40                  45


Leu Asn Ala Ile Arg Asn Ser Lys Asn Lys Glu Gln Arg Trp Met Glu
    50                  55                  60


Asp Lys Asp His Lys Val Ser Arg Ala Ile Val Asn Phe Ala Lys Glu
65                  70                  75                  80


Asn Lys Ile Ser Val Ile Arg Leu Glu Arg Leu Ala Asn Ile Arg Gln
                85                  90                  95


Thr Thr Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu His Thr Trp Ser
            100                 105                 110


Phe Tyr Arg Leu Ser Gln Phe Ile Glu Tyr Lys Ala Glu Leu Glu Gly
        115                 120                 125
```

```
Ile Lys Val Glu Tyr Val Asn Pro Ala Tyr Thr Ser Gln Thr Cys Pro
    130                 135                 140

Lys Cys Ser Gln Arg Asn Lys Ala Gln Asp Arg Lys Tyr Thr Cys Lys
145                 150                 155                 160

Cys Gly Phe Glu Lys His Arg Asp Ile Val Gly Ala Met Asn Ile Arg
                165                 170                 175

Tyr Ala Pro Val Val Asp Gly Asn Ser Gln Ser Ala
            180                 185
```

<210> 843
<211> 427
<212> PRT
<213> Sutterella wadsworthensis

<400> 843

```
Met Ser Val Arg Lys Pro Ser Gly Ile Thr Leu Lys Gly Leu Asn Ile
1               5                   10                  15

Ser Lys Gly Ala Gly Lys Leu Val Arg Arg Lys Val Asp Val Arg Thr
            20                  25                  30

Val Cys Ile Ala Leu Glu Val Asp Ala Asp Ala Ser Glu Lys Met His
        35                  40                  45

Gln Thr Arg Arg Leu Tyr Gly Gln Ala Cys Asn Leu Leu Val Pro Ile
    50                  55                  60

Val Val Ser Asp Thr Asp Arg Lys Lys Arg Leu Trp Gln Arg Tyr Asn
65                  70                  75                  80

Leu His Lys Ala Ala Tyr Pro Met Val Arg Thr Lys Met Ser Val Leu
                85                  90                  95

Gly Ala Gln Leu Ala Cys Asn Val Met Arg Ser Val Ser Ser Met Tyr
            100                 105                 110
```

```
Gln Ser Trp Ile Ser Asn His Pro Asn Phe Ser Lys Asp Lys Lys Met
        115                 120                 125

Val Leu Pro Ser Ile Ser Phe Arg Asn Pro Val Val His Leu Asp Lys
    130                 135                 140

Asn Thr Ile Arg Phe Phe Asn Asn Tyr Thr Glu Ala Ser Val Tyr Thr
145                 150                 155                 160

Val Asn Gly Arg Val Gly Val Arg Leu Arg Pro Gly Lys Phe Gln Leu
                165                 170                 175

Ser Gln Leu Ala Gly Phe Leu Ala Glu Glu Leu Ala Gly Thr Ser Lys
            180                 185                 190

Glu Asn Arg Ile Tyr Arg Leu Gly Glu Cys Asn Leu Val Trp Lys Cys
        195                 200                 205

Gly Ile Lys Gly Thr Pro Ser Arg Trp Glu Leu His Ile Ala Ile Glu
    210                 215                 220

Lys Lys Leu Lys Glu Val Ser Leu Asp Asn Leu Ser Leu Asn Gln Val
225                 230                 235                 240

Met Gly Val Asp Val Gly Glu Asn Asn Ala Ala Ala Leu Ser Thr Gly
                245                 250                 255

Arg Ile Phe Lys Ala Gly Lys Met Lys Asp Asp Arg Asp Lys Tyr Leu
            260                 265                 270

Ser Ser Arg Ala Arg Phe Gln Arg Asn Gly Ser Arg Ser Ala Arg Gln
        275                 280                 285

Ala Leu Arg Lys Ala Ser Gly Arg Glu Lys Arg His Val Glu Gln Ile
    290                 295                 300
```

```
Asn Asp Glu Ile Ser Lys Ser Ile Ile Glu Asp Val Ala Glu Arg Asn
305                 310                 315                 320


Ile Arg Leu Ile Val Leu Glu Asp Leu Thr Asp Ile Arg Glu Arg Ile
                325                 330                 335


Lys Ala Gly Gln Lys Val Arg Ala Arg Leu His Arg Trp Pro Phe Arg
            340                 345                 350


Glu Leu Gln Gln Lys Ile Val Asp Lys Ala Cys Arg Ala Gly Ile Glu
        355                 360                 365


Val Ile Phe Val Asp Pro Arg Tyr Thr Ser Gln Thr Cys Pro His Cys
    370                 375                 380


Asn Ala Ile Gly Thr Arg Gln Lys His Arg Phe Val Cys Lys Asn Cys
385                 390                 395                 400


Gly Tyr Arg Ala His Ser Asp Leu Asn Gly Gly Arg Asn Leu Gln Arg
                405                 410                 415


Leu Gly Cys Leu Leu Ile Thr Gln Gly Leu Val
            420                 425


<210>  844
<211>  350
<212>  PRT
<213>  Bacillus velezensis

<400>  844

Met Lys Leu Phe Pro Thr Lys Glu Gln Ala Ser Ile Leu Arg Glu Met
1               5                   10                  15


Ser Gln Thr Tyr Ile Ser Thr Ile Asn Thr Leu Val Ser Glu Met Val
            20                  25                  30


Ala Glu Lys Arg Ser Thr Arg Lys Ser Ser Lys Asp Ile Ser Ala Ser
        35                  40                  45
```

```
Leu Pro Ser Ala Val Lys Asn Gln Ala Ile Lys Asp Ala Lys Ser Val
    50                  55                  60

Phe Lys Lys Ala Lys Lys Asn Lys Phe Asn Val Val Pro Met Leu Lys
65                  70                  75                  80

Lys Pro Val Cys Ile Trp Asn Asn Gln Asn Tyr Ser Phe Gly Phe Thr
                85                  90                  95

His Ile Leu Met Pro Ile Met Ile Asp Gly Lys Ala Ala Lys Thr Pro
            100                 105                 110

Ile Arg Ala Leu Leu Val Asp Lys Asp Asn Arg Asn Phe His Leu Leu
        115                 120                 125

Lys His Lys Leu Gly Thr Leu Arg Ile Thr Gln Lys Ser Gly Lys Trp
    130                 135                 140

Ile Ala Gln Ile Ser Val Thr Ile Pro Thr Ser Glu Lys Thr Gly Thr
145                 150                 155                 160

Lys Ile Met Gly Val Asp Leu Gly Leu Lys Val Pro Ala Val Ala Val
                165                 170                 175

Thr Asp Asp Asp Lys Val Arg Phe Phe Gly Asn Gly Arg Gln Asn Lys
            180                 185                 190

Tyr Ile Lys Arg Lys Phe Arg Ser Glu Arg Lys Ala Leu Gly Lys Lys
        195                 200                 205

Lys Lys Leu Asn Ala Ile Arg Arg Ser Arg Asp Lys Glu Gln Arg Trp
    210                 215                 220

Met Lys Asp Gln Asp His Lys Val Ser Arg Ala Ile Val Thr Phe Ala
225                 230                 235                 240

Ile Glu Asn Lys Ile Ser Val Ile Arg Leu Glu Gln Leu Ala Asn Ile
```

```
                245                 250                 255

Arg Gln Thr Ala Arg Thr Ser Arg Lys Asn Glu Lys Asn Leu His Ile
            260                 265                 270

Trp Ser Phe Tyr Arg Leu Ser Gln Phe Ile Glu Tyr Lys Ala Asn Leu
        275                 280                 285

Glu Gly Ile Lys Val Glu Tyr Val Lys Pro Ala Tyr Thr Ser Gln Thr
    290                 295                 300

Cys Pro Lys Cys His Glu Lys Asn Lys Ala Gln Asp Arg Lys Tyr Lys
305                 310                 315                 320

Cys Lys Cys Gly Phe Glu Lys His Arg Asp Leu Val Gly Ala Met Asn
                325                 330                 335

Ile Arg Tyr Ala Pro Val Val Asp Gly Asn Ser Gln Pro Ala
            340                 345                 350
```

<210> 845
<211> 362
<212> PRT
<213> Halanaerobium praevalens

<400> 845

```
Met Gln Leu Thr Tyr Ile Leu Glu Leu Leu Lys Pro Thr Lys Arg Lys
1               5                   10                  15

Glu Asn Ile Phe Leu Asn Asn Ile Ala Glu Val Val Lys Asn Arg Gln
            20                  25                  30

Ala Val Ala Ala Lys Leu Lys Ala Gly Glu Thr Asn Leu Ser Ser Ala
        35                  40                  45

Asp Phe Lys Glu Ile Asn Leu Pro Ala Ala Val Lys Asn Gln Asn Ile
    50                  55                  60
```

```
Arg Glu Val Lys Ala Phe His Lys Leu Phe Leu Lys Ser Gly Ser Asp
65                  70                  75                  80


Lys Asp Asn Ile Glu Phe Lys Ala Asn Gln Pro Ile Cys Tyr Asn Asn
                85                  90                  95


Gln Asn Tyr Thr Ile Asp His His Ile Ile Ser Ile Pro Phe Tyr Thr
            100                 105                 110


Thr Lys Cys Gln Arg Phe Ala Phe Pro Val Lys Gln Thr Glu Arg Phe
        115                 120                 125


Glu Lys Leu Gln Gln His Ile Asp Ser Gly Cys Lys Leu Gly Lys Ala
    130                 135                 140


Cys Leu Phe Tyr Lys Arg Gly Lys Trp Tyr Phe Ala Val Thr Ile Lys
145                 150                 155                 160


Ile Ala Val Lys Lys Asn Thr Asn Ser Asn Leu Met Gly Ile Asp Ile
                165                 170                 175


Gly Leu Arg Gln Phe Ala Val Ala Ser Val Lys Thr His Arg Gly Lys
            180                 185                 190


Glu Ile Asn Cys Gln Phe His Asn Gly Lys Gln Ala Gly Phe Ile Arg
        195                 200                 205


Lys Lys Tyr Arg Met Leu Arg Arg Lys Leu Gly Gln Ser Lys Lys Val
    210                 215                 220


Lys Ala Ile Lys Asn Ile Asn Asp Lys Glu Gln Arg Trp Met Thr Asp
225                 230                 235                 240


Leu Asn His Lys Ile Ser Arg Gln Leu Ile Asn Leu Ala Val Gln Glu
                245                 250                 255


Gln Val Gly Thr Ile Ile Met Glu Asn Leu Glu Asn Ile Arg Asn Thr
            260                 265                 270
```

```
Ala Lys Ser Leu Asn Arg Ala Asp Arg Asn Ile His Ser Trp Thr Phe
        275                 280                 285


Tyr Gln Leu Gln Gln Phe Ile Glu Tyr Lys Ala Glu Leu Ala Gly Ile
    290                 295                 300


Lys Val Glu Tyr Ile Asn Pro Lys Tyr Thr Ser Gln Ser Cys Ser Lys
305                 310                 315                 320


Cys Asn Lys Val Lys Lys Ser Asn Arg Lys Ala Asn Leu Tyr Ser Cys
                325                 330                 335


Glu Cys Gly Asn His Ile His Ala Asp Leu Asn Ala Ser Arg Asn Ile
            340                 345                 350


Ala Asn Lys Tyr Leu Glu Gln Gln Ser Ala
        355                 360


<210>  846
<211>  267
<212>  PRT
<213>  Thermomonas hydrothermalis

<400>  846

Thr Val Ser Leu Tyr Thr Leu Asp Gly Arg Ile Thr Val Pro Met Arg
1               5                   10                  15


Leu Gly Glu His Gln Arg Arg Ile Leu Gly Ser Gly Gln Pro Lys Glu
            20                  25                  30


Ala Glu Leu Val Leu Arg Lys Gly Gln Trp Phe Phe Asn Leu Val Val
        35                  40                  45


Glu Thr Asp Asp Ala Gln Pro Val Ala Ser Gly Pro Val Met Gly Val
    50                  55                  60


Asp Val Gly Glu Asn Asn Leu Ala Ala His Ser Leu Gly Arg Val Phe
```

```
65                  70                  75                  80

Gly Gly Glu Arg Leu Arg Asp Lys Arg Asp Arg Tyr Leu Ala Leu Arg
                85                  90                  95

Arg Arg Leu Gln Ser Asn Gly Ser Gln Ser Ala Lys Gln Lys Leu Arg
            100                 105                 110

Gln Val Ser Gly Lys Glu Met Arg Arg Val Lys His Ile Asn His Glu
        115                 120                 125

Thr Ser Lys Ala Ile Val Gln Ala Ala Ile Asp Ala Gly Ile Ala Lys
    130                 135                 140

Ile Thr Met Glu Asp Leu Thr His Ile Arg Glu Arg Ile Lys Ala Gly
145                 150                 155                 160

Lys Arg Met Arg Gly Arg Leu His Arg Trp Ala Trp Arg Gln Leu Gln
                165                 170                 175

Thr Phe Val Glu Tyr Lys Ala Lys Ala Ala Gly Ile Ala Val Glu Tyr
            180                 185                 190

Ala Asn Pro Ala Tyr Thr Ser Gln Thr Cys Ser Cys Cys Gly Glu Leu
        195                 200                 205

Gly Lys Arg Ser Lys His Arg Phe Glu Cys Pro His Cys Gly Leu Arg
    210                 215                 220

Ala His Ser Asp Leu Asn Ala Ser Arg Asn Leu Ala Arg Ile Gly Ser
225                 230                 235                 240

Gly Ala Pro Leu Ser Arg Ala Val Val Asn Thr Pro Asp Val Gly Ser
                245                 250                 255

Val Asp Met Gly Asn His Val Cys Ala Ser Gln
            260                 265
```

<210> 847
<211> 8282
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 847
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gcgccattcg atggtgtccg ggatctcgac gctctccctt atgcgactcc tgcattagga 120

aattaatacg actcactata ggggaattgt gagcggataa caattcccct gtagaaataa 180

ttttgtttaa ctttaataag gagatatacc atgggtgaac tgccgagtag gtagctgata 240

acgagacctc tgtcttgtca gctagggtgg tctcgtgaac tgccgagtag gtagctgata 300

acggatccga attcgagcga aggagatata catatgtttt tgcaaagacc taaaccttac 360

agcgatgaaa gtttagaaag tttctttatc cgagtggcta acaaaaatgg ctacggtgat 420

gtccatcgct tcctagaagc cactaaacga ttccttcaag acattgacca taatggctat 480

caaacctttc cgactgatat aactcggata aacccatact cagctaaaaa cagttccagc 540

gcacgaactg cgtcattcct gaaacttgca caattgacat ttaatgaacc gccagagcta 600

cttgggttgg caattaacag aacaaacatg aaatactcgc cgtcaactag cgcggttgtt 660

agaggtgcag aagtctttcc tcgcagttta ctacggacgc actccatccc ctgctgtcct 720

ttgtgtctgc gagaaaatgg ctacgcctcc tacctttggc actttcaggg gtacgaatac 780

tgccacagcc ataacgtacc tttaattacc acttgtagct gtggtaagga gtttgactac 840

cgagtatctg ggttaaaggg catttgctgc aaatgcaagg agcctatcac cttaaccagc 900

agggagaacg gtcatgaggc agcgtgtact gtttcaaact ggcttgctgg ccatgaatct 960

aaacctctgc caaatcttcc taaaagctac cgatggggtt tagttcattg gtggatgggt 1020

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tcattccact cgataatcga agatgaagta gagttcaacc ttgagcatgc tgttgtcagc 1140

acgtctgaat tacgactaaa agatcttctt ggtcgattgt ttttcggttc aattcggtta 1200

cctgagcgga atcttcaaca caatatcatc cttggtgagc ttctctgcta tttagaaaat 1260

cgtttatggc aagacaaggg attaatcgcc aacctcaaaa tgaacgcgtt agaggcgact 1320

gtaatgttaa attgtagcct cgatcagatt gcatcaatgg ttgaacaacg catcttgaag 1380

ccaaatcgaa aaagcaagcc caacagccct cttgatgtta ccgattatct atttcatttc 1440

ggcgatattt tctgtctttg gttagctgag ttccaaagcg atgagtttaa ccgttcgttt 1500

tatgtgtcga ggtggtaaat gcaaactctg aaagaactaa tcgcatccaa tcctgacgac 1560

ttaacaactg aacttaagag agcatttcgt ccactcacac cgcatattgc aattgatggt 1620

aatgaacttg acgcactgac gatattagtc aatttaaccg ataagactga tgatcagaaa 1680

gacctgctcg atcgagccaa atgcaagcaa aaacttcgag atgaaaaatg gtgggctagc 1740

tgcataaatt gcgttaatta cagacaaagc cataacccaa aattcccgga tatacgttct 1800

gaaggcgtga ttcgaaccca agccctgggt gaattaccga gtttcctact ctcgtcctca 1860

aaaatcccac cataccattg gtcatatagc catgattcaa aatacgtcaa caaaagcgca 1920

ttcctcacca atgagttttg ttgggatggt gagatctcat gtttgggtga gcttcttaaa 1980

gatgcagatc acccactttg gaatactttg aaaaagttag gttgttctca aaaaacttgc 2040

aaagcaatgg caaaacaact agctgatatt actctcacga ctatcaatgt cacactcgca 2100

ccaaattacc tgactcaaat atctctcccc gatagtgata catcctacat ttcactctct 2160

cctgttgcat cgctatcgat gcaaagccac tttcatcaga ggctccaaga tgaaaatcgg 2220

catagcgcga taacgcggtt tagccgaact accaacatgg gggtcactgc gatgacatgt 2280

ggcggcgcat ttagaatgtt aaagtctggc gctaagtttt ccagcccccc tcatcaccga 2340

ttaaacagta aacgaagttg gttgacgtca gagcatgttc agtcattaaa acagtaccag 2400

cgcctcaaca aaagcctcat acctgaaaac tctcggattg cactccgtag aaaatacaaa 2460

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aacatactta tccaacattt gaatcatgac ctatcttact taggagccac aaaacgtttt 2580

gcatacgatc cagcgatgac caagctcttt actgagcttt tgaaacgaga gttatcaaat 2640

tcaatcaata atggtgagca acacactaat ggatcgtttt tagtcctacc gaatatcagg 2700

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ttctttggct tcgttcacgc atttgaacgg aatataaatc gcaccacctc atcgtttcgt 2820

gttgaatcct ttgcgatatg cgtccatcaa ctacatgtcg agaagcgagg tttgacagca 2880

gagtttgtgg aaaaaggcga cgggactata tccgctcccg cgacccggga tgactggcag 2940

tgtgatgtcg tatttagcct tattttgaac accaactttg ctcaacatat tgaccaagat 3000

acgttagtta catcactacc aaagcgattg gctcggggtt cagcaaaaat tgcgattgat 3060

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gcagccatga cagaggacca tcagctcatg gcaagctgcg tcggttacca cttgttagaa 3240

gagcccaaag ataaaccaaa ctccctcaga ggttacaaac acgctatcgc cgagtgcatc 3300

attggactca ttaactcaat caccttagc tcagagactg atcccaacac aatcttttgg 3360

tcgctaaaga actatcaaaa ctacctagtg gtacagccaa ggagtatcaa cgatgaaact 3420

accgacaaat ctagcctatg agcgctctat cgacccatca gatgtctgtt tttttgtcgt 3480

ctggcccgat gatagaaaaa caccttaac ctacaattct cgtactctgc tcgggcaaat 3540

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ggcgttagct caagggaacc ctcatcaagt tgatttctgc cacgttccat acggtgcgag 3660

tcatattgaa tgcagtttct ccgtctcgtt ttcttctgaa ctacgtcaac catataagtg 3720

taactcaagc aaagttaaac aaacgctagt gcaattagtc gagctctacg aaacgaaaat 3780

cggctggact gagctagcaa cccgatattt gatgaacatt tgcaacggta aatggctgtg 3840

gaaaaatacc cgtaaagcct attgctggaa cattgtactt acaccttggc cttggaacgg 3900

ggaaaaggtt ggatttgaag atattcgtac taactacacc tcacggcaag actttaaaaa 3960

taataaaaat tggtctgcta tagttgaaat gatcaaaacc gcattttcta gtactgatgg 4020

gctggcgata tttgaagtca gggccacctt gcacttgcca acgaatgcta tggtgcggcc 4080

aagccaagtt ttcacagaaa aagaaagtgg cagtaaaagt aaatctaaaa ctcaaaacag 4140

tcgagttttt cagagtacaa ctattgatgg tgaacgatcg ccaatactag gggcctttaa 4200

aacgggagca gctattgcaa ccattgacga ctggtatcct gaagccactg agccactaag 4260

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caaaactccc gctcaagaaa ctatcaacga catgcacttt ttaatggcta acctgattaa 4440

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Lys Ala Phe Asp Gln Ala Cys Glu Ser Leu Leu Ile Asn Val His Gln
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Asn Lys Val Glu Thr Pro Asp Asn Lys Pro His Val Glu Arg Asn Tyr
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Gly Thr Ile Asn Thr Ser Leu Leu Asp Asp Leu Pro Gly Lys Ser Phe
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Ser Gln Tyr Leu Gln Arg Glu Gly Tyr Asp Ser Val Gly Glu Ala Thr
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Leu Thr Leu Asn Glu Ile Arg Glu Ile Tyr Leu Ile Trp Leu Val Asp
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Ile Tyr His Lys Lys Pro Asn Gln Arg Gly Thr Asn Cys Pro Asn Val
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Ala Trp Lys Lys Gly Cys Gln Glu Trp Glu Pro Glu Glu Phe Ser Gly
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Ser Lys Asp Glu Leu Asp Phe Lys Phe Ala Ile Val Asp Tyr Lys Gln
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Leu Thr Lys Val Gly Ile Thr Val Tyr Lys Glu Leu Ser Tyr Ser Asn
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Asp Arg Leu Ala Glu Tyr Arg Gly Lys Lys Gly Asn His Lys Val Gln
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Ser Arg Val Ser Leu Trp Gln His Lys Tyr Asn Met Lys Tyr Gln Ala
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Glu Leu Asn Ser Ala Glu Tyr Asp Glu Asp Lys Glu Ile Asp Ala Glu
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Ile Lys Ile Glu Glu Ile Ala Asp Arg Ser Ile Val Lys Thr Asn Lys
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Ile Arg Ala Arg Arg Arg Gly Ala Arg His Gln Glu Asn Ser Ala Arg
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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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<220>
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gataattatc agtctaaact tcagtaagtt tacgacctct tcatggtcta ggatcccatg 120

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<210> 1051
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<220>
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<400> 1051
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gataattatc acaaccataa gttgatattt tctcttcatg gtctaaactt ggatcccatg 120

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gataattatc acaaccataa gttgatattt tctcttcatg gtctaaactt ggatcccatg 120

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<210> 1062
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aaattgatat tgctcacaac cataagttga tattttctct tcatggtcta ggatcccatg 120

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acatatcagg 130

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<211> 130
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acatatcagg 130

<210> 1065
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acatatcagg 130

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<210> 1068
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acatatcagg 130

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acatatcagg 130

<210> 1070
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<210> 1071
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gtaagtttac gactcacaac cataagttga tattttctct tcatggtcta ggatcccatg 120

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acatatcagg 130

<210> 1074
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<210> 1075
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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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<210> 1202
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acatatcagg 130

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acatatcagg 130

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<400> 1236
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acatatcagg 130

<210> 1237
<211> 130
<212> DNA
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<220>
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<400> 1237
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acatatcagg 130

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<220>
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gatatttatc acaaccataa aatgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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<213> Artificial Sequence

<220>
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gataattatc acaaccataa aatgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

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acatatcagg 130

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<220>
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acatatcagg 130

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<220>
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acatatcagg 130

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<220>
<223> Synthetic

<400> 1246
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gataattatc acaaccataa aatgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1247
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<220>
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<400> 1247

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<220>
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<400> 1248
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acatatcagg 130

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acatatcagg 130

<210> 1250
<211> 130
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<220>
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<400> 1250
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gataattatc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1251
<211> 130
<212> DNA
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<220>
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<400> 1251
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aaattgataa ttatcacacc cataaattga taattactct tcatggtcta ggatcccatg 120

acatatcagg 130

<210> 1252
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<220>
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<400> 1252
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gataattatc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1253
<211> 130
<212> DNA
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<220>
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<400> 1253
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gataattatc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1254
<211> 130
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<220>
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<400> 1254
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gataattatc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1255
<211> 130
<212> DNA
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<220>
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<400> 1255
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gatattgctc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1256
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<220>
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<400> 1256
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gatattgctc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1257
<211> 130
<212> DNA
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<220>
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<400> 1257
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acatatcagg 130

<210> 1258
<211> 130
<212> DNA
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<220>
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<210> 1259
<211> 130
<212> DNA
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<220>
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<400> 1259
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gatattgctc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1260

<211> 130
<212> DNA
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<220>
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<400> 1260
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acatatcagg 130

<210> 1261
<211> 130
<212> DNA
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<220>
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<400> 1261
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gatattgctc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1262
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<400> 1262
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acatatcagg 130

<210> 1263
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<220>
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<400> 1263
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acatatcagg 130

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gtaagtttac gactcacacc cataaattga taattactct tcatggtcta ggatcccatg 120

acatatcagg 130

<210> 1265
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<212> DNA
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<220>
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<400> 1265
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acatatcagg 130

<210> 1266
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<400> 1266
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gtaagtttac gactcacacc cataaattga taattactct tcatggtcta ggatcccatg 120

acatatcagg 130

<210> 1267
<211> 130
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acatatcagg 130

<210> 1268
<211> 130
<212> DNA
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<400> 1268
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acatatcagg 130

<210> 1269
<211> 130
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<220>
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<400> 1269
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gatatttttc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1270
<211> 130
<212> DNA
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<220>
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<400> 1270
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gatatttttc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1271
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<400> 1271
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gatatttttc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1272
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<220>
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<400> 1272

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aagttgatat ttttcacacc cataaattga taattactct tcatggtcta ggatcccatg 120

acatatcagg 130

<210> 1273
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<400> 1273
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gatatttttc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1274
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<400> 1274
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gatatttttc acacccataa attgataatt actcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1275
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acatatcagg 130

<210> 1278
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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

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acatatcagg 130

<210> 1296
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<400> 1296
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acatatcagg 130

<210> 1297
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tctgagtgag 130

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<212> DNA
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<220>
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<400> 1298
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gataattatc agtgggtatt taactataac gctcttcatg gtctaaactt ggatcctcca 120

tctgagtgag 130

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<212> DNA
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tctgagtgag 130

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aagtctgtgg 130

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gataattatc acacccataa attgatattg cctcttcatg gtctaaactt ggatcctctc 120

aagtctgtgg 130

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gataattatc acacccataa attgatattg cctcttcatg gtctaaactt ggatcctctc 120

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

<210> 1457
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cataaaatga taattacacc cataaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

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cactgagtag 130

<210> 1459
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cataaattga taattacacc cataaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

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cactgagtag 130

<210> 1461
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<212> DNA
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cataaaatgt taattacacc cataaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

<210> 1462
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cactgagtag 130

<210> 1463
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cataaaatga tcattacacc cataaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

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cataaaatga taattaaacc cataaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

<210> 1465
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cactgagtag 130

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cactgagtag 130

<210> 1467
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cataaaatga taattacacc cacaaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

<210> 1468
<211> 130
<212> DNA
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<220>
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cataaaatga taattacacc catcaattga taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

<210> 1469
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<212> DNA
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cataaaatga taattacacc cataaattaa taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

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cataaaatga taattacacc cataaattgg taattatcac acccaaggat ccgggtttga 120

cactgagtag 130

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cataaaatga taattacacc cataaattga taattatccc acccaaggat ccgggtttga 120

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<210> 1472
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cactgagtag 130

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cactgagtag 130

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<220>
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cactgagtag 130

<210> 1475
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cactgagtag 130

<210> 1476
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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

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cactgagtag 130

<210> 1485

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cactgagtag 130

<210> 1486
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<210> 1487
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<210> 1488
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tggatggtag 130

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tggatggtag 130

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tggatggtag 130

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<212> DNA
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tggatggtag 130

<210> 1493
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<212> DNA
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<400> 1493
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tggatggtag 130

<210> 1494
<211> 130
<212> DNA
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<220>
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<400> 1494
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tggatggtag 130

<210> 1495
<211> 130
<212> DNA
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<220>
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<400> 1495
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tggatggtag 130

<210> 1496
<211> 130
<212> DNA
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<400> 1496
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tggatggtag 130

<210> 1497
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1497

ctgttgatac aaccataaaa tgataattag atttaggagt cacccataaa ttgataatta 60

tcacacccat aaattgatat tgctgattta atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1498
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1498
ctgttgatac aaccataaaa tgataattag atttaggagt tcacccataa attgataatt 60

atcacaccca taaattgata ttgcgattta atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1499
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<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1499
ctgttgatac aaccataaaa tgataattag atttaggagt tgcacccata aattgataat 60

tatcacaccc ataaattgat attgcattta atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1500
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1500
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ttatcacacc cataaattga tattgcttta atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1501
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1501
ctgttgatac aaccataaaa tgataattag atttaggagt tgatcaccca taaattgata 60

attatcacac ccataaattg atattgctta atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1502
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1502
ctgttgatac aaccataaaa tgataattag atttaggagt tgattcaccc ataaattgat 60

aattatcaca cccataaatt gatattgcta atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1503
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1503
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttcacc cataaattga 60

taattatcac acccataaat tgatattgca atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1504
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1504
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttacac ccataaattg 60

ataattatca cacccataaa ttgatattgc atcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1505
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1505
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaaca cccataaatt 60

gataattatc acacccataa attgatattg ctcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1506
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1506
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc acccataaat 60

tgataattat cacacccata aattgatatt gccaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1507
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1507
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ttgataatta tcacacccat aaattgatat tgcaacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1508
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1508
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc acacccataa 60

attgataatt atcacaccca taaattgata ttgcacttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1509
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1509
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aacacccata 60

aattgataat tatcacaccc ataaattgat attgccttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1510

<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1510
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aaccacccat 60

aaattgataa ttatcacacc cataaattga tattgcttta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1511
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1511
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactcaccca 60

taaattgata attatcacac ccataaattg atattgctta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1512
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1512
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aacttcaccc 60

ataaattgat aattatcaca cccataaatt gatattgcta gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1513
<211> 130
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1513
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttcacc 60

cataaattga taattatcac acccataaat tgatattgca gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1514
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1514
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttacac 60

ccataaattg ataattatca cacccataaa ttgatattgc gtggaccaat cacgtgatca 120

tggatggtag 130

<210> 1515
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1515
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttagca 60

cccataaatt gataattatc acacccataa attgatattg ctggaccaat cacgtgatca 120

tggatggtag 130

<210> 1516
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1516
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttagtc 60

acccataaat tgataattat cacacccata aattgatatt gcggaccaat cacgtgatca 120

tggatggtag 130

<210> 1517
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1517
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttagtg 60

cacccataaa ttgataatta tcacacccat aaattgatat tgcgaccaat cacgtgatca 120

tggatggtag 130

<210> 1518
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1518
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttagtg 60

gcacccataa attgataatt atcacaccca taaattgata ttgcaccaat cacgtgatca 120

tggatggtag 130

<210> 1519
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1519
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttagtg 60

gacacccata aattgataat tatcacaccc ataaattgat attgcccaat cacgtgatca 120

tggatggtag 130

<210> 1520
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1520
ctgttgatac aaccataaaa tgataattag atttaggagt tgatttaatc aactttagtg 60

gaccacccat aaattgataa ttatcacacc cataaattga tattgccaat cacgtgatca 120

tggatggtag 130

<210> 1521
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1521
ccttctagac tgctgacata ctcgatt 27

<210> 1522
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1522
ctcggtacct gttgatgcaa ccataaa 27

<210> 1523

<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1523
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1524
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1524
tgttgatgca accataaagt gatatttata attatttata atcagcaact taaccacaaa 60

acaaccatat attgatatct cacaaaacaa ccataagttg atattttatg tgaatcgagt 120

atgtcagcag 130

<210> 1525
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1525
tgttgatgca accataaagt gatatttaaa ttatttataa tcagcaactt aaccacaaaa 60

caaccatata ttgatatctc acaaaacaac cataagttga tattttcatg tgaatcgagt 120

atgtcagcag 130

<210> 1526
<211> 130
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1526
tgttgatgca accataaagt gatatttaat tatttataat cagcaactta accacaaaac 60

aaccatatat tgatatctca caaaacaacc ataagttgat atttttcatg tgaatcgagt 120

atgtcagcag 130

<210> 1527
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1527
tgttgatgca accataaagt gatatttatt atttataatc agcaacttaa ccacaaaaca 60

accatatatt gatatctcac aaaacaacca taagttgata ttttatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1528
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1528
tgttgatgca accataaagt gatatttata tttataatca gcaacttaac cacaaaacaa 60

ccatatattg atatctcaca aaacaaccat aagttgatat tttaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1529
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1529
tgttgatgca accataaagt gatatttaat ttataatcag caacttaacc acaaaacaac 60

catatattga tatctcacaa aacaaccata agttgatatt ttcaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1530
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1530
tgttgatgca accataaagt gatatttatt tataatcagc aacttaacca caaaacaacc 60

atatattgat atctcacaaa acaaccataa gttgatattt tccaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1531
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1531
tgttgatgca accataaagt gatatttatt ataatcagca acttaaccac aaaacaacca 60

tatattgata tctcacaaaa caaccataag ttgatatttt accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1532
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1532
tgttgatgca accataaagt gatatttata taatcagcaa cttaaccaca aaacaaccat 60

atattgatat ctcacaaaac aaccataagt tgatattttg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1533
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1533
tgttgatgca accataaagt gatatttaat aatcagcaac ttaaccacaa aacaaccata 60

tattgatatc tcacaaaaca accataagtt gatattttgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1534
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1534
tgttgatgca accataaagt gatatttata atcagcaact taaccacaaa acaaccatat 60

attgatatct cacaaaacaa ccataagttg atatttttgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1535
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1535

tgttgatgca accataaagt gatatttaaa tcagcaactt aaccacaaaa caaccatata 60

ttgatatctc acaaaacaac cataagttga tattttgtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1536
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1536
tgttgatgca accataaagt gatatttaat cagcaactta accacaaaac aaccatatat 60

tgatatctca caaaacaacc ataagttgat attttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1537
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1537
tgttgatgca accataaagt gatatttatc agcaacttaa ccacaaaaca accatatatt 60

gatatctcac aaaacaacca taagttgata tttttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1538
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1538
tgttgatgca accataaagt gatatttaca gcaacttaac cacaaaacaa ccatatattg 60

atatctcaca aaacaaccat aagttgatat tttttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1539
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1539
tgttgatgca accataaagt gatatttaag caacttaacc acaaaacaac catatattga 60

tatctcacaa aacaaccata agttgatatt tttttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1540
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1540
tgttgatgca accataaagt gatatttagc aacttaacca caaaacaacc atatattgat 60

atctcacaaa acaaccataa gttgatattt tctttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1541
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1541
tgttgatgca accataaagt gatatttaca acttaaccac aaaacaacca tatattgata 60

tctcacaaaa caaccataag ttgatatttt actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1542
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1542
tgttgatgca accataaagt gatatttaaa cttaaccaca aaacaaccat atattgatat 60

ctcacaaaac aaccataagt tgatatttta actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1543
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1543
tgttgatgca accataaagt gatatttaac ttaaccacaa aacaaccata tattgatatc 60

tcacaaaaca accataagtt gatattttca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1544
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1544
tgttgatgca accataaagt gatatttact taaccacaaa acaaccatat attgatatct 60

cacaaaacaa ccataagttg atatttttca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1545
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1545
tgttgatgca accataaagt gatatttatt aaccacaaaa caaccatata ttgatatctc 60

acaaaacaac cataagttga tattttatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1546
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1546
tgttgatgca accataaagt gatatttata accacaaaac aaccatatat tgatatctca 60

caaaacaacc ataagttgat attttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1547
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1547
tgttgatgca accataaagt gatatttaaa ccacaaaaca accatatatt gatatctcac 60

aaaacaacca taagttgata tttttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1548

<211> 130
<212> DNA
<213> Artificial Sequence

<220>
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<400> 1548
tgttgatgca accataaagt gatatttaac cacaaaacaa ccatatattg atatctcaca 60

aaacaaccat aagttgatat tttttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1549
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1549
tgttgatgca accataaagt gatatttacc acaaaacaac catatattga tatctcacaa 60

aacaaccata agttgatatt tttttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1550
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1550
tgttgatgca accataaagt gatatttaca caaaacaacc atatattgat atctcacaaa 60

acaaccataa gttgatattt tatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1551
<211> 130
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1551
tgttgatgca accataaagt gatatttaac aaaacaacca tatattgata tctcacaaaa 60

caaccataag ttgatatttt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1552
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1552
tgttgatgca accataaagt gatatttaca aaacaaccat atattgatat ctcacaaaac 60

aaccataagt tgatattttt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1553
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1553
tgttgatgca accataaagt gatatttaaa aacaaccata tattgatatc tcacaaaaca 60

accataagtt gatatttttt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1554
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1554
tgttgatgca accataaagt gatatttaaa acaaccatat attgatatct cacaaaacaa 60

ccataagttg atattttgtt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1555
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1555
tgttgatgca accataaagt gatatttaaa caaccatata ttgatatctc acaaaacaac 60

cataagttga tattttagtt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1556
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1556
tgttgatgca accataaagt gatatttaac aaccatatat tgatatctca caaaacaacc 60

ataagttgat attttgagtt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1557
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1557
tgttgatgca accataaagt gatatttaca accatatatt gatatctcac aaaacaacca 60

taagttgata ttttggagtt gatttaatca actttagtgg accaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1558
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1558
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1559
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1559
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacaaacaa ccataagttg atattttatg tgaatcgagt 120

atgtcagcag 130

<210> 1560
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1560

tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacaacaac cataagttga tattttcatg tgaatcgagt 120

atgtcagcag 130

<210> 1561
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1561
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacacaacc ataagttgat atttttcatg tgaatcgagt 120

atgtcagcag 130

<210> 1562
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1562
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcaccaacca taagttgata ttttatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1563
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1563
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacaaccat aagttgatat tttaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1564
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1564
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aacaaccata tattgatatc tccaaccata agttgatatt ttcaatcatg tgaatcgagt 120

atgtcagcag 130

<210> 1565
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1565
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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atgtcagcag 130

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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1568
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
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<400> 1568
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1569
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<400> 1569
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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atgtcagcag 130

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<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1571
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1572
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1573

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<212> DNA
<213> Artificial Sequence

<220>
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<400> 1573
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1574
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1574
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1575
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1575
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1576
<211> 130
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1576
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1577
<211> 130
<212> DNA
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<400> 1577
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1578
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1578
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1579
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1579
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1580
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<220>
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<400> 1580
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1581
<211> 130
<212> DNA
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<220>
<223> Synthetic

<400> 1581
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1582
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<220>
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<400> 1582
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1583
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<220>
<223> Synthetic

<400> 1583
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1584
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<223> Synthetic

<400> 1584
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1585
<211> 130
<212> DNA
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<220>
<223> Synthetic

<400> 1585

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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1586
<211> 130
<212> DNA
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<223> Synthetic

<400> 1586
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1587
<211> 130
<212> DNA
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<223> Synthetic

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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1588
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<212> DNA
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1589
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<212> DNA
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<220>
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<400> 1589
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1590
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<212> DNA
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<220>
<223> Synthetic

<400> 1590
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1591
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1591
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1592
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1592
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1593
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<220>
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<400> 1593
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1594
<211> 130
<212> DNA
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<400> 1594
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1595
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<400> 1595
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1596
<211> 130
<212> DNA
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<400> 1596
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1597
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<400> 1597
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1598

<211> 130
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<220>
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<400> 1598
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aacaaccata tattgatatc tcacaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1599
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1599
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aacaaccata tattgatatc tctcaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1600
<211> 130
<212> DNA
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<220>
<223> Synthetic

<400> 1600
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aacaaccata tattgatatc tcagaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1601
<211> 130
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1601
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aacaaccata tattgatatc tcactaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1602
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1602
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aacaaccata tattgatatc tcacataaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1603
<211> 130
<212> DNA
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<220>
<223> Synthetic

<400> 1603
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aacaaccata tattgatatc tcacaataca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1604
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aacaaccata tattgatatc tcacaaatca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

<210> 1605
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
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<400> 1605
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aacaaccata tattgatatc tcgcaaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<400> 1606
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aacaaccata tattgatatc tcataaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<212> DNA
<213> Artificial Sequence

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<400> 1607
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aacaaccata tattgatatc tcacgaaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<400> 1608
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aacaaccata tattgatatc tcacagaaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<212> DNA
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<400> 1609
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aacaaccata tattgatatc tcacaagaca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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<400> 1610

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aacaaccata tattgatatc tcacaaagca accataagtt gatatttttg tgaatcgagt 120

atgtcagcag 130

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ttttcgttcc actgagcgtc agaccccgta gaaaagatca aaggatcttc ttgagatcct 180

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<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1645
atgccgatcg cgtcacacta cgt 23

<210> 1646
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1646
gccactcgct ttaatgatga ttt 23

<210> 1647
<211> 37
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1647
gtttcaacaa ccatcccggc taggggtggg ttgaaag 37

<210> 1648
<211> 372
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (350)..(372)
<223> n is a, c, g, or t

<400> 1648
gtactaatag cgccgcagtt catgctcttt aagagtctct gtactgtgga aaatctgggt 60

tagtttgacg gttggaaaac cgttttgctt tctgaccctg gtagctgccc gcttctcatg 120

ctctgacttt tcacgttatg tggaaaaagt aacgtaattt cgttagttaa gacttaccgt 180

aaaaagtcag ttctgatgct gctgtcgcaa gacaggatag gtgcgctccc agcaaaagga 240

gtatgtcttg aaaaagacta gccgttctag taacggtgcg gattaccgca gtggtggcta 300

ctgaatcacc cccttcgtcg ggggaaccct ccaaaaggtg ggttgaaagn nnnnnnnnnn 360

nnnnnnnnnn nn 372

<210> 1649
<211> 463
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (241)..(250)
<223> n is a, c, g, or t

<400> 1649
tgtacattcg caaattaaat gtcgtaattc gcaaatttgt gtcgtttttc gcaaattaat 60

gtcgtttaga atagtttgtc tcatcaattc aattatagga acttttcgca aattaatgtc 120

gtcctgtttc tccatttagt gtcgattaac aaattaatgt cgctgttaac gaattaatgt 180

cgtcgaatta gttccaacta acgttaacaa attaatgtcg tctaacataa tgtcttgcta 240

nnnnnnnnnn aaaatgcgac atctaatttg cgaaacaggc aaatcttaat aaacgacatt 300

taatttgcga aaataggatt tgcgacatct aatttgcgaa acaggcaaat tactcagttt 360

tatggataaa tagcttgtaa gtcctacgca ataaagatct cagctattag aagtaattgc 420

gacactaatt tgcgaattgc gacatataat ttgcgaatgt aca 463

<210> 1650
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1650

taaggaatat tgttgata 18

<210> 1651
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1651
catcaacaaa tatgacag 18

<210> 1652
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1652
gatacacaca tgttgatg 18

<210> 1653
<211> 18
<212> DNA
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<220>
<223> Synthetic

<400> 1653
tatcaacatc tctctttt 18

<210> 1654
<211> 60
<212> RNA
<213> Artificial Sequence

<220>
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<220>
<221> misc_feature

<222> (9)..(40)
<223> n is a, c, g, or u

<400> 1654
cugauaacnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn gugaacugcc gaguagguag 60

<210> 1655
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1655
ccagtacagc gcggctgaaa tcatcattaa agcgagtggc aacatggaaa 50

<210> 1656
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1656
tttccatgtt gccactcgct ttaatgatga tttcagccgc gctgtactgg 50

<210> 1657
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1657
ccagtacagc gcggctgaaa tcatcattaa agcg 34

<210> 1658
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1658
cgctttaatg atgatttcag ccgcgctgta ctgg 34

<210> 1659
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1659
cataacagga agaaaaatgc cccgctgtgg gcggacaaaa tagtt 45

<210> 1660
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1660
tccgcccaca cccgcttacg cagggcatcc atttattact caacc 45

<210> 1661
<211> 146
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1661
tgttgatgca accataaagt gatatttaat aattatttat aatcagcaac ttaaccacaa 60

aacaaccata tattgatatc ctcacaaaac aaccataagt tgatattttt gtgaatcgag 120

tatttcagca aaactactgc agtaag 146

<210> 1662
<211> 127
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1662
tgttgataca accataaaat gataattaca cccataaatt gataattatc acacccataa 60

attgatattg cctcttcatg gtctaaactt cagtaagttt acgacatttt catgaagagg 120

tcatttc 127

<210> 1663
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (21)..(40)
<223> n is a, c, g, or t

<400> 1663
attttatggt tgttccaaca nnnnnnnnnn nnnnnnnnnn 40

<210> 1664
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (1)..(20)
<223> n is a, c, g, or t

<400> 1664
nnnnnnnnnn nnnnnnnnnn tgttggaaca accataaaat 40

<210> 1665
<211> 40
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (21)..(40)
<223> n is a, c, g, or t

<400> 1665
attttatggt tgtatcaaca nnnnnnnnnn nnnnnnnnnn 40

<210> 1666
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (1)..(20)
<223> n is a, c, g, or t

<400> 1666
nnnnnnnnnn nnnnnnnnnn tgttgataca accataaaat 40

<210> 1667
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (1)..(20)
<223> n is a, c, g, or t

<400> 1667
nnnnnnnnnn nnnnnnnnnn tgttgatgca accataaagt 40

<210> 1668
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (21)..(40)
<223> n is a, c, g, or t

<400> 1668
actttatggt tgcatcaaca nnnnnnnnnn nnnnnnnnnn 40

<210> 1669
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (1)..(20)
<223> n is a, c, g, or t

<400> 1669
nnnnnnnnnn nnnnnnnnnn tgttggagca accataaagt 40

<210> 1670
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<220>
<221> misc_feature
<222> (21)..(40)
<223> n is a, c, g, or t

<400> 1670
actttatggt tgctccaaca nnnnnnnnnn nnnnnnnnnn 40

<210> 1671
<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1671

Gly Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser
1 5 10 15

<210> 1672
<211> 74
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1672
ttcatcaagc cattggaccg ccttacagga cgctttggct tcattgcttt tcagcttcgc 60

cttgacggcc aaaa 74

<210> 1673
<211> 74
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1673
ttttggccgt caaggcgaag ctgaaaagca atgaagccaa agcgtcctgt aaggcggtcc 60

aatggcttga tgaa 74

<210> 1674
<211> 130
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1674
cacatgatta cgccaagctt tgttgataca accataaaat gataattaca cccataaatt 60

gataattatc acacccataa attgatattg cctcttcatg gtctaaactt ggatcccatg 120

acatatcagg 130

<210> 1675
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1675
gttctgctgt agtcaagctt tgttgataca accataaaat gataattaca cccataaatt 60

gataattatc agtgggtatt taactataac gctcttcatg gtctaaactt ggatcctcca 120

tctgagtgag 130

<210> 1676
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1676
gctaccgtga tacaaagctt tgttgataca accataaaat gataattaca cccataaatt 60

gataattatc acacccataa attgatattg gctcttcatg gtctaaactt ggatcctgtg 120

tcacgtatcg 130

<210> 1677
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1677
cagttcttgg tcgaaagctt tgttgataca accataaaat gataattaca cccataaatt 60

gataattatc acacccataa attgatattg cctcttcatg gtctaaactt ggatcctctc 120

aagtctgtgg 130

<210> 1678
<211> 130
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1678
ggaaaggtac tcgaagcttc aaggcagttc cgggctgaat gaagcgccgt gttgatacaa 60

ccataaaatg ataattacac ccataaattg ataattatca cacccaggat ccgggtttga 120

cactgagtag 130

<210> 1679
<211> 129
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1679
ctgttgatac aaccaaaaat gataattaca cccataaatt gataattatc acacccataa 60

attgatattg cgatttagga gttgatttaa tcaactttag tggaccaatc acgtgatcat 120

ggatggtag 129

<210> 1680
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1680
aaaat 5

<210> 1681
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1681
ctatt 5

<210> 1682
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1682
aaatc 5

<210> 1683
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1683
caaaa 5

<210> 1684
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1684

aatag 5

<210> 1685
<211> 5
<212> DNA
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<220>
<223> Synthetic

<400> 1685
gttgt 5

<210> 1686
<211> 5
<212> DNA
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<220>
<223> Synthetic

<400> 1686
cgaac 5

<210> 1687
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1687
tagtt 5

<210> 1688
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1688
taaac 5

<210> 1689
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1689
ttatt 5

<210> 1690
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1690
taaaa 5

<210> 1691
<211> 5
<212> DNA
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<220>
<223> Synthetic

<400> 1691
gtatt 5

<210> 1692
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1692
aaatt 5

<210> 1693

<211> 5
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<220>
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<400> 1693
ctact 5

<210> 1694
<211> 5
<212> DNA
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<220>
<223> Synthetic

<400> 1694
agatg 5

<210> 1695
<211> 5
<212> DNA
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<220>
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<400> 1695
tgaaa 5

<210> 1696
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1696
agaac 5

<210> 1697
<211> 5
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1697
aaaag 5

<210> 1698
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1698
gcttt 5

<210> 1699
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1699
ttttt 5

<210> 1700
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1700
ttggg 5

<210> 1701
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1701
cccaa 5

<210> 1702
<211> 5
<212> DNA
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<220>
<223> Synthetic

<400> 1702
aagag 5

<210> 1703
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1703
agctt 5

<210> 1704
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1704
aattt 5

<210> 1705
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1705
attcc 5

<210> 1706
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1706
cgcta 5

<210> 1707
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1707
ccatc 5

<210> 1708
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1708
taagg 5

<210> 1709
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1709

cttta 5

<210> 1710
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1710
taaag 5

<210> 1711
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1711
catct 5

<210> 1712
<211> 5
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1712
gatgg 5

<210> 1713
<211> 273
<212> PRT
<213> Escherichia coli strain K-12

<400> 1713

Met Ala Lys Ala Asn Ser Ser Phe Ser Glu Val Gln Ile Ala Arg Arg
1 5 10 15

```
Ile Lys Glu Gly Arg Gly Gln Gly His Gly Lys Asp Tyr Ile Pro Trp
            20                  25                  30

Leu Thr Val Gln Glu Val Pro Ser Ser Gly Arg Ser His Arg Ile Tyr
        35                  40                  45

Ser His Lys Thr Gly Arg Val His His Leu Leu Ser Asp Leu Glu Leu
    50                  55                  60

Ala Val Phe Leu Ser Leu Glu Trp Glu Ser Ser Val Leu Asp Ile Arg
65                  70                  75                  80

Glu Gln Phe Pro Leu Leu Pro Ser Asp Thr Arg Gln Ile Ala Ile Asp
                85                  90                  95

Ser Gly Ile Lys His Pro Val Ile Arg Gly Val Asp Gln Val Met Ser
            100                 105                 110

Thr Asp Phe Leu Val Asp Cys Lys Asp Gly Pro Phe Glu Gln Phe Ala
        115                 120                 125

Ile Gln Val Lys Pro Ala Ala Ala Leu Gln Asp Glu Arg Thr Leu Glu
    130                 135                 140

Lys Leu Glu Leu Glu Arg Arg Tyr Trp Gln Gln Lys Gln Ile Pro Trp
145                 150                 155                 160

Phe Ile Phe Thr Asp Lys Glu Ile Asn Pro Val Val Lys Glu Asn Ile
                165                 170                 175

Glu Trp Leu Tyr Ser Val Lys Thr Glu Glu Val Ser Ala Glu Leu Leu
            180                 185                 190

Ala Gln Leu Ser Pro Leu Ala His Ile Leu Gln Glu Lys Gly Asp Glu
        195                 200                 205

Asn Ile Ile Asn Val Cys Lys Gln Val Asp Ile Ala Tyr Asp Leu Glu
    210                 215                 220
```

```
Leu Gly Lys Thr Leu Ser Glu Ile Arg Ala Leu Thr Ala Asn Gly Phe
225                 230                 235                 240


Ile Lys Phe Asn Ile Tyr Lys Ser Phe Arg Ala Asn Lys Cys Ala Asp
                245                 250                 255


Leu Cys Ile Ser Gln Val Val Asn Met Glu Glu Leu Arg Tyr Val Ala
            260                 265                 270


Asn
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<210> 1714
<211> 282
<212> PRT
<213> Enterobacter cloacae strain e1713

<400> 1714

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Met Thr Arg Gly Arg Arg Phe Thr Ser Phe Glu Ser Tyr Glu Lys Ala
1               5                   10                  15


Leu Arg Asp Gly Ile Gly Leu Gly Ala Gly Glu Asn Tyr Gln Pro Trp
            20                  25                  30


Ile Arg Pro Gln Asp Phe Thr Asn Ser Thr Gly Ile Arg Ser Ala Ile
        35                  40                  45


Arg Gly Leu Lys Thr Phe Arg Gln His Asn Thr Leu Ser Gly Ile Glu
    50                  55                  60


Ser Glu Phe Tyr Tyr Leu Ala Glu Phe Asn Asp Ser Val Ile Asp Ile
65                  70                  75                  80


Arg Glu Gln Phe Pro Leu Leu Pro Val Thr Leu Thr Gln Asn Ile Ala
                85                  90                  95


Asn Ile Leu Asn Val Pro His Pro Ala Leu Arg Arg Lys Val Cys Asp
```

```
            100                 105                 110

Thr Asp Lys Pro Ala Val Pro Ala Val Met Thr Thr Asp Phe Val Leu
        115                 120                 125

Thr Phe Arg Asn Gln Asp Gly Thr Ile Lys Tyr Lys Ser Tyr Ser Val
    130                 135                 140

Lys Pro Asp Glu Ile Ile Ser Lys Arg Asp Ala Glu Lys Gln Glu Ile
145                 150                 155                 160

Glu Arg Val Phe Trp Glu Gly Ile Asn Val Cys Phe Gln Ile Tyr Thr
                165                 170                 175

Gly Ser Glu Val Thr Arg Ile Lys Ser Gly Asn Ile Ser Trp Phe Thr
            180                 185                 190

Ala Pro Phe Arg Met Asn Gly Leu Pro Asp Tyr His Leu Asp Val Ser
        195                 200                 205

Leu Leu Arg Glu Phe Pro Pro Gly Gln Tyr Val Leu Leu His Met Val
    210                 215                 220

Lys Lys Ile Ala Ser Ser Leu Ser Ile Ser Thr Asp Asp Ala Phe Ile
225                 230                 235                 240

Val Leu Lys Phe Met Leu Ala Thr Lys Ser Ile Glu Val Asp Leu Thr
                245                 250                 255

Ser Asp Ile Val Ser Asn Gly Cys Ile Val Val Leu Arg Asn Ser Ala
            260                 265                 270

Cys Asp Met Gly Leu Ala Tyr Glu Asn Asn
        275                 280

<210>  1715
<211>  275
<212>  PRT
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<213> Aeromonas salmonicida strain BG

<400> 1715

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Met Ala Lys Ser Gln Gln Ser Leu Ser Glu Leu Gln Ile Val Arg Arg
1               5                   10                  15


Ile Lys Asp Gly Arg Gly Gln Gly Phe Gly Lys Gln Tyr Arg Pro Trp
            20                  25                  30


Leu Tyr Val Gln Asp Val Pro Ser Glu Gly Arg Ser His Arg Ile Tyr
        35                  40                  45


Ser His Lys Thr Gly Arg Val His His Leu Leu Ser Asp Leu Glu Leu
    50                  55                  60


Ala Ala Phe Leu Val Phe Glu Trp Ser Pro Asp Ile Ala Asp Ile Arg
65                  70                  75                  80


Glu Gln Phe Pro Leu Arg Arg Glu Asp Thr Arg Ala Ile Ala Ala Glu
                85                  90                  95


His Arg Leu Arg His Pro Ser Val Arg Gly Val Asp Gln Val Met Ser
            100                 105                 110


Ser Asp Phe Leu Val Asp Thr Asp Asn Gly Leu His Arg Gln Phe Ala
        115                 120                 125


Val Gln Val Lys Pro Met Glu Ala Leu Ser Asp Val Lys Ile Ile Glu
    130                 135                 140


Lys Leu Glu Leu Glu Arg Arg Tyr Trp Gln Leu Lys Gln Val Pro Trp
145                 150                 155                 160


Phe Leu Ile Thr Glu His Glu Ile Asp Pro Val Ile Arg Gln Asn Val
                165                 170                 175


Glu Trp Leu Tyr Pro Thr Lys Thr Glu Gly Leu Val Glu Pro Gly Leu
            180                 185                 190
```

```
Leu Ala Gln Leu Pro Leu Leu Tyr Arg Thr Phe Ser Lys Ala Pro Glu
        195                 200                 205

Thr Lys Val Ile Asp Ile Cys Lys Arg Ile Asp Thr Ala Tyr Asp Leu
    210                 215                 220

Glu Leu Gly His Thr Leu Arg Asp Val Arg Thr Leu Ile Ala Asn Gly
225                 230                 235                 240

Phe Leu Lys Phe Asn Ile His Lys Val Phe Arg Thr Ile Thr Ala Ala
                245                 250                 255

Glu Leu Ile Phe Cys Gln Phe Asn Asp Met Glu Ala Leu Leu His Val
            260                 265                 270

Ala Asn Gln
        275
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<210> 1716
<211> 273
<212> PRT
<213> Proteus mirabilis

<400> 1716

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Met Ala Lys Ala Asn Ser Ser Phe Ser Glu Val Gln Ile Ala Arg Arg
1               5                   10                  15

Ile Lys Glu Gly Arg Gly Gln Gly His Gly Lys Asp Tyr Ile Pro Trp
            20                  25                  30

Leu Thr Val Gln Glu Val Pro Ser Ser Gly Arg Ser His Arg Ile Tyr
        35                  40                  45

Ser His Lys Thr Gly Arg Val His His Leu Leu Ser Asp Leu Glu Leu
    50                  55                  60

Ala Val Phe Leu Ser Leu Glu Trp Glu Ser Ser Val Leu Asp Ile Arg
```

```
65                  70                  75                  80

Glu Gln Phe Pro Leu Leu Pro Ser Asp Thr Arg Gln Ile Ala Ile Asp
                85                  90                  95

Ser Gly Ile Lys His Pro Val Ile Arg Gly Val Asp Gln Val Met Ser
            100                 105                 110

Thr Asp Phe Leu Val Asp Cys Lys Asp Gly Pro Phe Glu Gln Phe Ala
        115                 120                 125

Ile Gln Val Lys Pro Ala Ala Ala Leu Gln Asp Glu Arg Thr Leu Glu
    130                 135                 140

Lys Leu Glu Leu Glu Arg Arg Tyr Trp Gln Gln Lys Gln Ile Pro Trp
145                 150                 155                 160

Phe Ile Phe Thr Asp Lys Glu Ile Asn Pro Val Val Lys Glu Asn Ile
                165                 170                 175

Glu Trp Leu Tyr Ser Val Lys Thr Glu Glu Val Ser Ala Glu Leu Leu
            180                 185                 190

Ala Gln Leu Ser Pro Leu Ala His Ile Leu Gln Glu Lys Gly Asp Glu
        195                 200                 205

Asn Ile Ile Asn Val Cys Lys Gln Val Asp Ile Ala Tyr Asp Leu Glu
    210                 215                 220

Leu Gly Lys Thr Leu Ser Glu Ile Arg Ala Leu Thr Ala Asn Gly Phe
225                 230                 235                 240

Ile Lys Phe Asn Ile Tyr Lys Ser Phe Arg Ala Asn Lys Cys Ala Asp
                245                 250                 255

Leu Cys Ile Ser Gln Val Val Asn Met Glu Glu Leu Arg Tyr Val Ala
            260                 265                 270
```

Asn

<210> 1717
<211> 702
<212> PRT
<213> Escherichia coli strain K-12

<400> 1717

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Met Trp Gln Ile Asn Glu Val Val Leu Phe Asp Asn Asp Pro Tyr Arg
1               5                   10                  15


Ile Leu Ala Ile Glu Asp Gly Gln Val Val Trp Met Gln Ile Ser Ala
            20                  25                  30


Asp Lys Gly Val Pro Gln Ala Arg Ala Glu Leu Leu Leu Met Gln Tyr
        35                  40                  45


Leu Asp Glu Gly Arg Leu Val Arg Thr Asp Asp Pro Tyr Val His Leu
    50                  55                  60


Asp Leu Glu Glu Pro Ser Val Asp Ser Val Ser Phe Gln Lys Arg Glu
65                  70                  75                  80


Glu Asp Tyr Arg Lys Ile Leu Pro Ile Ile Asn Ser Lys Asp Arg Phe
                85                  90                  95


Asp Pro Lys Val Arg Ser Glu Leu Val Glu His Val Val Gln Glu His
            100                 105                 110


Lys Val Thr Lys Ala Thr Val Tyr Lys Leu Leu Arg Arg Tyr Trp Gln
        115                 120                 125


Arg Gly Gln Thr Pro Asn Ala Leu Ile Pro Asp Tyr Lys Asn Ser Gly
    130                 135                 140


Ala Pro Gly Glu Arg Arg Ser Ala Thr Gly Thr Ala Lys Ile Gly Arg
145                 150                 155                 160
```

```
Ala Arg Glu Tyr Gly Lys Gly Glu Gly Thr Lys Val Thr Pro Glu Ile
                165                 170                 175

Glu Arg Leu Phe Arg Leu Thr Ile Glu Lys His Leu Leu Asn Gln Lys
            180                 185                 190

Gly Thr Lys Thr Thr Val Ala Tyr Arg Arg Phe Val Asp Leu Phe Ala
        195                 200                 205

Gln Tyr Phe Pro Arg Ile Pro Gln Glu Asp Tyr Pro Thr Leu Arg Gln
    210                 215                 220

Phe Arg Tyr Phe Tyr Asp Arg Glu Tyr Pro Lys Ala Gln Arg Leu Lys
225                 230                 235                 240

Ser Arg Val Lys Ala Gly Val Tyr Lys Lys Asp Val Arg Pro Leu Ser
                245                 250                 255

Ser Thr Ala Thr Ser Gln Ala Leu Gly Pro Gly Ser Arg Tyr Glu Ile
            260                 265                 270

Asp Ala Thr Ile Ala Asp Ile Tyr Leu Val Asp His His Asp Arg Gln
        275                 280                 285

Lys Ile Ile Gly Arg Pro Thr Leu Tyr Ile Val Ile Asp Val Phe Ser
    290                 295                 300

Arg Met Ile Thr Gly Phe Tyr Ile Gly Phe Glu Asn Pro Ser Tyr Val
305                 310                 315                 320

Val Ala Met Gln Ala Phe Val Asn Ala Cys Ser Asp Lys Thr Ala Ile
                325                 330                 335

Cys Ala Gln His Asp Ile Glu Ile Ser Ser Ser Asp Trp Pro Cys Val
            340                 345                 350
```

```
Gly Leu Pro Asp Val Leu Leu Ala Asp Arg Gly Glu Leu Met Ser His
        355                 360                 365

Gln Val Glu Ala Leu Val Ser Ser Phe Asn Val Arg Val Glu Ser Ala
    370                 375                 380

Pro Pro Arg Arg Gly Asp Ala Lys Gly Ile Val Glu Ser Thr Phe Arg
385                 390                 395                 400

Thr Leu Gln Ala Glu Phe Lys Ser Phe Ala Pro Gly Ile Val Glu Gly
                405                 410                 415

Ser Arg Ile Lys Ser His Gly Glu Thr Asp Tyr Arg Leu Asp Ala Ser
            420                 425                 430

Leu Ser Val Phe Glu Phe Thr Gln Ile Ile Leu Arg Thr Ile Leu Phe
        435                 440                 445

Arg Asn Asn His Leu Val Met Asp Lys Tyr Asp Arg Asp Ala Asp Phe
    450                 455                 460

Pro Thr Asp Leu Pro Ser Ile Pro Val Gln Leu Trp Gln Trp Gly Met
465                 470                 475                 480

Gln His Arg Thr Gly Ser Leu Arg Ala Val Glu Gln Glu Gln Leu Arg
                485                 490                 495

Val Ala Leu Leu Pro Arg Arg Lys Val Ser Ile Ser Ser Phe Gly Val
            500                 505                 510

Asn Leu Trp Gly Leu Tyr Tyr Ser Gly Ser Glu Ile Leu Arg Glu Gly
        515                 520                 525

Trp Leu Gln Arg Ser Thr Asp Ile Ala Arg Pro Gln His Leu Glu Ala
    530                 535                 540

Ala Tyr Asp Pro Val Leu Val Asp Thr Ile Tyr Leu Phe Pro Gln Val
545                 550                 555                 560
```

```
Gly Ser Arg Val Phe Trp Arg Cys Asn Leu Thr Glu Arg Ser Arg Gln
                565                 570                 575


Phe Lys Gly Leu Ser Phe Trp Glu Val Trp Asp Ile Gln Ala Gln Glu
            580                 585                 590


Lys His Asn Lys Ala Asn Ala Lys Gln Asp Glu Leu Thr Lys Arg Arg
        595                 600                 605


Glu Leu Glu Ala Phe Ile Gln Gln Thr Ile Gln Lys Ala Asn Lys Leu
    610                 615                 620


Thr Pro Ser Thr Thr Glu Pro Lys Ser Thr Arg Ile Lys Gln Ile Lys
625                 630                 635                 640


Thr Asn Lys Lys Glu Ala Val Thr Ser Glu Arg Lys Lys Arg Ala Glu
                645                 650                 655


His Leu Lys Pro Ser Ser Ser Gly Asp Glu Ala Lys Val Ile Pro Phe
            660                 665                 670


Asn Ala Val Glu Ala Asp Asp Gln Glu Asp Tyr Ser Leu Pro Thr Tyr
        675                 680                 685


Val Pro Glu Leu Phe Gln Asp Pro Pro Glu Lys Asp Glu Ser
    690                 695                 700


<210>  1718
<211>  673
<212>  PRT
<213>  Enterobacter cloacae strain e1713

<400>  1718

Met Ile Leu Tyr Glu Leu Asn Asp Asn Lys Ile Thr Arg Pro Lys Leu
1               5                   10                  15


Phe Tyr Ile Glu Pro Phe Lys Leu Gly Val Gln Glu Arg Asn Ile Val
```

```
            20                  25                  30

His Phe Asn Tyr Pro Ile Pro Val Trp Met Met Ala Thr Asp Asn Asp
        35                  40                  45

Ile Pro Asp Lys Asn Arg Ile Arg Arg Asp Lys Asn Phe Ala Leu Ile
    50                  55                  60

Ser Pro Leu Leu Ser Asp Pro Asp Phe Leu Phe Leu Tyr Ala Leu Asn
65                  70                  75                  80

Glu Arg Ser Pro Leu Leu Arg Asn Tyr Ala Lys Asp Asn Asn Ala Ser
                85                  90                  95

Tyr Ser Thr Ile Lys Lys Leu Leu Ser Asn Cys Trp Lys Tyr Gly Arg
            100                 105                 110

Gly Lys Gln Ser Leu Thr Pro Ala Tyr Ala Arg Ser Gly Gly Asn Gly
        115                 120                 125

Val Lys Lys Thr Val Lys Ser Val Ser Val Gly Arg Lys Lys Lys Gly
    130                 135                 140

Arg Ala Leu Ile Asp Gly Arg Ala Glu Thr Tyr Ile Met Arg Glu Arg
145                 150                 155                 160

Asp Ser Ala Asn Ile Lys Lys Ile Leu Lys Arg His Tyr Leu Lys Pro
                165                 170                 175

Lys Gly Lys Ser Gln Ala Glu Cys Trp Arg Ile Tyr Leu Glu Glu Tyr
            180                 185                 190

Phe Pro Gln Leu Ala Ser Ile Thr Gln Asp Cys Ala Ile Ser Tyr Pro
        195                 200                 205

Ser Leu Ala Gln Phe Arg Tyr Cys Ile Thr Lys Leu Phe Ser Leu Thr
    210                 215                 220
```

```
Glu Ile Ala Arg Arg Arg Thr Thr Glu Arg Asp Phe Leu Leu Asn Lys
225                 230                 235                 240

Arg Ala Leu Ala Gly Ser Ser Ala Asp Ser Asp Thr Leu Pro Gly Ser
                245                 250                 255

Val Phe Glu Ile Asp Ala Thr Val Ala Asp Val His Leu Val Ser Glu
            260                 265                 270

Leu Thr Gly Asp Val Val Gly Arg Pro Thr Val Tyr Leu Val Ala Asp
        275                 280                 285

Arg Ala Thr Arg Met Ile Thr Gly Met His Val Ser Tyr Leu Tyr Ala
    290                 295                 300

Ser Trp Arg Ala Ala Ser Gln Ala Leu Ala Asn Cys Phe Ser Pro Lys
305                 310                 315                 320

Gly Gln Tyr Cys Arg Leu Phe Gly Val Asn Asp Ile Ser Asp Asp Arg
                325                 330                 335

Trp Pro Cys Ser His Val Pro Thr Lys Leu Leu Cys Asp Asn Ala Glu
            340                 345                 350

Met Leu Gly Leu Lys Thr Gln Ser Ala Val Val Pro Phe Thr Glu Leu
        355                 360                 365

Met Phe Ala Pro Ser Tyr Arg Ala Asp Leu Lys Gly Val Val Glu Ser
    370                 375                 380

Arg Phe Arg Ile Leu Asn Gln Lys Ala Ile His Lys Leu Leu Gly Thr
385                 390                 395                 400

Thr Arg Gly Gly Phe Val Val Arg Gly Glu Thr Arg Pro Gln Leu Arg
                405                 410                 415

Ser Cys Tyr Thr Leu Lys Ala Phe Thr Glu Ile Ile Ile Arg Ala Val
```

```
            420                 425                 430

Asp Glu Tyr Asn His Ala Leu Asn Thr Glu Leu Leu Tyr Ile Asn Pro
        435                 440                 445

Leu Leu Leu Glu His Asn Leu Ile Ala Thr Pro Val Asn Ser Trp Asn
    450                 455                 460

Ile Ser Ile Asn Asn Phe Arg Phe Gly Gly Tyr Gln Ile Thr Glu His
465                 470                 475                 480

Glu Ile Ile Ser Arg Leu Leu Tyr Pro Asp Ser Ala Ser Ile Thr Gly
                485                 490                 495

Lys Gly Ile Gln Tyr Gly Asn Arg Phe Tyr Glu Cys Ser Glu Asp Glu
            500                 505                 510

Met Val Gly Ala Arg Ser Phe Gly Gln Thr Arg Val Asp Val Arg Ile
        515                 520                 525

Asn Asp Asn Ser Met Asp Lys Ile Tyr Ile Arg Ser Gly Lys Asp Thr
    530                 535                 540

Val Phe Ser Gln Arg Glu Leu Leu Ser Arg Arg Lys Ile Phe Gln Gly
545                 550                 555                 560

Leu Pro His Met Glu Ala Glu Val Val Ser Asp Ile Val Asp Met His
                565                 570                 575

Lys Ser Ser Asn Val Ile Thr Pro Glu Ser Met Ala Leu Arg Lys Leu
            580                 585                 590

Ile Glu Ala Asn Glu Gln Glu Gly Glu Ile Leu Leu Ala Ala Leu Arg
        595                 600                 605

Lys Lys Gly Arg Gly Arg Tyr Lys Asn Ile Arg Glu Asn Arg Arg Lys
    610                 615                 620
```

Glu Val Leu Tyr Ala Gln Gln Gly Asp Ser Arg Lys Thr Ser Glu Asn
625 630 635 640

Tyr Lys Leu Pro Pro Ala Asn Asn Ile Val Ile Leu Pro Gly Pro Glu
645 650 655

Ala Arg Lys Ala Trp Leu Thr Lys Gln Asn Asp Pro Tyr Lys Lys Asp
660 665 670

Lys

<210> 1719
<211> 697
<212> PRT
<213> Aeromonas salmonicida strain BG

<400> 1719

Met Trp Gln Ile Asn Glu Val Leu Arg Phe Asp Gly Gln His Tyr Arg
1 5 10 15

Ile Leu Ala Val Asn Ser Gly Glu Ile Val Trp Ile Cys Leu Asp Leu
20 25 30

Asp Thr Ala Gln Pro Glu Arg Arg Thr Glu Leu Glu Leu Ile Ser Tyr
35 40 45

Phe Asp Glu Glu Arg Leu Phe Arg His Val Asp Pro Phe Ala Ser Ile
50 55 60

Asp Leu Glu Glu Pro Leu Val Gly Ser Val Ala Phe Asn Lys Arg Glu
65 70 75 80

Arg Gly Leu Leu Ile Ile Gln Pro Ile Ile Ala Asp Glu Leu Cys Phe
85 90 95

Glu Pro Arg Ile Arg Ala Arg Arg Val Glu Gln Val Arg Gln Ser Gly
100 105 110

```
Met Ala Ser Ile Ala Thr Ile Tyr Lys Leu Leu Arg Arg Tyr Trp Gln
        115                 120                 125

Arg Gly Gln Lys Pro Asn Ser Leu Leu Pro Asp Tyr Lys Asn Ser Gly
    130                 135                 140

Ala Pro Gly Lys Thr Arg Ala Ala Ser Gly Gln Ala Lys Ile Gly Arg
145                 150                 155                 160

Ser Arg Lys Phe Gly Asp Gly Glu Gly Met Lys Val Thr Pro Asp Ile
                165                 170                 175

Glu Arg Leu Phe Arg Leu Thr Ile Glu Lys His Ile Leu Ser Val Asp
            180                 185                 190

Gly Leu Lys Thr Thr Val Ala Tyr Arg Arg Phe Ser Asp Leu Phe Lys
        195                 200                 205

Gln Tyr Tyr Pro Gln Val Glu Glu Ala Asn Arg Pro Thr Ile Arg Gln
    210                 215                 220

Phe Arg Tyr Phe Tyr Asp Arg Glu Tyr Lys Lys Pro Gln Arg Leu Glu
225                 230                 235                 240

Ala Arg Thr His Pro Gly Val Tyr Lys Lys Asp Val Arg Pro Leu Thr
                245                 250                 255

Ser Thr Ala Thr Ala Ser Val Leu Gly Pro Gly Ser Arg Tyr Glu Ile
            260                 265                 270

Asp Ala Thr Ile Ala Asp Ile Tyr Leu Val Asp Asp Glu Asp Arg Ser
        275                 280                 285

Lys Ile Ile Gly Arg Pro Thr Ile Tyr Ile Val Ile Asp Val Phe Ser
    290                 295                 300
```

```
Arg Met Thr Ser Gly Phe Tyr Ile Gly Phe Asp Asn Pro Ser Tyr Val
305                 310                 315                 320


Val Ala Met Gln Ala Val Val Asn Ala Cys Ile Asp Lys Thr Asn Ile
                325                 330                 335


Cys Ala Gln Leu Gly Val Asp Val Ser Pro Asp Glu Trp Pro Cys Ile
            340                 345                 350


Gly Leu Pro Asp Val Ile Leu Ala Asp Arg Gly Glu Met Met Ser His
        355                 360                 365


Gln Val Asp Ala Leu Ile Ser Gly Phe Asn Leu Arg Ile Glu Ser Ala
    370                 375                 380


Pro Pro Arg Arg Gly Asp Ala Lys Gly Ile Val Glu Ser Cys Phe Arg
385                 390                 395                 400


Thr Leu Gln Ala Glu Phe Lys Pro Tyr Val Pro Gly Val Val Val Gly
                405                 410                 415


Asn Arg Val Lys Lys His Gly Glu Arg Asp Tyr Arg Leu Asp Ala Val
            420                 425                 430


Met Pro Ile Ser Asp Phe Ser Gln Ile Ile Leu Arg Thr Ile Leu Phe
        435                 440                 445


Arg Asn Asn Tyr His Val Leu Asp Lys Tyr Asp Arg Asp Ala Asp Leu
    450                 455                 460


Pro Ala Asp Leu Pro Ser Ile Pro Arg Asp Leu Trp Asn Trp Gly Met
465                 470                 475                 480


Gln His Arg Val Gly Gly Leu Arg Gln Val Asp Pro Leu Gln Leu Gln
                485                 490                 495


Val Ala Leu Leu Pro Arg Arg Lys Val Ser Val Ser Pro Phe Gly Val
            500                 505                 510
```

```
Asn Met Trp Gly Leu Tyr Tyr Ser Gly Thr Asp Leu Leu Arg Glu Gly
        515                 520                 525

Trp Leu His Arg Ser Thr Glu Ile Asn Arg Pro Glu Ser Leu Glu Ala
    530                 535                 540

Ala Tyr Asp Pro Ala Ser Ala Asp Thr Ile Tyr Leu Phe Pro Gln Ala
545                 550                 555                 560

Gly Ser Arg Ile Tyr Trp Glu Cys Ser Leu Thr Asp Arg Ser Arg Gln
                565                 570                 575

Phe Arg Gly Leu Thr Phe Trp Gln Val Trp Asp Ile Gln Ala Glu Glu
            580                 585                 590

Lys His Asn Lys Ala Asn Ala Lys Leu Ile Glu Asp Ala Lys Arg Arg
        595                 600                 605

Glu Leu Asp Ala Phe Ile Lys Ser Lys Thr Val Asp Ala Ile Lys Gln
    610                 615                 620

Ser Pro Ser Val Thr Glu Pro Asp Gln Gln Arg Ile Gln Gln Ile Arg
625                 630                 635                 640

Ser Asn Lys Lys Ser Ala Arg Asp Ala Glu Arg Gln Asn Arg Thr Lys
                645                 650                 655

Ser Val Thr Val Asp Pro Gly Lys Pro Leu Ala Asp Val Val Pro Leu
            660                 665                 670

Lys Pro Ala Asp Asp Asp Tyr Ser Phe Pro His Phe Val Pro Glu Leu
        675                 680                 685

Phe Asp Asp Gly Gln Gly Asp Ala Glu
    690                 695
```

<210> 1720
<211> 702
<212> PRT
<213> Proteus mirabilis

<400> 1720

```
Met Trp Gln Ile Asn Glu Val Val Leu Phe Asp Asn Asp Pro Tyr Arg
1               5                  10                  15


Ile Leu Ala Ile Glu Asp Gly Gln Val Val Trp Met Gln Ile Ser Ala
            20                  25                  30


Asp Lys Gly Val Pro Gln Ala Arg Ala Glu Leu Leu Leu Met Gln Tyr
        35                  40                  45


Leu Asp Glu Gly Arg Leu Val Arg Thr Asp Asp Pro Tyr Val His Leu
    50                  55                  60


Asp Leu Glu Glu Pro Ser Val Asp Ser Val Ser Phe Gln Lys Arg Glu
65                  70                  75                  80


Glu Asp Tyr Arg Lys Ile Leu Pro Ile Ile Asn Ser Lys Asp Arg Phe
                85                  90                  95


Asp Pro Lys Val Arg Ser Glu Leu Val Glu His Val Val Gln Glu His
            100                 105                 110


Lys Val Thr Lys Ala Thr Val Tyr Lys Leu Leu Arg Arg Tyr Trp Gln
        115                 120                 125


Arg Gly Gln Thr Pro Asn Ala Leu Ile Pro Asp Tyr Lys Asn Ser Gly
    130                 135                 140


Ala Pro Gly Glu Arg Arg Ser Ala Thr Gly Thr Ala Lys Ile Gly Arg
145                 150                 155                 160


Ala Arg Glu Tyr Gly Lys Gly Glu Gly Thr Lys Val Thr Pro Glu Ile
                165                 170                 175
```

```
Glu Arg Leu Phe Arg Leu Thr Ile Glu Lys His Leu Leu Asn Gln Lys
            180                 185                 190

Gly Thr Lys Thr Thr Val Ala Tyr Arg Arg Phe Val Asp Leu Phe Ala
        195                 200                 205

Gln Tyr Phe Pro Arg Ile Pro Gln Glu Asp Tyr Pro Thr Leu Arg Gln
    210                 215                 220

Phe Arg Tyr Phe Tyr Asp Arg Glu Tyr Pro Lys Ala Gln Arg Leu Lys
225                 230                 235                 240

Ser Arg Val Lys Ala Gly Val Tyr Lys Lys Asp Val Arg Pro Leu Ser
                245                 250                 255

Ser Thr Ala Thr Ser Gln Ala Leu Gly Pro Gly Ser Arg Tyr Glu Ile
            260                 265                 270

Asp Ala Thr Ile Ala Asp Ile Tyr Leu Val Asp His His Asp Arg Gln
        275                 280                 285

Lys Ile Ile Gly Arg Pro Thr Leu Tyr Ile Val Ile Asp Val Phe Ser
    290                 295                 300

Arg Met Ile Thr Gly Phe Tyr Ile Gly Phe Glu Asn Pro Ser Tyr Val
305                 310                 315                 320

Val Ala Met Gln Ala Phe Val Asn Ala Cys Ser Asp Lys Thr Ala Ile
                325                 330                 335

Cys Ala Gln His Asp Ile Glu Ile Ser Ser Ser Asp Trp Pro Cys Val
            340                 345                 350

Gly Leu Pro Asp Val Leu Leu Ala Asp Arg Gly Glu Leu Met Ser His
        355                 360                 365

Gln Val Glu Ala Leu Val Ser Ser Phe Asn Val Arg Val Glu Ser Ala
```

```
    370                 375                 380

Pro Pro Arg Arg Gly Asp Ala Lys Gly Ile Val Glu Ser Thr Phe Arg
385                 390                 395                 400

Thr Leu Gln Ala Glu Phe Lys Ser Phe Ala Pro Gly Ile Val Glu Gly
                405                 410                 415

Ser Arg Ile Lys Ser His Gly Glu Thr Asp Tyr Arg Leu Asp Ala Ser
            420                 425                 430

Leu Ser Val Phe Glu Phe Thr Gln Ile Ile Leu Arg Thr Ile Leu Phe
        435                 440                 445

Arg Asn Asn His Leu Val Met Asp Lys Tyr Asp Arg Asp Ala Asp Phe
    450                 455                 460

Pro Thr Asp Leu Pro Ser Ile Pro Val Gln Leu Trp Gln Trp Gly Met
465                 470                 475                 480

Gln His Arg Thr Gly Ser Leu Arg Ala Val Glu Gln Glu Gln Leu Arg
                485                 490                 495

Val Ala Leu Leu Pro Arg Arg Lys Val Ser Ile Ser Ser Phe Gly Val
            500                 505                 510

Asn Leu Trp Gly Leu Tyr Tyr Ser Gly Ser Glu Ile Leu Arg Glu Gly
        515                 520                 525

Trp Leu Gln Arg Ser Thr Asp Ile Ala Arg Pro Gln His Leu Glu Ala
    530                 535                 540

Ala Tyr Asp Pro Val Leu Val Asp Thr Ile Tyr Leu Phe Pro Gln Val
545                 550                 555                 560

Gly Ser Arg Val Phe Trp Arg Cys Asn Leu Thr Glu Arg Ser Arg Gln
                565                 570                 575
```

```
Phe Lys Gly Leu Ser Phe Trp Glu Val Trp Asp Ile Gln Ala Gln Glu
            580                 585                 590

Lys His Asn Lys Ala Asn Ala Lys Gln Asp Glu Leu Thr Lys Arg Arg
        595                 600                 605

Glu Leu Glu Ala Phe Ile Gln Gln Thr Ile Gln Lys Ala Asn Lys Leu
    610                 615                 620

Thr Pro Ser Thr Thr Glu Pro Lys Ser Thr Arg Ile Lys Gln Ile Lys
625                 630                 635                 640

Thr Asn Lys Lys Glu Ala Val Thr Ser Glu Arg Lys Lys Arg Ala Glu
                645                 650                 655

His Leu Lys Pro Ser Ser Ser Gly Asp Glu Ala Lys Val Ile Pro Phe
            660                 665                 670

Asn Ala Val Glu Ala Asp Asp Gln Glu Asp Tyr Ser Leu Pro Thr Tyr
        675                 680                 685

Val Pro Glu Leu Phe Gln Asp Pro Pro Glu Lys Asp Glu Ser
    690                 695                 700
```

<210> 1721
<211> 555
<212> PRT
<213> Escherichia coli strain K-12

<400> 1721

```
Met Ser Ala Thr Arg Ile Gln Ala Val Tyr Arg Asp Thr Gly Val Glu
1               5                   10                  15

Ala Tyr Arg Asp Asn Pro Phe Ile Glu Ala Leu Pro Pro Leu Gln Glu
            20                  25                  30

Ser Val Asn Ser Ala Ala Ser Leu Lys Ser Ser Leu Gln Leu Thr Ser
        35                  40                  45
```

```
Ser Asp Leu Gln Lys Ser Arg Val Ile Arg Ala His Thr Ile Cys Arg
    50                  55                  60

Ile Pro Asp Asp Tyr Phe Gln Pro Leu Gly Thr His Leu Leu Leu Ser
65                  70                  75                  80

Glu Arg Ile Ser Val Met Ile Arg Gly Gly Tyr Val Gly Arg Asn Pro
                85                  90                  95

Lys Thr Gly Asp Leu Gln Lys His Leu Gln Asn Gly Tyr Glu Arg Val
            100                 105                 110

Gln Thr Gly Glu Leu Glu Thr Phe Arg Phe Glu Glu Ala Arg Ser Thr
        115                 120                 125

Ala Gln Ser Leu Leu Leu Ile Gly Cys Ser Gly Ser Gly Lys Thr Thr
    130                 135                 140

Ser Leu His Arg Ile Leu Ala Thr Tyr Pro Gln Val Ile Tyr His Arg
145                 150                 155                 160

Glu Leu Asn Val Glu Gln Val Val Tyr Leu Lys Ile Asp Cys Ser His
                165                 170                 175

Asn Gly Ser Leu Lys Glu Ile Cys Leu Asn Phe Phe Arg Ala Leu Asp
            180                 185                 190

Arg Ala Leu Gly Ser Asn Tyr Glu Arg Arg Tyr Gly Leu Lys Arg His
        195                 200                 205

Gly Ile Glu Thr Met Leu Ala Leu Met Ser Gln Ile Ala Asn Ala His
    210                 215                 220

Ala Leu Gly Leu Leu Val Ile Asp Glu Ile Gln His Leu Ser Arg Ser
225                 230                 235                 240
```

```
Arg Ser Gly Gly Ser Gln Glu Met Leu Asn Phe Phe Val Thr Met Val
                245                 250                 255

Asn Ile Ile Gly Val Pro Val Met Leu Ile Gly Thr Pro Lys Ala Arg
            260                 265                 270

Glu Ile Phe Glu Ala Asp Leu Arg Ser Ala Arg Arg Gly Ala Gly Phe
        275                 280                 285

Gly Ala Ile Phe Trp Asp Pro Ile Gln Gln Thr Gln Arg Gly Lys Pro
    290                 295                 300

Asn Gln Glu Trp Ile Ala Phe Thr Asp Asn Leu Trp Gln Leu Gln Leu
305                 310                 315                 320

Leu Gln Arg Lys Asp Ala Leu Leu Ser Asp Glu Val Arg Asp Val Trp
                325                 330                 335

Tyr Glu Leu Ser Gln Gly Val Met Asp Ile Val Val Lys Leu Phe Val
            340                 345                 350

Leu Ala Gln Leu Arg Ala Leu Ala Leu Gly Asn Glu Arg Ile Thr Ala
        355                 360                 365

Gly Leu Leu Arg Gln Val Tyr Gln Asp Glu Leu Lys Pro Val His Pro
    370                 375                 380

Met Leu Glu Ala Leu Arg Ser Gly Ile Pro Glu Arg Ile Ala Arg Tyr
385                 390                 395                 400

Ser Asp Leu Val Val Pro Glu Ile Asp Lys Arg Leu Ile Gln Leu Gln
                405                 410                 415

Leu Asp Ile Ala Ala Ile Gln Glu Gln Thr Pro Glu Glu Lys Ala Leu
            420                 425                 430

Gln Glu Leu Asp Thr Glu Asp Gln Arg His Leu Tyr Leu Met Leu Lys
        435                 440                 445
```

```
Glu Asp Tyr Asp Ser Ser Leu Leu Ile Pro Thr Ile Lys Lys Ala Phe
    450                 455                 460

Ser Gln Asn Pro Thr Met Thr Arg Gln Lys Leu Leu Pro Leu Val Leu
465                 470                 475                 480

Gln Trp Leu Met Glu Gly Glu Thr Val Val Ser Glu Leu Glu Lys Pro
                485                 490                 495

Ser Lys Ser Lys Lys Val Ser Ala Ile Lys Val Val Lys Pro Ser Asp
            500                 505                 510

Trp Asp Ser Leu Pro Asp Thr Asp Leu Arg Tyr Ile Tyr Ser Gln Arg
        515                 520                 525

Gln Pro Glu Lys Thr Met His Glu Arg Leu Lys Gly Lys Gly Val Ile
    530                 535                 540

Val Asp Met Ala Ser Leu Phe Lys Gln Ala Gly
545                 550                 555
```

<210> 1722
<211> 487
<212> PRT
<213> Enterobacter cloacae strain e1713

<400> 1722

```
Met Ala Val Asn Ala Lys Tyr His Gln Ala Asp Leu Pro Glu Tyr Arg
1               5                   10                  15

Gly Asn Pro Leu Ile Glu Ala Leu Pro Pro Leu Met Ser Arg Glu Asp
            20                  25                  30

Val Met Leu Ala Leu Ser Asn Phe Pro Glu Ile Asn Ala Asn Glu Arg
        35                  40                  45

Glu Leu Ser Thr Glu Val Arg Glu Gln Tyr Val Asp Arg Ile Asp Ala
```

```
    50                  55                  60

Phe Arg Cys Pro Gln Gly Thr Phe Phe Asp Cys Tyr Lys Ala Ile Val
65                  70                  75                  80

Arg Leu Leu Arg Thr Gly Tyr Thr Thr Arg Asn Pro Leu Asp Ile His
                85                  90                  95

Thr Val Arg Phe Leu His Tyr Ser Val Glu Gly Ser Leu Gly Glu Ala
            100                 105                 110

Leu Gly Asp Gly Phe His Arg Pro Arg Ala Gly Thr Phe Ser Ile Thr
        115                 120                 125

Gly Ile Ser Gly Val Gly Lys Ser Thr Met Leu Glu Gln Val Leu Gly
    130                 135                 140

His Phe Pro Gln Ile Ile Asp His Asn Val Tyr Gln Gly His Asp Leu
145                 150                 155                 160

Thr Pro Leu Arg Leu Val Val Trp Leu Lys Ile Asn Cys Pro Pro Asn
                165                 170                 175

Ser Lys Ala Arg Asp Leu Thr Glu Ile Leu Leu Thr Ala Ile Asp Asp
            180                 185                 190

Ala Leu Gly Leu Glu Arg Thr Ala Pro Pro Ser Arg Thr Gly Thr Leu
        195                 200                 205

Leu Arg Leu Ile Ala Gln Lys Ile Lys Ser Ala Phe Ile Gly Val Leu
    210                 215                 220

Val Ile Asp Glu Met Gln Arg Leu Thr Arg Thr Asn Gly Asp Glu Gln
225                 230                 235                 240

Leu Ile Asn Phe Leu His Asp Ile Val Asp Thr Leu Gly Val Pro Leu
                245                 250                 255
```

```
Val Phe Cys Gly Asn Pro Glu Phe Glu Asp Lys Met Arg Gln Arg Leu
            260                 265                 270

Arg Phe Ala Arg Arg Ala Glu Thr Ala Gly Phe Ile Arg Leu Asn Pro
        275                 280                 285

Leu Ala Tyr Gln Thr Thr Asp Trp Gln Ser Phe Ile Gln Tyr Leu Trp
    290                 295                 300

Arg Tyr Gln Trp Thr Asn Val Tyr Thr Pro Leu Asn Asp Glu Leu Asn
305                 310                 315                 320

Ile Lys Met His Lys Leu Ser Lys Gly Asn Leu Ala Ile Ala Gln Arg
                325                 330                 335

Leu Phe Val Thr Ala Gln Leu Lys Val Ile Gly Thr Gly Asn Glu Val
            340                 345                 350

Ile Thr Pro Ala Leu Leu Gly Leu Ser Glu Ser Val Leu Thr Ser Arg
        355                 360                 365

Ala Asp Glu Phe Ile Gln Ala Asp Ala Leu Ile Tyr Asp Val Glu Leu
    370                 375                 380

Pro Glu Leu Ser Glu Ser Glu Glu Thr Val Leu Pro Gln Lys Asn Asn
385                 390                 395                 400

Gly Lys Ser Phe Leu Lys Ser Arg Glu Ile Arg Gln Lys Pro Ala Arg
                405                 410                 415

Arg Val His Lys Ser Phe Thr Val Thr Ala Asp Leu Asn Arg Pro Gln
            420                 425                 430

His Glu Glu Phe Ala Glu Glu Leu Asn Asn Tyr Thr Ala Gln Thr Glu
        435                 440                 445

Ala Ile Leu Ala Lys Arg Cys Glu Pro Val Leu Phe Arg Ala Leu Trp
```

```
    450                 455                 460

Gln Asn Lys Cys Arg Tyr Ser Ala Leu Glu His Tyr Asp Arg Leu Cys
465                 470                 475                 480

Asn Asp Pro Ser Thr Glu Thr
                485
```

<210> 1723
<211> 552
<212> PRT
<213> Aeromonas salmonicida strain BG

<400> 1723

```
Met Ser Ala Ser Lys Ile Lys Ala Ile Tyr Arg Asp Thr Gly Val Ser
1               5                   10                  15

Ala Tyr Thr Gly Asn Pro Phe Ile Glu Ala Leu Pro Pro Leu Gln Glu
            20                  25                  30

Ser Val Asp Ser Ala Asn Ala Leu Arg Ser Asn Met Leu Phe His Pro
        35                  40                  45

Glu Asp Leu Gln Lys Ala Arg Ile Val Arg Ala His Asn Ile Cys Arg
    50                  55                  60

Ile Ala Asp Glu Phe Phe Gln Pro Leu Gly Ala His Met Leu Leu Ser
65                  70                  75                  80

Glu Arg Val Ser Leu Met Ile Arg Gly Gly Tyr Val Gly Arg Asn Pro
                85                  90                  95

Lys Thr Gly Asp Leu Gln Arg His Leu Gln Asn Gly Tyr Glu Arg Val
            100                 105                 110

Gln Thr Gly Asp Leu Ser Thr Phe Arg Phe Glu Glu Ala Lys Ser Thr
        115                 120                 125
```

```
Ala Gln Ser Met Leu Leu Ile Gly Cys Ser Gly Ser Gly Lys Thr Thr
    130                 135                 140

Ser Leu Gly Arg Ile Leu Gln Thr Tyr Pro Gln Val Ile Tyr His Ala
145                 150                 155                 160

Glu Phe Asn Phe Glu Gln Val Val Tyr Leu Lys Val Asp Cys Ser His
                165                 170                 175

Asn Gly Ser Leu Lys Glu Ile Cys Leu Asn Phe Phe Arg Ser Leu Asp
            180                 185                 190

Lys Ala Leu Gly Thr Asn Tyr Glu Lys Thr Tyr Gly Leu Lys Arg Arg
        195                 200                 205

Asn Gly Ile Glu Thr Leu Leu Ala Leu Met Ala Gln Thr Ala Asn Ala
    210                 215                 220

His Ala Leu Gly Leu Leu Val Ile Asp Glu Ile Gln His Leu Ser Arg
225                 230                 235                 240

Ser Arg Ser Gly Gly Ser Glu Glu Met Leu Asn Phe Phe Val Thr Met
                245                 250                 255

Val Asn Thr Ile Gly Val Pro Val Met Leu Ile Gly Thr Pro Lys Ala
            260                 265                 270

Arg Asp Ile Phe Glu Ala Asp Leu Arg Ser Ala Arg Arg Gly Ala Gly
        275                 280                 285

Leu Gly Ala Ile Phe Trp Glu Pro Met Ser Leu Gly His Pro Asp Lys
    290                 295                 300

Pro Ser Gln Glu Trp Ile Ala Phe Thr Asn Asn Leu Trp Lys Leu Gln
305                 310                 315                 320

Leu Leu Gln Lys Arg Asp Val Leu Leu Thr Asp Glu Ile Arg Ala Val
                325                 330                 335
```

```
Trp Tyr Asp Leu Ser Gln Gly Val Met Asp Ile Val Val Lys Leu Phe
            340                 345                 350

Val Leu Ala Gln Leu Arg Ala Leu Ala Leu Asn Lys Glu Arg Ile Thr
        355                 360                 365

Val Gly Leu Leu Arg Gln Val Tyr Glu Asp Glu Leu Lys Pro Val His
    370                 375                 380

Pro Met Leu Ala Ala Leu Arg Ser Gly Ile Pro Glu Lys Ile Ala Gln
385                 390                 395                 400

Tyr Ser Asp Leu Met Val Pro Asp Met Asp Lys Arg Leu Ile Gln Leu
                405                 410                 415

Gln Gln Asn Ile Ala Ala Met Lys Glu Gln Thr Ala Glu Glu Thr Ala
            420                 425                 430

Leu Gln Gln Leu Ala Thr Glu Asp Glu Arg Arg Ile Tyr Leu Leu Leu
        435                 440                 445

Lys Asp Val Tyr Asp Ser Pro Leu Leu Val Ala Thr Ile Arg Lys Ala
    450                 455                 460

Phe Thr Glu Asn Pro Gln Leu Thr Ile Ser Gln Leu Leu Pro Val Val
465                 470                 475                 480

Thr Gln Trp Leu Ser Gln Pro Ala Val Lys Asp Ala Thr Met Pro Asn
                485                 490                 495

Val Ser Gln Glu Lys Ser Thr Val Ile Lys Ala Asp Ala Trp Glu Gln
            500                 505                 510

Leu Pro Phe Asp Asp Leu Arg Tyr Ile Lys Ser Gln His Lys Gln Ala
        515                 520                 525
```

```
Val Asp Val His Ala Glu Leu Lys Ser Lys Gly Met Leu Leu Asp Leu
    530                 535                 540


Lys Ser Val Leu Ala Arg Ala Ser
545                 550
```

<210> 1724
<211> 555
<212> PRT
<213> Proteus mirabilis

<400> 1724

```
Met Ser Ala Thr Arg Ile Gln Ala Val Tyr Arg Asp Thr Gly Val Glu
1               5                   10                  15


Ala Tyr Arg Asp Asn Pro Phe Ile Glu Ala Leu Pro Pro Leu Gln Glu
            20                  25                  30


Ser Val Asn Ser Ala Ala Ser Leu Lys Ser Ser Leu Gln Leu Thr Ser
        35                  40                  45


Ser Asp Leu Gln Lys Ser Arg Val Ile Arg Ala His Thr Ile Cys Arg
    50                  55                  60


Ile Pro Asp Asp Tyr Phe Gln Pro Leu Gly Thr His Leu Leu Leu Ser
65                  70                  75                  80


Glu Arg Ile Ser Val Met Ile Arg Gly Gly Tyr Val Gly Arg Asn Pro
                85                  90                  95


Lys Thr Gly Asp Leu Gln Lys His Leu Gln Asn Gly Tyr Glu Arg Val
            100                 105                 110


Gln Thr Gly Glu Leu Glu Thr Phe Arg Phe Glu Glu Ala Arg Ser Thr
        115                 120                 125


Ala Gln Ser Leu Leu Leu Ile Gly Cys Ser Gly Ser Gly Lys Thr Thr
    130                 135                 140
```

```
Ser Leu His Arg Ile Leu Ala Thr Tyr Pro Gln Val Ile Tyr His Arg
145                 150                 155                 160


Glu Leu Asn Val Glu Gln Val Val Tyr Leu Lys Ile Asp Cys Ser His
                165                 170                 175


Asn Gly Ser Leu Lys Glu Ile Cys Leu Asn Phe Phe Arg Ala Leu Asp
            180                 185                 190


Arg Ala Leu Gly Ser Asn Tyr Glu Arg Arg Tyr Gly Leu Lys Arg His
        195                 200                 205


Gly Ile Glu Thr Met Leu Ala Leu Met Ser Gln Ile Ala Asn Ala His
    210                 215                 220


Ala Leu Gly Leu Leu Val Ile Asp Glu Ile Gln His Leu Ser Arg Ser
225                 230                 235                 240


Arg Ser Gly Gly Ser Gln Glu Met Leu Asn Phe Phe Val Thr Met Val
                245                 250                 255


Asn Ile Ile Gly Val Pro Val Met Leu Ile Gly Thr Pro Lys Ala Arg
            260                 265                 270


Glu Ile Phe Glu Ala Asp Leu Arg Ser Ala Arg Arg Gly Ala Gly Phe
        275                 280                 285


Gly Ala Ile Phe Trp Asp Pro Ile Gln Gln Thr Gln Arg Gly Lys Pro
    290                 295                 300


Asn Gln Glu Trp Ile Ala Phe Thr Asp Asn Leu Trp Gln Leu Gln Leu
305                 310                 315                 320


Leu Gln Arg Lys Asp Ala Leu Leu Ser Asp Glu Val Arg Asp Val Trp
                325                 330                 335


Tyr Glu Leu Ser Gln Gly Val Met Asp Ile Val Val Lys Leu Phe Val
```

```
            340                 345                 350

Leu Ala Gln Leu Arg Ala Leu Ala Leu Gly Asn Glu Arg Ile Thr Ala
        355                 360                 365

Gly Leu Leu Arg Gln Val Tyr Gln Asp Glu Leu Lys Pro Val His Pro
    370                 375                 380

Met Leu Glu Ala Leu Arg Ser Gly Ile Pro Glu Arg Ile Ala Arg Tyr
385                 390                 395                 400

Ser Asp Leu Val Val Pro Glu Ile Asp Lys Arg Leu Ile Gln Leu Gln
                405                 410                 415

Leu Asp Ile Ala Ala Ile Gln Glu Gln Thr Pro Glu Glu Lys Ala Leu
            420                 425                 430

Gln Glu Leu Asp Thr Glu Asp Gln Arg His Leu Tyr Leu Met Leu Lys
        435                 440                 445

Glu Asp Tyr Asp Ser Ser Leu Leu Ile Pro Thr Ile Lys Lys Ala Phe
    450                 455                 460

Ser Gln Asn Pro Thr Met Thr Arg Gln Lys Leu Leu Pro Leu Val Leu
465                 470                 475                 480

Gln Trp Leu Met Glu Gly Glu Thr Val Val Ser Glu Leu Glu Lys Pro
                485                 490                 495

Ser Lys Ser Lys Lys Val Ser Ala Ile Lys Val Val Lys Pro Ser Asp
            500                 505                 510

Trp Asp Ser Leu Pro Asp Thr Asp Leu Arg Tyr Ile Tyr Ser Gln Arg
        515                 520                 525

Gln Pro Glu Lys Thr Met His Glu Arg Leu Lys Gly Lys Gly Val Ile
    530                 535                 540
```

```
Val Asp Met Ala Ser Leu Phe Lys Gln Ala Gly
545                 550                 555


<210>  1725
<211>  508
<212>  PRT
<213>  Escherichia coli strain K-12

<400>  1725

Met Arg Asn Phe Pro Val Pro Tyr Ser Asn Glu Leu Ile Tyr Ser Thr
1               5                   10                  15


Ile Ala Arg Ala Gly Val Tyr Gln Gly Ile Val Ser Pro Lys Gln Leu
            20                  25                  30


Leu Asp Glu Val Tyr Gly Asn Arg Lys Val Val Ala Thr Leu Gly Leu
        35                  40                  45


Pro Ser His Leu Gly Val Ile Ala Arg His Leu His Gln Thr Gly Arg
    50                  55                  60


Tyr Ala Val Gln Gln Leu Ile Tyr Glu His Thr Leu Phe Pro Leu Tyr
65                  70                  75                  80


Ala Pro Phe Val Gly Lys Glu Arg Arg Asp Glu Ala Ile Arg Leu Met
                85                  90                  95


Glu Tyr Gln Ala Gln Gly Ala Val His Leu Met Leu Gly Val Ala Ala
            100                 105                 110


Ser Arg Val Lys Ser Asp Asn Arg Phe Arg Tyr Cys Pro Asp Cys Val
        115                 120                 125


Ala Leu Gln Leu Asn Arg Tyr Gly Glu Ala Phe Trp Gln Arg Asp Trp
    130                 135                 140


Tyr Leu Pro Ala Leu Pro Tyr Cys Pro Lys His Gly Ala Leu Val Phe
145                 150                 155                 160
```

```
Phe Asp Arg Ala Val Asp Asp His Arg His Gln Phe Trp Ala Leu Gly
                165                 170                 175

His Thr Glu Leu Leu Ser Asp Tyr Pro Lys Asp Ser Leu Ser Gln Leu
            180                 185                 190

Thr Ala Leu Ala Ala Tyr Ile Ala Pro Leu Leu Asp Ala Pro Arg Ala
        195                 200                 205

Gln Glu Leu Ser Pro Ser Leu Glu Gln Trp Thr Leu Phe Tyr Gln Arg
    210                 215                 220

Leu Ala Gln Asp Leu Gly Leu Thr Lys Ser Lys His Ile Arg His Asp
225                 230                 235                 240

Leu Val Ala Glu Arg Val Arg Gln Thr Phe Ser Asp Glu Ala Leu Glu
                245                 250                 255

Lys Leu Asp Leu Lys Leu Ala Glu Asn Lys Asp Thr Cys Trp Leu Lys
            260                 265                 270

Ser Ile Phe Arg Lys His Arg Lys Ala Phe Ser Tyr Leu Gln His Ser
        275                 280                 285

Ile Val Trp Gln Ala Leu Leu Pro Lys Leu Thr Val Ile Glu Ala Leu
    290                 295                 300

Gln Gln Ala Ser Ala Leu Thr Glu His Ser Ile Thr Thr Arg Pro Val
305                 310                 315                 320

Ser Gln Ser Val Gln Pro Asn Ser Glu Asp Leu Ser Val Lys His Lys
                325                 330                 335

Asp Trp Gln Gln Leu Val His Lys Tyr Gln Gly Ile Lys Ala Ala Arg
            340                 345                 350
```

```
Gln Ser Leu Glu Gly Gly Val Leu Tyr Ala Trp Leu Tyr Arg His Asp
        355                 360                 365

Arg Asp Trp Leu Val His Trp Asn Gln Gln His Gln Gln Glu Arg Leu
    370                 375                 380

Ala Pro Ala Pro Arg Val Asp Trp Asn Gln Arg Asp Arg Ile Ala Val
385                 390                 395                 400

Arg Gln Leu Leu Arg Ile Ile Lys Arg Leu Asp Ser Ser Leu Asp His
                405                 410                 415

Pro Arg Ala Thr Ser Ser Trp Leu Leu Lys Gln Thr Pro Asn Gly Thr
            420                 425                 430

Ser Leu Ala Lys Asn Leu Gln Lys Leu Pro Leu Val Ala Leu Cys Leu
        435                 440                 445

Lys Arg Tyr Ser Glu Ser Val Glu Asp Tyr Gln Ile Arg Arg Ile Ser
    450                 455                 460

Gln Ala Phe Ile Lys Leu Lys Gln Glu Asp Val Glu Leu Arg Arg Trp
465                 470                 475                 480

Arg Leu Leu Arg Ser Ala Thr Leu Ser Lys Glu Arg Ile Thr Glu Glu
                485                 490                 495

Ala Gln Arg Phe Leu Glu Met Val Tyr Gly Glu Glu
            500                 505
```

<210> 1726
<211> 331
<212> PRT
<213> Enterobacter cloacae strain e17132

<400> 1726

```
Met Leu Leu Arg Ala Phe Pro Gly Glu Ile Leu Phe Ser Arg Leu Cys
1               5                   10                  15
```

```
Arg Ser Leu Ser Val Ser Gly Leu Pro Val Gln Lys Phe Ser Arg Ser
            20                  25                  30

Leu Gly Pro Glu Ala Arg Ser Ser Phe His Pro Phe Leu Thr Gln His
        35                  40                  45

Leu Thr Glu Ile Ala Gln Thr Ser His Glu Asn Ala Glu Leu Leu Trp
    50                  55                  60

Ala Glu Gln Thr Leu Phe Pro Leu Trp Val Trp Ser Met Pro Gly Tyr
65                  70                  75                  80

Ala Lys Ala Leu Arg Gln Leu Thr Gly Pro Pro Ala Arg Leu Leu Trp
                85                  90                  95

Phe Tyr Gln Leu Thr Gly Asn His Ser Ser Gln Ser Met Gln Leu His
            100                 105                 110

Phe Cys Pro Val Cys Ala Arg Glu Asp Ala Met Glu Tyr Gly Val Pro
        115                 120                 125

Tyr Trp His Cys Glu His Gln Ile Pro Gly Val Ser Ile Cys Asn Arg
    130                 135                 140

His Cys Cys Arg Leu Met Pro Lys Leu Val Pro Pro Ser Pro His Ile
145                 150                 155                 160

Ala Val Glu Phe Tyr Pro Asp Asn Phe Asn Thr Met Ile Leu Ser Lys
                165                 170                 175

Asn Ile Glu Asn Asp Phe Ala Val Phe Ala Ser Gln Ile Leu Thr Arg
            180                 185                 190

Leu Ala His Gly Glu Glu Ile Ser Asp Asn Tyr Leu Ser Gly Phe Thr
        195                 200                 205

Ser Thr Arg Thr Asp Val Glu Asn Met Lys His Ser Gly Asn Glu Lys
```

```
    210                 215                 220

Leu Phe Leu Ser Leu Asn Asp Leu Ile Arg His Leu Trp Glu Glu Asn
225                 230                 235                 240

Ser Asp Pro Val Ile Ser Asp Lys Ser His Phe Leu Tyr Tyr Ile Ile
                245                 250                 255

Ser His Phe Glu Asn Ile Phe Pro Ala Gln Lys Leu Leu Leu Leu Phe
            260                 265                 270

Tyr Leu Gln Arg Met His Ser Ile Arg Gln Asn Ala Ser Arg Glu His
        275                 280                 285

Thr Pro Leu Asn Lys Met Asn Lys Asp His Thr Lys Asn Gly Ile His
    290                 295                 300

Lys Pro Val Met Glu Leu Asn Asn Leu Met Val Arg Leu Trp Pro Ser
305                 310                 315                 320

Thr Lys Phe Ile Ala Asp Leu Arg Thr Gln Thr
                325                 330
```

<210> 1727
<211> 506
<212> PRT
<213> Aeromonas salmonicida strain BG

<400> 1727

```
Met Arg Asn Phe Pro Val Pro Tyr Pro Asp Glu Leu Val Tyr Ser Met
1               5                   10                  15

Val Ala Arg Ala Gly Ile Tyr His Gly Ile Thr Ser Pro Lys Gln Leu
            20                  25                  30

Leu Asp Glu Val Phe Glu Asn Arg Lys Val Ile Ala Thr Leu Asp Leu
        35                  40                  45
```

```
Pro Cys His Leu Gln Ser Ile Ser Ser Leu Phe Gln Asn Thr Gly Arg
    50                  55                  60

Tyr Ser Val Glu Glu Leu Val Tyr Gln His Thr Leu Phe Pro Leu Tyr
65                  70                  75                  80

Ala Pro Phe Val Thr Glu Ser His Lys Ser Arg Ala Leu Gln Met Met
                85                  90                  95

Ala Gly Arg Ser Gln Gly Ala Val His Leu Met Leu Gly Val Ala Ala
            100                 105                 110

Ser Arg Ile Gln Ser Ser Asp Arg Phe Arg Tyr Cys Pro Glu Cys Ile
        115                 120                 125

Lys Asn Gln His Gln His Tyr Gly Glu Tyr Phe Trp Gln Arg Asn Trp
    130                 135                 140

Phe Phe Pro Gly Leu Ala Val Cys Pro Glu His Gly Pro Leu Ser Ile
145                 150                 155                 160

Leu Thr Asn Gly Ser Gly Ser His Arg His His Phe Phe Ala Met Thr
                165                 170                 175

Pro Gln Ser Pro Val Asp Cys Glu Leu Ser Ser Val Asn Glu Glu Leu
            180                 185                 190

Leu Arg Leu Ala Ile Tyr Ala Asn Lys Phe Leu Asn Ile Ser Pro Gly
        195                 200                 205

Tyr Ser Pro Asp Phe Glu Gln Trp Thr Ser Phe Tyr Arg Asp Leu Ala
    210                 215                 220

Ser Asp Phe Gly Phe Cys Arg Gly Arg His Ile Asn His Gly Glu Ile
225                 230                 235                 240

His Glu Arg Val His Ala Cys Phe His Pro Ser Thr Leu Thr Gln Leu
                245                 250                 255
```

```
Asn Leu Tyr Thr Asp Ser Ala Thr Glu Thr Gly Trp Leu Lys Gly Ile
            260                 265                 270

Phe Arg Lys His Arg Lys Ala Phe Ser Tyr Leu Glu His Ala Ile Ile
        275                 280                 285

Trp Gln Ser Phe Ile Ala Glu Leu Glu Pro Glu Asp Val Ile Asp Arg
    290                 295                 300

Val Arg Lys Ile Lys Pro Cys Thr Lys Val Val Phe Glu Ile Thr Ala
305                 310                 315                 320

Ser Ser Thr Leu Ser Lys Asn Asn Glu His Leu Gln Val Gln Arg Gln
                325                 330                 335

Thr Trp Gln Lys Leu Val Leu Gln Tyr Gly Val Leu Asn Ala Arg Asn
            340                 345                 350

Ser Arg Pro Gly Lys Ala Leu Tyr Ala Trp Leu Tyr Arg Asn Asp Lys
        355                 360                 365

Cys Trp Leu Met Ala Phe Asn Phe Glu His Lys Glu Gln Arg Thr Asn
    370                 375                 380

Pro Glu Leu Lys Ala Asp Trp His Arg Arg Asp Leu Val Ala Ile Arg
385                 390                 395                 400

Gln Leu Arg Lys Leu Leu Gln Glu Ile Ala Pro Ser Tyr Ala Gly Pro
                405                 410                 415

Arg Leu Ser Ala Asn Phe Leu Leu Cys Lys Leu Gln Gln Ser Ser Thr
            420                 425                 430

Ile Glu Lys Asn Leu Asp Lys Leu Pro Leu Val Arg Met Phe Leu Gln
        435                 440                 445
```

```
Arg Tyr Thr Glu Thr Ile Thr Glu Tyr Gln Ile Arg Arg Leu Thr Asn
    450                 455                 460

Thr Cys Ala Glu Met Gln Arg Gln Gly Glu Pro Leu Lys Lys Trp Leu
465                 470                 475                 480

Val Met Arg Lys Ala Gly Leu Ser Gln Glu Arg Leu Arg Pro Asp Ala
                485                 490                 495

Gln Thr Val Leu Asn Glu Leu Gln Leu Phe
            500                 505
```

<210> 1728
<211> 508
<212> PRT
<213> Proteus mirabilis

<400> 1728

```
Met Arg Asn Phe Pro Val Pro Tyr Ser Asn Glu Leu Ile Tyr Ser Thr
1               5                   10                  15

Ile Ala Arg Ala Gly Val Tyr Gln Gly Ile Val Ser Pro Lys Gln Leu
            20                  25                  30

Leu Asp Glu Val Tyr Gly Asn Arg Lys Val Val Ala Thr Leu Gly Leu
        35                  40                  45

Pro Ser His Leu Gly Val Ile Ala Arg His Leu His Gln Thr Gly Arg
    50                  55                  60

Tyr Ala Val Gln Gln Leu Ile Tyr Glu His Thr Leu Phe Pro Leu Tyr
65                  70                  75                  80

Ala Pro Phe Val Gly Lys Glu Arg Arg Asp Glu Ala Ile Arg Leu Met
                85                  90                  95

Glu Tyr Gln Ala Gln Gly Ala Val His Leu Met Leu Gly Val Ala Ala
            100                 105                 110
```

```
Ser Arg Val Lys Ser Asp Asn Arg Phe Arg Tyr Cys Pro Asp Cys Val
        115                 120                 125

Ala Leu Gln Leu Asn Arg Tyr Gly Glu Ala Phe Trp Gln Arg Asp Trp
    130                 135                 140

Tyr Leu Pro Ala Leu Pro Tyr Cys Pro Lys His Gly Ala Leu Val Phe
145                 150                 155                 160

Phe Asp Arg Ala Val Asp Asp His Arg His Gln Phe Trp Ala Leu Gly
                165                 170                 175

His Thr Glu Leu Leu Ser Asp Tyr Pro Lys Asp Ser Leu Ser Gln Leu
            180                 185                 190

Thr Ala Leu Ala Ala Tyr Ile Ala Pro Leu Leu Asp Ala Pro Arg Ala
        195                 200                 205

Gln Glu Leu Ser Pro Ser Leu Glu Gln Trp Thr Leu Phe Tyr Gln Arg
    210                 215                 220

Leu Ala Gln Asp Leu Gly Leu Thr Lys Ser Lys His Ile Arg His Asp
225                 230                 235                 240

Leu Val Ala Glu Arg Val Arg Gln Thr Phe Ser Asp Glu Ala Leu Glu
                245                 250                 255

Lys Leu Asp Leu Lys Leu Ala Glu Asn Lys Asp Thr Cys Trp Leu Lys
            260                 265                 270

Ser Ile Phe Arg Lys His Arg Lys Ala Phe Ser Tyr Leu Gln His Ser
        275                 280                 285

Ile Val Trp Gln Ala Leu Leu Pro Lys Leu Thr Val Ile Glu Ala Leu
    290                 295                 300

Gln Gln Ala Ser Ala Leu Thr Glu His Ser Ile Thr Thr Arg Pro Val
```

```
305                 310                 315                 320

Ser Gln Ser Val Gln Pro Asn Ser Glu Asp Leu Ser Val Lys His Lys
                325                 330                 335

Asp Trp Gln Gln Leu Val His Lys Tyr Gln Gly Ile Lys Ala Ala Arg
            340                 345                 350

Gln Ser Leu Glu Gly Gly Val Leu Tyr Ala Trp Leu Tyr Arg His Asp
        355                 360                 365

Arg Asp Trp Leu Val His Trp Asn Gln Gln His Gln Gln Glu Arg Leu
    370                 375                 380

Ala Pro Ala Pro Arg Val Asp Trp Asn Gln Arg Asp Arg Ile Ala Val
385                 390                 395                 400

Arg Gln Leu Leu Arg Ile Ile Lys Arg Leu Asp Ser Ser Leu Asp His
                405                 410                 415

Pro Arg Ala Thr Ser Ser Trp Leu Leu Lys Gln Thr Pro Asn Gly Thr
            420                 425                 430

Ser Leu Ala Lys Asn Leu Gln Lys Leu Pro Leu Val Ala Leu Cys Leu
        435                 440                 445

Lys Arg Tyr Ser Glu Ser Val Glu Asp Tyr Gln Ile Arg Arg Ile Ser
    450                 455                 460

Gln Ala Phe Ile Lys Leu Lys Gln Glu Asp Val Glu Leu Arg Arg Trp
465                 470                 475                 480

Arg Leu Leu Arg Ser Ala Thr Leu Ser Lys Glu Arg Ile Thr Glu Glu
                485                 490                 495

Ala Gln Arg Phe Leu Glu Met Val Tyr Gly Glu Glu
            500                 505
```

<210> 1729
<211> 188
<212> PRT
<213> Rhodanobacter sp. isolate FW106

<400> 1729

```
Met Thr Thr His Tyr Ile Asp Ile Thr Val Lys Pro Asp Pro Glu Ser
1               5                   10                  15


Ser Ala Ala Gln Leu Leu Gly Ala Leu Tyr Asp Lys Leu His Leu Ala
            20                  25                  30


Leu Val Gln Tyr Gly Leu Asn Asp Ile Gly Val Ser Phe Pro Gly Tyr
        35                  40                  45


Ser Met Asn Pro Arg Asn Leu Gly Thr Ala Leu Arg Leu His Gly Thr
    50                  55                  60


Asp His Ala Leu Arg Gln Leu Thr Gln Ala Asp Trp Leu Lys Gly Val
65                  70                  75                  80


Arg Asp His Val Arg Val Thr Asp Ile Thr Glu Val Pro Asp Gly Ala
                85                  90                  95


Ser His Arg Thr Val Arg Arg Lys Gln Phe Lys Thr Ser Ala Glu Arg
            100                 105                 110


Leu Arg Arg Arg Arg Met Arg Arg Lys Gly Glu Thr Ala Glu Gln Ala
        115                 120                 125


Ala Arg Ala Ile Pro Ser Ser Ile Glu Arg Gln Pro Asn Leu Pro Tyr
    130                 135                 140


Val His Val Arg Ser Gln Ser Thr Gly Gln Pro Phe Cys Leu Phe Val
145                 150                 155                 160


Thr Leu Gly Ala Pro Ala Ala Asp Ala Thr Pro Gly Lys Phe Asn Gly
                165                 170                 175
```

Tyr Gly Leu Ser Glu Thr Thr Thr Ile Pro Trp Phe
            180   185

<210> 1730
<211> 188
<212> PRT
<213> Burkholderia plantarii strain PG1

<400> 1730

Met Thr Thr His Phe Ile Asp Ile Arg Leu Leu Pro Asp Pro Glu Phe
1   5   10   15

Ser Gln Val His Val Phe Gly Ala Leu Val Ser Lys Leu His Arg Val
            20   25   30

Leu Val Gln Met Arg Arg Asp Asp Ile Gly Ile Ser Phe Pro Glu Tyr
        35   40   45

Ser Leu Arg Pro Arg Ser Val Gly Arg Val Leu Arg Leu His Gly Gly
    50   55   60

Asp Val Gly Leu Arg Glu Leu Met Ala Gln Pro Trp Leu Gln Gly Met
65   70   75   80

Arg Asp His Val Val Val Ala Glu Ala Ala Pro Val Pro Ala Gly Ala
                85   90   95

Thr His Arg Val Val Arg Arg Arg Gln Phe Lys Thr Asn Ala Glu Arg
            100   105   110

Leu Arg Arg Arg Arg Met Gln Arg Lys Gly Glu Thr Ala Glu Gln Ala
        115   120   125

Ala Ala His Ile Pro Asp Ser Val Glu Arg Arg Pro Asp Leu Pro Tyr
    130   135   140

Val Gln Leu Arg Ser Thr Ser Thr Gly Gln Gly Phe Cys Leu Phe Val

145 150 155 160

Glu Gln Gly Asn Val Gly Arg Glu Ala Val Ala Gly Ala Phe Asn Ser
165 170 175

Tyr Gly Leu Ser Gln Gly Ala Thr Val Pro Trp Phe
180 185

<210> 1731
<211> 189
<212> PRT
<213> Idiomarina sp. H105

<400> 1731

Met Asp His Tyr Ile Asp Ile Arg Leu Arg Pro Asp Pro Asp Phe Pro
1 5 10 15

Glu Ala Met Leu Met Gly Ala Leu Tyr Asn Lys Leu His Arg Ala Leu
20 25 30

Phe Asp Leu Gln Ala Thr Asp Leu Gly Val Ser Phe Pro Gly His Lys
35 40 45

His Gly Val Arg Ala Arg Thr Leu Gly Ser His Leu Arg Leu His Gly
50 55 60

Thr His Glu Arg Leu Lys Gln Leu Met Gly Met Asp Trp Leu Thr Gly
65 70 75 80

Met Arg Asp His Thr Gln Val Ser Ala Val Leu Glu Val Pro Ala Gly
85 90 95

Ala Gln His Ile Asn Val Ala Arg Lys Gln Phe Asn Thr Gly Ser Glu
100 105 110

Ser Arg Ala Lys Arg Tyr Ala Lys Arg His Ser Ile Ser Glu Glu Glu
115 120 125

```
Ala Arg Ser Ile Tyr Ser Lys Val Ala Ala Arg Arg Ile Glu Leu Pro
    130                 135                 140

Phe Val Gln Ile Asn Ser Arg Ser Thr Gln Gln Arg Phe Ser Leu Phe
145                 150                 155                 160

Ile Glu His Gly Lys Pro Ala Ala Ser Ser Ser Glu Gly Ser Phe Ser
                165                 170                 175

His Tyr Gly Leu Ser Pro Ser Ala Thr Val Pro Trp Phe
            180                 185
```

<210> 1732
<211> 187
<212> PRT
<213> Pseudomonas aeruginosa strain X9820

<400> 1732

```
Met Asp His Tyr Leu Asp Ile Arg Leu Arg Pro Asp Pro Glu Phe Pro
1               5                   10                  15

Pro Ala Gln Leu Met Ser Val Leu Phe Gly Lys Leu His Gln Ala Leu
            20                  25                  30

Val Ala Gln Gly Gly Asp Arg Ile Gly Val Ser Phe Pro Asp Leu Asp
        35                  40                  45

Glu Ser Arg Ser Arg Leu Gly Glu Arg Leu Arg Ile His Ala Ser Ala
    50                  55                  60

Asp Asp Leu Arg Ala Leu Leu Ala Arg Pro Trp Leu Glu Gly Leu Arg
65                  70                  75                  80

Asp His Leu Gln Phe Gly Glu Pro Ala Val Val Pro His Pro Thr Pro
                85                  90                  95

Tyr Arg Gln Val Ser Arg Val Gln Ala Lys Ser Asn Pro Glu Arg Leu
            100                 105                 110
```

Arg Arg Arg Leu Met Arg Arg His Asp Leu Ser Glu Glu Glu Ala Arg
        115   120   125

Lys Arg Ile Pro Asp Thr Val Ala Arg Thr Leu Asp Leu Pro Phe Val
    130   135   140

Thr Leu Arg Ser Gln Ser Thr Gly Gln His Phe Arg Leu Phe Ile Arg
145   150   155   160

His Gly Pro Leu Gln Ala Thr Ala Glu Glu Gly Gly Phe Thr Cys Tyr
                165   170   175

Gly Leu Ser Lys Gly Gly Ser Val Pro Trp Phe
            180   185

<210> 1733
<211> 341
<212> PRT
<213> Rhodanobacter sp. isolate FW106

<400> 1733

Met Thr Asn Glu Leu Lys Thr Ala Ser Val Leu Ala Phe Glu Arg Lys
1   5   10   15

Leu Asp Pro Ser Asp Ala Leu Leu Phe Ala Gly Asn Trp Ala Ala Arg
            20   25   30

Thr Glu Ser Gln Asp Trp Ala Pro Ile Thr Leu Arg Glu Lys Ser Val
        35   40   45

Arg Gly Thr Ile Ser Asn Arg Leu Lys Ala Gly Ala Gln Asp Pro Ala
    50   55   60

Lys Leu Asp Ala Ser Ile Gln Asn Pro Asn Leu Gln Thr Val Asp Val
65   70   75   80

Ala Ala Leu Pro Ala Asp Ala Asp Thr Leu Lys Val Gln Phe Thr Val
                85   90   95

```
Arg Val Leu Gly Gly Ala Gly Asn Pro Ser Ala Cys Asn Asp Ala Asp
            100                 105                 110

Tyr Arg His Lys Leu Leu Ala Thr Val Gly Asp Tyr Val Gln Gln His
        115                 120                 125

Gly Phe Val Glu Leu Ala Arg Arg Tyr Ala Ala Asn Leu Ala Asn Gly
    130                 135                 140

Arg Phe Leu Trp Arg Asn Arg Ile Gly Ala Glu Gln Val Glu Val Gln
145                 150                 155                 160

Ile Ala His Ile Gln Asp Gly Glu Ala Ala Ser Arg Trp Thr Phe Asn
                165                 170                 175

Ala Leu Ala His Ser Met Leu Asp Leu Ala Ala Ser Ala Asp Asp Thr
            180                 185                 190

Gln Ser Leu Ser Glu Leu Ala Thr Leu Ile Ala Ser Gly Leu Ala Gly
        195                 200                 205

Glu Ser His Val Leu Leu Gln Ile Met Ala Phe Val Arg Val Gly Ala
    210                 215                 220

Gly Gln Glu Val Phe Pro Ser Gln Glu Leu Ile Leu Asp Lys Gly Ser
225                 230                 235                 240

Ser Lys Lys Ser Lys Thr Leu Tyr Asp Val Gln Ser Val Ala Ala Ile
                245                 250                 255

His Ser Gln Lys Val Gly Asn Ala Leu Arg Thr Ile Asp Thr Trp Tyr
            260                 265                 270

Pro Asp Ala Ile Glu Asn Gly Pro Ile Ala Val Glu Pro Tyr Gly Ser
        275                 280                 285
```

```
Val Thr Thr Gln Gly Lys Ala Tyr Arg Gln Pro Lys Ala Lys Met Asp
    290                 295                 300

Phe Tyr Asn Leu Leu Asp Gly Trp Ile Ile Lys Asp Lys Val Pro Asp
305                 310                 315                 320

Val Asp Gln Gln His Phe Val Ile Ala Thr Leu Ile Arg Gly Gly Val
                325                 330                 335

Phe Gly Glu Ala Ser
            340
```

<210> 1734
<211> 341
<212> PRT
<213> Burkholderia plantarii strain PG1

<400> 1734

```
Met Ala Phe Met Ser Glu Lys Leu Thr Thr Ala Thr Val Leu Ala Phe
1               5                   10                  15

Glu Arg Lys Leu Asp Pro Ser Asp Ala Ile Phe His Ala Gly His Trp
            20                  25                  30

Asp Asp His Asp Lys Ala Ser Ala Trp Thr Pro Val Glu Ile Arg Glu
        35                  40                  45

Lys Ser Val Arg Gly Thr Ile Ser Asn Arg Leu Lys Thr Lys Glu Gln
    50                  55                  60

Asp Pro Ala Lys Leu Asp Ala Ala Ile Glu Lys Pro Asn Leu Gln Thr
65                  70                  75                  80

Val Asp Val Ala Thr Leu Pro Ser Asp Ala Asp Thr Leu Arg Val Gln
                85                  90                  95

Phe Thr Leu Arg Val Leu Ser Gly Ala Gly Thr Pro Ser Ala Cys Asn
            100                 105                 110
```

```
Ser Ala Ala Tyr Arg Ala Lys Leu Ser Ser Val Val Ser Ala Tyr Val
        115                 120                 125

Glu Gln His Gly Phe Ala Glu Leu Ala Asn Arg Tyr Ala Ala Asn Leu
    130                 135                 140

Ala Asn Gly Arg Phe Leu Trp Arg Asn Arg Ile Gly Ala Glu Ser Val
145                 150                 155                 160

Arg Val Glu Ile Ala Arg Leu Arg Lys Gly Ala Ala Glu Arg Thr Trp
                165                 170                 175

Thr Phe Asp Ala Leu Ser Leu Asn Leu Arg Ser Ile Glu Thr Pro Asp
            180                 185                 190

Ala Pro Leu Ala Glu Leu Gly Glu Leu Ile Ala Asp Gly Leu Ala Gly
        195                 200                 205

Arg Thr Asp Val Leu Leu Gln Val Thr Ala Tyr Val Arg Leu Gly Arg
    210                 215                 220

Gly Gln Glu Val Phe Pro Ser Gln Glu Leu Ile Leu Asp Lys Gly Ser
225                 230                 235                 240

Ser Arg Lys Ser Lys Thr Leu Tyr Gln Val Arg Asp Ile Ala Ala Ile
                245                 250                 255

His Ser Gln Lys Ile Gly Asn Ala Ile Arg Thr Ile Asp Ser Trp Tyr
            260                 265                 270

Glu Gly Ala Asp Glu Leu Gly Pro Ile Ala Val Glu Pro Tyr Gly Ser
        275                 280                 285

Val Thr Thr Gln Gly Lys Ala Tyr Arg Gln Pro Lys Gln Lys Gln Asp
    290                 295                 300

Phe Tyr Thr Leu Leu Asp Asp Trp Leu Leu Lys Asp Arg Ile Pro Pro
```

305 310 315 320

Val Glu Gln Gln His Phe Val Leu Ala Val Leu Ile Arg Gly Gly Val
325 330 335

Phe Gly Asp Ala Ser
340

<210> 1735
<211> 344
<212> PRT
<213> Idiomarina sp. H105

<400> 1735

Met Ala Lys Asn Asp Thr Leu Lys Thr Ala Ser Val Leu Ala Phe Glu
1 5 10 15

Arg Lys Leu Asp Pro Ser Asp Ala Leu Phe Arg Ala Gly Gln Trp Glu
20 25 30

Asp Arg Ser Gln Ala Ala Gln Trp Lys Leu Ile Pro Val Arg Glu Lys
35 40 45

Ser Val Arg Gly Thr Ile Ser Asn Arg Leu Lys Ala Lys Asp Gln Asp
50 55 60

Pro Ala Lys Val Asp Ala Lys Ile Glu Asp Pro Asn Leu Gln Thr Val
65 70 75 80

Asp Val Ala Thr Leu Pro His Asp Ala Asp Thr Leu Ala Val Arg Phe
85 90 95

Thr Leu Arg Val Leu Ala Gly Ala Gly Thr Pro Ser Ala Cys Asn Asn
100 105 110

Ala Glu Tyr Gln Lys Lys Leu Ala Gln Thr Val Ser Gly Tyr Val Ser
115 120 125

```
Glu His Gly Phe Asp Glu Leu Ala His Arg Tyr Ala Cys Asn Leu Ala
    130                 135                 140

Asn Gly Arg Phe Leu Trp Arg Asn Arg Ile Gly Ala Glu Glu Val Glu
145                 150                 155                 160

Val Val Val Ser Gln Met Lys Glu Gly Gln Pro Glu Lys Thr Trp Thr
                165                 170                 175

Phe Asp Ala Leu Glu Gln Ser Thr Arg Asp Phe Thr Gly Asn Ala Glu
            180                 185                 190

Thr Arg Glu Leu Gly Ala Val Ile Ala Gln Ala Leu Ala Gly Lys Gln
        195                 200                 205

Tyr Leu Leu Leu Asp Val Val Ala Phe Ala Arg Ile Gly Ala Gly Gln
    210                 215                 220

Glu Val Phe Pro Ser Gln Glu Leu Ile Leu Asp Arg Ser Arg Gly Asp
225                 230                 235                 240

Lys Ser Lys Thr Leu Tyr Ser Ile Gly Asp Glu Lys Gln Ala Ala Ile
                245                 250                 255

His Ser Gln Lys Leu Gly Asn Ala Leu Arg Thr Ile Asp Thr Trp Tyr
            260                 265                 270

Pro Ala Pro Glu Asp Gly Asp Thr Leu Gly Pro Ile Ala Val Glu Pro
        275                 280                 285

Tyr Gly Ser Val Thr Thr Gln Gly Thr Ala Tyr Arg Gln Pro Lys Gln
    290                 295                 300

Lys Val Asp Phe Tyr Asn Leu Leu Asp Asn Trp Leu Leu Lys Asp Gln
305                 310                 315                 320

Val Pro Pro Val Glu Gln Gln His Phe Val Met Ala Thr Leu Ile Arg
                325                 330                 335
```

```
Gly Gly Val Phe Gly Glu Ala Gly
            340


<210>  1736
<211>  342
<212>  PRT
<213>  Pseudomonas aeruginosa strain X9820

<400>  1736

Met Ser Lys Pro Ile Leu Ser Thr Ala Ser Val Leu Ala Phe Glu Arg
1               5                   10                  15


Lys Leu Asp Pro Ser Asp Ala Leu Met Ser Ala Gly Ala Trp Ala Gln
            20                  25                  30


Arg Asp Ala Ser Gln Glu Trp Pro Ala Val Thr Val Arg Glu Lys Ser
        35                  40                  45


Val Arg Gly Thr Ile Ser Asn Arg Leu Lys Thr Lys Asp Arg Asp Pro
    50                  55                  60


Ala Lys Leu Asp Ala Ser Ile Gln Ser Pro Asn Leu Gln Thr Val Asp
65                  70                  75                  80


Val Ala Asn Leu Pro Ser Asp Ala Asp Thr Leu Lys Val Arg Phe Thr
                85                  90                  95


Leu Arg Val Leu Gly Gly Ala Gly Thr Pro Ser Ala Cys Asn Asp Ala
            100                 105                 110


Ala Tyr Arg Asp Lys Leu Leu Gln Thr Val Ala Thr Tyr Val Asn Glu
        115                 120                 125


Gln Gly Phe Ala Glu Leu Ala Arg Arg Tyr Ala His Asn Leu Ala Asn
    130                 135                 140


Ala Arg Phe Leu Trp Arg Asn Arg Val Gly Ala Glu Ala Val Glu Val
```

```
145                 150                 155                 160

Arg Ile Asn His Ile Arg Gln Gly Glu Val Ala Arg Ala Trp Arg Phe
                165                 170                 175

Asp Ala Leu Ala Ile Gly Leu Arg Asp Phe Lys Ala Asp Ala Glu Leu
            180                 185                 190

Asp Ala Leu Ala Glu Leu Ile Ala Ser Gly Leu Ser Gly Ser Gly His
        195                 200                 205

Val Leu Leu Glu Val Val Ala Phe Ala Arg Ile Gly Asp Gly Gln Glu
    210                 215                 220

Val Phe Pro Ser Gln Glu Leu Ile Leu Asp Lys Gly Asp Lys Lys Gly
225                 230                 235                 240

Gln Lys Ser Lys Thr Leu Tyr Ser Val Arg Asp Ala Ala Ala Ile His
                245                 250                 255

Ser Gln Lys Ile Gly Asn Ala Leu Arg Thr Ile Asp Thr Trp Tyr Pro
            260                 265                 270

Asp Glu Asp Gly Leu Gly Pro Ile Ala Val Glu Pro Tyr Gly Ser Val
        275                 280                 285

Thr Ser Gln Gly Lys Ala Tyr Arg Gln Pro Lys Gln Lys Leu Asp Phe
    290                 295                 300

Tyr Thr Leu Leu Asp Asn Trp Val Leu Arg Asp Glu Ala Pro Ala Val
305                 310                 315                 320

Glu Gln Gln His Tyr Val Ile Ala Asn Leu Ile Arg Gly Gly Val Phe
                325                 330                 335

Gly Glu Ala Glu Glu Lys
            340
```

<210> 1737
<211> 457
<212> PRT
<213> Rhodanobacter sp. isolate FW106

<400> 1737

```
Met Ser Glu Leu Thr Asp Arg Gly Lys Thr Phe Arg Ala Ala Ile Ala
1               5                   10                  15


Gly Phe Ile Glu Ala Arg Arg Glu Ala Lys Leu Lys Ser Lys Ala Asp
            20                  25                  30


Asp Ala Asp Thr Ala Ser Lys Tyr Asp Tyr Ala Thr Trp Leu Ala Asp
        35                  40                  45


Ala Ala Arg Arg Val Gly Gln Ile Gln Ala Val Thr His Val Leu Lys
    50                  55                  60


Ala Thr His Pro Asp Ala Arg Gly Ser Ser Leu His Val Ala Pro Ser
65                  70                  75                  80


Gln Leu Pro Gln His Val Glu Ile Gly Ser His Leu Leu Gly Ser Asp
                85                  90                  95


Tyr Ala Glu Asp Val Val Gly Asn Ala Ala Ala Leu Asp Val Phe Lys
            100                 105                 110


Leu Leu Lys Leu Asp Val Asp Gly Arg Arg Leu Leu Asp Trp Ala Gln
        115                 120                 125


Ala Gly Asp Ala Asp Leu Gln Ala Ala Leu Ser Asp Ala Ala Glu Gln
    130                 135                 140


Ala Gln Gly Trp Met Gln Ala Phe Thr Ser Leu Val Arg Glu Glu Thr
145                 150                 155                 160


Gln Pro Thr Ser His Pro Met Ala Lys Gln Leu Tyr Trp Leu Ala Gly
                165                 170                 175
```

```
Glu Asn Pro Gln Asp Asp Ala Gln Tyr His Leu Leu Gln Pro Met Phe
            180                 185                 190

Ser Ser Thr Leu Ala His Ala Val His Ala Asp Ile Gln Ala Ala Arg
        195                 200                 205

Phe Gly Glu Ile Asn Lys Glu Ala Arg Gln Ala Arg Arg Asp Asn Lys
    210                 215                 220

Pro Gly Glu His Pro Tyr Arg Asp Tyr Arg Gly Leu Val Ala Arg Lys
225                 230                 235                 240

Leu Gly Gly Thr Lys Pro Gln Asn Ile Ser Gln Leu Asn Ser Glu Arg
                245                 250                 255

Gly Gly Val Asn Tyr Leu Phe Ala Ser Leu Pro Pro Pro Ala Trp Ala
            260                 265                 270

Pro Arg Gln Gly Pro Asp Leu Arg Lys Leu Asp Ser Val Phe Asp Gln
        275                 280                 285

Ile Arg Gly Ala Leu Phe Trp Phe Gly Glu Val Arg Glu His Leu Gln
    290                 295                 300

Val Leu Ala Asp Phe Leu Lys Thr Asn Pro Asp Gln Asn Lys Glu Thr
305                 310                 315                 320

Arg Asp Arg Val Ala Ala Ser Val Gln Ala Ile Gly Gln Glu Leu Ala
                325                 330                 335

Met Phe Gly Thr Ala Val Gln Gly Arg Tyr Pro Ala Gly Trp Thr Arg
            340                 345                 350

Asp Ala Asp Cys Arg Leu Pro Arg Cys Glu Gln Leu Trp Leu Asp Pro
        355                 360                 365
```

```
Asp Arg Thr Glu Leu Pro Leu Arg Glu Asp Ala Asp Tyr Pro Gln Trp
    370                 375                 380

His Glu Asp Asp Val Thr Phe Gln Gln Ala Tyr Asp Arg Gly Asp Trp
385                 390                 395                 400

Ala Asp Glu Val Ala Thr Arg Phe Gly Leu Trp Leu Asn Gly Gln Leu
                405                 410                 415

Arg Lys Arg Ser Asp Glu Leu Ala Val Leu Gly Glu Ser Glu Met Arg
            420                 425                 430

His Phe Ala Arg Gln Ala Ile Leu Asp Val Ala Trp Pro Ile Pro Leu
        435                 440                 445

Gln Arg Arg Ala Lys Ala Gly Ala Ala
    450                 455
```

<210> 1738
<211> 457
<212> PRT
<213> Burkholderia plantarii strain PG1

<400> 1738

```
Met Ser Asp Ser Pro Ala Ala Pro Gly Asn Ser Ser Phe Arg Ala Ala
1               5                   10                  15

Val Asp Ala Phe Leu Arg Ala Arg Leu Gln Ala Lys Leu Asp Lys Leu
            20                  25                  30

Pro Glu Asp Asp Pro Lys Arg Ala Gly Leu Ile Ala Glu His Gln Arg
        35                  40                  45

Thr Ala Trp Ile Pro Asp Ala Ala Arg Arg Val Arg Gln Ile Gln Ala
    50                  55                  60

Val Thr His Ser Leu Lys Pro Ile His Pro Asp Ala Arg Gly Thr Asn
65                  70                  75                  80
```

```
Leu His Val Ala Pro Ser Asp Leu Pro Thr Leu Thr Asp Leu Gly Ser
                85                  90                  95

His Ala Leu Gly Gly Arg Phe Ala Leu Asp Val Val Gly Asn Ala Ala
            100                 105                 110

Ala Leu Asp Val Val Lys Leu Leu Lys Val Glu His Asp Gly Arg Thr
        115                 120                 125

Leu Leu Glu Ala Leu Gln Ala Asp Asp Ala Gly Ala Leu His Ser Leu
    130                 135                 140

Ala Asp Asp Ala Gly Glu Ala Ala Ala Leu Arg Asp Ala Phe Leu Asn
145                 150                 155                 160

Leu Thr Glu Ala Arg Asp Gly Ala Ala Ser Ser His Val Leu Ala Lys
                165                 170                 175

Gln Val Tyr Trp Leu Thr Gly Asp Asp Pro Ser Asp Asp Ala Gln Tyr
            180                 185                 190

His Leu Leu Ala Pro Leu Tyr Pro Thr Ser Leu Val Gln Ala Val Tyr
        195                 200                 205

Asp Asp Val His Asp Ala Arg Phe Gly Glu Ala Asn Lys Leu Ala Arg
    210                 215                 220

Gln Ala Arg Arg Glu Gly Ala Pro Phe Asp Gly Val Tyr Arg Glu Tyr
225                 230                 235                 240

Arg Asp Leu Ala Val Gln Lys Leu Gly Gly Thr Lys Pro Gln Asn Ile
                245                 250                 255

Ser Gln Leu Asn Ser Glu Arg Gly Gly Asn Asn Tyr Leu Leu Ser Ser
            260                 265                 270

Leu Gln Pro Val Trp Asp Ser Arg Leu Asn His Leu Pro Ala His Thr
```

```
        275                 280                 285

Asp Ser Ile Phe Asp Arg Pro Phe Thr Gly Arg Pro Glu Val Arg Arg
    290                 295                 300

Thr Leu Asn Ala Leu Arg Thr Phe Leu Ser Gly Asp Pro Ser Ala Asn
305                 310                 315                 320

Leu Asp Thr Arg Thr Arg Arg Asp Ala Leu Arg Asp Arg Leu Ile Asp
                325                 330                 335

Glu Leu Val Ser Tyr Ala Gly Glu Leu Leu Arg His Pro Ala Gly Trp
            340                 345                 350

Thr Arg Glu Ala Pro Phe Ala Asp Leu Asn Asp Asp Glu Lys Leu Trp
        355                 360                 365

Leu Asp Pro Leu Arg Ala Glu Leu Pro Glu Glu Arg Glu Phe Ala Val
    370                 375                 380

Arg Trp Leu Ala Met Glu Trp Pro Glu Arg Ile Gly Ala Arg Phe Gly
385                 390                 395                 400

Lys Trp Leu Asn Ala Gln Leu Arg His Glu Leu Pro Asp Val Gly Tyr
                405                 410                 415

His Glu Ala Arg Glu Trp Gln Arg Ala Leu Leu Gly Asp Asp Ser Ser
            420                 425                 430

Trp Gln Glu Gln Leu Arg Arg Met Arg Asp Ala Leu Asp His Val His
        435                 440                 445

Leu Ser His Val Ser Thr Glu Gly Ala
    450                 455


<210>  1739
<211>  448
<212>  PRT
```

<213> Idiomarina sp. H105

<400> 1739

```
Met Thr Glu Pro Pro His Gln Ser Leu Ser Leu Lys Glu Leu Ile His
1               5                  10                  15


Asp Phe Ile Gln Gln Arg Phe Ala Thr Lys Thr Glu Lys Leu Ala Lys
            20                  25                  30


Asp Asp Pro Ala Tyr Leu Lys Phe Gln Glu Gln Phe Ala Pro Gln Thr
        35                  40                  45


Trp Leu Ala Asp Ala Ala Arg Arg Val Ser Gln Leu Gln Val Val Thr
    50                  55                  60


His Ser Leu Lys Pro Ile His Pro Asp Ala Lys Gly Thr Asn Leu Tyr
65                  70                  75                  80


Val Glu Pro Arg Thr Leu Asp Gln Gly Asp Leu Val Gly Ser His Cys
                85                  90                  95


Leu Pro Asp Asp Phe Gln Gly Asp Val Val Gly Asn Ala Ala Ala Leu
            100                 105                 110


Asp Val Tyr Lys Phe Leu Lys Leu Glu Trp Gln Gly Arg Ser Leu Leu
        115                 120                 125


Glu Leu Ala Leu Glu Asn Asp Asp Thr Phe Ile Asp Ala Leu Ser Lys
    130                 135                 140


Asn Pro Glu Glu Ala Gln Ala Trp Val Ser Ala Phe Ala Ser Ile Val
145                 150                 155                 160


Glu Pro Lys Gly Ala Pro Ser Ser His Thr Arg Gly Lys Gln Met Tyr
                165                 170                 175


Trp Leu Val Gly Asp Asp Pro Thr Asp Asp Ala Ser Tyr His Leu Leu
            180                 185                 190
```

```
Ala Pro Leu Tyr Ala Thr Ala Leu Thr His Pro Phe His Ala Arg Leu
        195                 200                 205

Ser Glu Ala Arg Phe Gly Glu His Ala Lys Ala Gly Arg Lys Ala Arg
    210                 215                 220

Arg Glu Asn Val Ala Phe Glu Gly Val Tyr Ser Asp Tyr Leu Asn Leu
225                 230                 235                 240

Ala Val Gln Lys Leu Gly Gly Thr Lys Pro Gln Asn Ile Ser Gln Leu
                245                 250                 255

Asn Ser Glu Arg Gly Gly Gln Asn Tyr Leu Leu Ala Ser Leu Pro Pro
            260                 265                 270

His Trp Gln Ser His Asp Ile Tyr Pro Pro Met Arg Asp Ala Phe Arg
        275                 280                 285

Ala Phe Lys Arg Arg Pro Thr Val Trp Lys Thr Val His Glu Leu Lys
    290                 295                 300

Arg Phe Leu Glu Thr Asp Pro Ala Lys Asn Met His Thr Arg Asp Leu
305                 310                 315                 320

Arg Asp Asp Phe Ile Thr Met Leu Val Asp Glu Leu Met Leu Phe Thr
                325                 330                 335

Phe Asp Met His Ser Leu Ala Pro Gly Trp Thr Ala Asp Asp Lys Cys
            340                 345                 350

Glu Leu Gly Pro Glu Glu Gln Tyr Trp Leu Asp Pro Gly Arg Ala Leu
        355                 360                 365

Gln Asp Ser Glu Phe Asp Gln Ala Arg Arg Arg Ser Pro Trp His Glu
    370                 375                 380
```

```
Ala Ile Ser Asp Arg Ala Ala Ala Trp Leu Asn Arg Gln Leu Asn Tyr
385                 390                 395                 400


Lys Ser Ala Leu Ser Val Gly Asp Leu Glu His Asp His Trp Gln Arg
                405                 410                 415


Gln Ile Glu Ala Val Leu Lys Asn Phe Arg Arg Gln Leu Asp Asp Leu
            420                 425                 430


Gln Asp Ala Leu Arg Asp Asp Asp Glu Ser Phe Gln Gly Glu Ser Ala
        435                 440                 445


<210>  1740
<211>  433
<212>  PRT
<213>  Pseudomonas aeruginosa strain X9820

<400>  1740

Met Ser Glu Arg Pro Asn Gly Asp Ser Pro Thr Leu Arg Gln Leu Ile
1               5                   10                  15


Glu Ser Phe Ile Gln Glu Arg Leu Gln Gly Lys Leu Asp Lys Leu Lys
            20                  25                  30


Pro Asp Glu Asp Val Lys Arg Gln Ser Leu Leu Ala Gly His Arg Arg
        35                  40                  45


Glu Ala Trp Leu Ala Asp Ala Ala Arg Arg Val Gly Gln Leu Gln Leu
    50                  55                  60


Val Thr His Thr Leu Lys Pro Ile His Pro Asp Ala Arg Gly Ser Asn
65                  70                  75                  80


Leu His Ser Leu Pro Gln Ala Pro Gly Gln Pro Gly Leu Ala Gly Ser
                85                  90                  95


His Glu Leu Gly Asp Lys Leu Val Ser Asp Val Val Gly Asn Ala Ala
            100                 105                 110
```

```
Ala Leu Asp Val Phe Lys Phe Leu Ser Leu Gln Tyr Gln Gly Lys Asn
        115                 120                 125

Leu Leu Asn Trp Leu Thr Glu Asp Ser Ala Glu Ala Val Gln Ala Leu
    130                 135                 140

Ser Asp Asn Ala Glu Gln Ala Arg Glu Trp Arg Gln Ala Phe Ile Gly
145                 150                 155                 160

Ile Thr Ala Val Lys Gly Ala Pro Ala Ser His Ser Leu Ala Lys Gln
                165                 170                 175

Leu Tyr Phe Pro Leu Pro Gly Ser Gly Tyr His Leu Leu Ala Pro Leu
            180                 185                 190

Phe Pro Thr Ser Leu Val His His Val His Gly Leu Leu Arg Glu Ala
        195                 200                 205

Arg Phe Gly Glu Ala Ala Arg Ala Ala Arg Glu Ala Arg Ser Arg Gln
    210                 215                 220

Glu Ser Trp Pro His Gly Phe Ser Glu Tyr Pro Asn Leu Ala Ile Gln
225                 230                 235                 240

Lys Phe Gly Gly Thr Lys Pro Gln Asn Ile Ser Gln Leu Asn Ser Glu
                245                 250                 255

Arg Tyr Gly Glu Asn Trp Leu Leu Pro Ser Leu Pro Pro His Trp Gln
            260                 265                 270

Arg Gln Asp Gln Arg Ala Pro Ile Arg His Ser Ser Val Phe Glu His
        275                 280                 285

Asp Phe Gly Arg Ser Pro Glu Val Ser Arg Leu Thr Arg Thr Leu Gln
    290                 295                 300

Arg Leu Leu Ala Lys Thr Arg His Asn Asn Phe Thr Ile Arg Lys Tyr
```

305 310 315 320

Arg Ala Gln Leu Val Gly Gln Ile Cys Asp Glu Ala Leu Gln Tyr Ala
325 330 335

Ala Arg Leu Arg Glu Leu Glu Pro Gly Trp Ser Ala Thr Pro Gly Cys
340 345 350

Gln Leu His Asp Ala Glu Gln Leu Trp Leu Asp Pro Leu Arg Ala Gln
355 360 365

Thr Asp Glu Thr Phe Leu Gln Arg Arg Leu Arg Gly Asp Trp Pro Ala
370 375 380

Glu Val Gly Asn Arg Phe Ala Asn Trp Leu Asn Arg Ala Val Ser Ser
385 390 395 400

Asp Ser Gln Ile Leu Gly Ser Pro Glu Ala Ala Gln Trp Ser Gln Glu
405 410 415

Leu Ser Lys Glu Leu Thr Met Phe Lys Glu Ile Leu Glu Asp Glu Arg
420 425 430

Asp

<210> 1741
<211> 324
<212> PRT
<213> Rhodanobacter sp. isolate FW106

<400> 1741

Met Asn Ala Cys Pro Asn Phe Thr His Leu Leu Val Leu Pro His Leu
1 5 10 15

Lys Val His Asn Ala Asn Ala Ile Ser Ser Pro Leu Thr His Gly Phe
20 25 30

```
Pro Ser Ile Thr Ala Phe Leu Gly Leu Met Trp Ala Leu Glu Arg Lys
        35                  40                  45

Thr Arg Ala Ala Gly Leu Asp Leu Glu Phe Gly Ala Val Gly Val Val
    50                  55                  60

Cys His Ser His Gln Glu Gln Thr Thr Glu Ser Gly Phe Val Lys Ala
65                  70                  75                  80

Phe Arg Leu Thr Arg Asn Ala Val Gly Lys Asp Gly Lys Thr Ala Ala
                85                  90                  95

Ile Val Glu Glu Gly Arg Ile His Leu Asp Leu Ser Leu Val Leu Ala
            100                 105                 110

Val His Ala Gly Pro Trp Asp Gln Asp Ala Gln Arg Arg Asp Leu Lys
        115                 120                 125

Thr Ile Ala Asp Leu Leu Gln Gly Met Arg Ile Ala Gly Gly Thr Leu
    130                 135                 140

Leu Pro Ala Pro Gln Thr Gln Thr Ser Arg His Arg Pro Trp Leu Ala
145                 150                 155                 160

Asp Leu Thr Gly Asn Ser Asp Asp Gln Ala Asn Ala Phe Arg Lys Leu
                165                 170                 175

Arg Ala Arg Leu Leu Pro Gly Ser Ala Leu Val Ala Arg Asp Asp Leu
            180                 185                 190

Ile Asp Gln Arg Leu Arg Val Leu Gln Ala Gly Thr Pro Glu Pro Thr
        195                 200                 205

Arg Leu Asp Ala Trp Leu Ser Leu Cys Arg Ile Asn Trp Tyr Tyr Asp
    210                 215                 220

Met Gln Ala Glu Gly Gly Thr Gly Ala Trp Gln Asn Asp Arg Thr Lys
225                 230                 235                 240
```

```
Gly Ser Gly Trp Val Val Pro Ile Pro Val Gly Tyr Gly Ala Leu Gly
                245                 250                 255


Asp Leu His Glu Ala Gly Ser Val Pro Asn Ala Arg Asp Ala Ser Thr
            260                 265                 270


Pro Phe Arg Phe Val Glu Ser Leu Tyr Ser Met Gly Glu Trp Ile Gly
        275                 280                 285


Pro His Arg Leu His Ser Pro Gln Asp Leu Leu Trp Tyr Ala Asp Ser
    290                 295                 300


His Pro Asp Asp Gly Leu Tyr Arg Cys Arg Asn Asp Tyr His Thr Val
305                 310                 315                 320


Asn Thr Asn Leu
```

<210> 1742
<211> 349
<212> PRT
<213> Burkholderia plantarii strain PG1

<400> 1742

```
Met Ser Asp Ile Glu Ala Leu Leu Val Leu Pro His Leu Gln Ile Gln
1               5                   10                  15


Asn Ala Asn Ala Ile Ser Ser Pro Leu Thr His Gly Phe Pro Ser Ile
            20                  25                  30


Thr Ala Met Thr Gly Leu Met Trp Ala Leu Gln Arg Lys Leu Ala Gly
        35                  40                  45


Ala Gly Ile Pro Leu Lys Leu Arg Arg Val Gly Val Ile Cys His Asp
    50                  55                  60


Phe Asp Glu Gln Val Gln Asp Gly Tyr Val Lys Thr Phe Arg Leu Thr
```

```
65                  70                  75                  80

Arg Asn Pro Val Asp Lys Asp Gly Ala Thr Ala Ala Ile Val Glu Gln
                85                  90                  95

Gly Arg Met His Leu Asp Leu Thr Leu Leu Phe Asp Val Val Asp Ala
            100                 105                 110

Gly Thr Ala Gly Asp Ala Pro Ser Ser Gly Leu Arg Asp Asp Thr Gly
        115                 120                 125

Arg Asn Glu Trp Ala Thr Arg Ile Gly Glu Ile Val Ala Gly Met Arg
    130                 135                 140

Val Ala Gly Gly Ser Val Leu Pro Gly Arg Ala Ile Pro Gly Arg Arg
145                 150                 155                 160

Thr Arg Pro Trp Ile Ala Thr Leu Pro Asp Asp Tyr Glu Glu Gln Leu
                165                 170                 175

Arg Leu Phe Ala Arg Trp Arg Arg Gln Trp Leu Pro Gly Tyr Ala Leu
            180                 185                 190

Val Gly Arg Asp Asp Leu Leu Ala Glu Arg His Arg Leu Leu Arg Glu
        195                 200                 205

Gln Gly Asp Asp Ala Ser Leu Leu Asp Ala Trp Leu His Ala Ala Arg
    210                 215                 220

Phe Asn His Gln Pro Leu Pro Asp Glu Ser Ala Gly Ser Gly Ala Asp
225                 230                 235                 240

Ala Ala Lys Arg Leu Arg Trp Gly Asp Pro Leu Arg Pro Arg Gly Ser
                245                 250                 255

Gly Trp Ile Val Pro Ile Pro Val Gly Tyr Thr Ala Leu Thr Lys Pro
            260                 265                 270
```

```
His Ala Pro Gly Ala Val Ala Asn Thr Arg Asp Ala Ala Thr Pro Phe
        275                 280                 285

Val Trp Val Glu Ser Ile Tyr Ser Leu Gly Gln Trp Ile Ser Pro His
    290                 295                 300

Arg Val Thr His Trp His Glu Leu Leu Trp Gln Pro Glu Thr Asp Gly
305                 310                 315                 320

Lys Ala Gly Leu Tyr Arg Cys Arg Ser Gly Tyr Gln Gly Pro Ala Gly
                325                 330                 335

Ala Asn Glu Pro Gly Asp Asp Asp Leu Pro Asp Phe Asp
            340                 345
```

<210> 1743
<211> 327
<212> PRT
<213> Idiomarina sp. H105

<400> 1743

```
Met Ile Asn His Leu Leu Val Leu Pro Arg Leu Arg Ile Gln Asn Ala
1               5                   10                  15

Asn Thr Ile Ser Ser Pro Met Thr Trp Gly Phe Pro Ser Met Ser Ala
            20                  25                  30

Phe Val Gly Val Gln Gln Val Leu Glu Arg Asn Leu Pro Asp Asp Ile
        35                  40                  45

Lys Leu Val Phe Asn Glu Ile Gly Val Val Cys His His Ile Asp Pro
    50                  55                  60

Gln Val Thr Glu Gly Gly Phe Ile Lys Ala Phe His Leu Thr Arg Asn
65                  70                  75                  80

Pro Val Asp Lys Ser Gly Gly Thr Ala Ala Ile Val Glu Glu Gly Arg
                85                  90                  95
```

```
Ala His Leu Glu Ile Ser Leu Leu Ile Gly Val Glu Ser Asp Gly Asp
            100                 105                 110

Asp Leu Gly Ser Pro Glu Arg Cys Arg Val Ile Ala Gln Thr Leu Phe
        115                 120                 125

Asp Gln Val Gln Gly Met Arg Ile Ala Gly Gly Ser Val Ile Pro Ala
    130                 135                 140

Leu Asn Ala Gln Gln Arg Tyr Arg Pro Glu Leu Val Ser Phe Asp Val
145                 150                 155                 160

Asn Glu Ser Glu Arg Ala Lys Gln Trp Gln Arg Leu Lys Arg Arg Leu
                165                 170                 175

Leu Pro Gly Phe Ala Leu Val Leu Arg Asp Asp Leu Leu Thr Lys His
            180                 185                 190

Thr Ala Thr Leu Lys Ala Gln Asn Ser Ser Ala Thr Ala Leu Asp Ala
        195                 200                 205

Trp Leu Asp Leu Ser Arg Leu Asn His Glu Cys His Val Glu Gln Val
    210                 215                 220

Lys Asp Glu Lys Asp Gly Lys Glu Lys Glu Val Val Gln Trp Ser Ile
225                 230                 235                 240

Arg Arg Pro Tyr Pro Gly Trp Leu Val Pro Ile Pro Val Gly Tyr Gly
                245                 250                 255

Ala Ile Ser Asp Leu Tyr Ala Pro Gly Asp Val Ala Asn Ala Arg Asn
            260                 265                 270

Ala Glu Val Pro Phe Arg Phe Val Glu Ser Leu Tyr Ser Met Gly Glu
        275                 280                 285
```

```
Trp Val Ser Pro His Arg Phe Gln Lys Pro Asp Asp Leu Met Trp Phe
    290                 295                 300

Val Glu Asn Asp Leu Asp Arg Gly Ile Tyr Arg Leu Gln Asn Asp Tyr
305                 310                 315                 320

Ala Asn Thr Leu Thr Glu Asp
                325
```

<210> 1744
<211> 327
<212> PRT
<213> Pseudomonas aeruginosa strain X9820

<400> 1744

```
Met Ser Val Thr Asp Pro Glu Ala Leu Leu Leu Leu Pro Arg Leu Ser
1               5                   10                  15

Ile Gln Asn Ala Asn Ala Ile Ser Ser Pro Leu Thr Trp Gly Phe Pro
            20                  25                  30

Ser Pro Gly Ala Phe Thr Gly Phe Val His Ala Leu Gln Arg Arg Val
        35                  40                  45

Gly Ile Ser Leu Asp Ile Glu Leu Asp Gly Val Gly Ile Val Cys His
    50                  55                  60

Arg Phe Glu Ala Gln Ile Ser Gln Pro Ala Gly Lys Arg Thr Lys Val
65                  70                  75                  80

Phe Asn Leu Thr Arg Asn Pro Leu Asn Arg Asp Gly Ser Thr Ala Ala
                85                  90                  95

Ile Val Glu Glu Gly Arg Thr His Leu Glu Val Ser Leu Leu Leu Gly
            100                 105                 110

Val His Gly Asp Gly Leu Asp Asp His Pro Ala Gln Glu Ile Ala Arg
        115                 120                 125
```

```
Gln Val Gln Glu Gln Ala Gly Ala Met Arg Leu Ala Gly Gly Ser Ile
    130                 135                 140

Leu Pro Trp Cys Asn Glu Arg Phe Pro Ala Pro Asn Ala Glu Leu Leu
145                 150                 155                 160

Met Leu Gly Gly Ser Asp Glu Gln Arg Arg Lys Asn Gln Arg Arg Leu
                165                 170                 175

Thr Arg Arg Leu Leu Pro Gly Phe Ala Leu Val Ser Arg Glu Ala Leu
            180                 185                 190

Leu Gln Gln His Leu Glu Thr Leu Arg Thr Thr Leu Pro Glu Ala Thr
        195                 200                 205

Thr Leu Asp Ala Leu Leu Asp Leu Cys Arg Ile Asn Phe Glu Pro Pro
    210                 215                 220

Ala Thr Ser Ser Glu Glu Glu Ala Ser Pro Pro Asp Ala Ala Trp Gln
225                 230                 235                 240

Val Arg Asp Lys Pro Gly Trp Leu Val Pro Ile Pro Ala Gly Tyr Asn
                245                 250                 255

Ala Leu Ser Pro Leu Tyr Leu Pro Gly Glu Val Arg Asn Ala Arg Asp
            260                 265                 270

Arg Glu Thr Pro Leu Arg Phe Val Glu Asn Leu Phe Gly Leu Gly Glu
        275                 280                 285

Trp Leu Ser Pro His Arg Val Ala Thr Leu Ser Asp Leu Leu Trp Tyr
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<210> 1767
<211> 690
<212> DNA
<213> Vibrio cholerae strain 4874

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tctgaatttg aattgggttg ttatgcctaa 690

<210> 1768
<211> 1812
<212> DNA
<213> Vibrio cholerae strain 4874

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agtaaagcca aagtaccaac attcgttgat gctttgatgg aacaagctgt agacagagtt 420

atctctggga gaaaagtgcg tataagaagt gcctacaggc gcgtgcgaag gaaattacgt 480

cagcataatc tgaacaatgg aacgaagtac aaatacccaa cttatgaatc tcttcggaaa 540

cgggttaaaa agaagactcc tttcgaatta ctggctgcga agaagggcga gcgagtcgcg 600

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gaaatagatc atacggtagt ggatctcttt gctgtacatg aagaacatcg cgtgccattg 720

ggccgacctt ggcttactca attagttgat tgttacagca aagcagttat tggtttttac 780

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gtcccatccc agaaacatga agacgaaatt gtaattgttg ataatgaaga ttgggatatt 1800

gattatgttt aa 1812

<210> 1769
<211> 990
<212> DNA
<213> Vibrio cholerae strain 4874

<400> 1769
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gaagaaaggt caaatcgggt tctcacgcaa gtaggtaact ggctaaaaat gatactcaac 480

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aactcgcaac ttcatggacg attttccatt cagttcgaac tgagaccctt cagttaccag 600

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aacatgcgct cattgagaaa cctcatttat caagcatcta ttgaagcaat tgataatcag 780

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ccgccaccaa aggatattgg gtgggaggat tattatcata acgttaaacc caaaaaccaa 960

agacgcaagg gtagtaatat gtttgaataa 990

<210> 1770
<211> 1194
<212> DNA
<213> Vibrio cholerae strain 4874

<400> 1770
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aaacactatt tgtgtgatgg ggattctgaa aaattttcct cattccccac tgatatccgt 180

cgaataaacc catattcctc aaaacatagt tcagctgcta gaagtcatgc tcttcataag 240

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ccacttaaat attccccctc agtaacagca gttatccgtg gtcacgaggt tttccctcgc 360

tctttactaa ggaccaatat cataccggta tgccctgttt gccttcagga aaatggttac 420

gccagctatt tatggcattt tgaaggttat gactactgcc atattcacga tctcgctcta 480

acgtataact gtcaatgtgg caaaccttgc gactaccgag taagcggttt acaactagtt 540

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gatatttctc actggctagc aggcgaaacc ataaaatggt taccagcagt tcccgtaagt 660

tatcgttggg ggctagttca ttggtggatg aataataaaa aatcaaaaga actggaaaca 720

gagagcttca cgatttttg gaaaaattgg cccaattcct ttcataacct aattcaagaa 780

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<210> 1771
<211> 1971
<212> DNA
<213> Vibrio cholerae strain 4874

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tccccactga ttgatatcac taacaatccg atgacggcat tgactatctt agtcaatctg 180

acagagaaag ggatatccaa caaaaatctt cttgataaag agcgttgtaa agaaaaactg 240

agggatgaca aatggtgggc tgcagtctta aaaccagccc aataccgtca cagccataat 300

gttaaatttc ctgatattcg ttctacaggc acaattcgaa cagtagcacc tgataacctt 360

ccggcttatt tcatcacgtc gagcaaactg cctaacgtag gatggactta ctcaaaggat 420

tcctctgata tcaatcgctg tctgtttttt acctctgaat ttttatgggc tggacaacca 480

tgctgtttag ccagagcgtt aacggatagt gaacacccac tttggagtac actcaaaaaa 540

cttgggtgtt atgagaaaaa taaaaaactg gcagcaaagc tgctttctca aatccccggc 600

gaactcattg atgttgattt aaccggtaat tacctcagcc aagtttcttt tccggatggt 660

cgggatagtt atctgtcttt ctctcccgtc gcatctcaag ctatgcaaag ttgtgtttat 720

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<210> 1772
<211> 1038
<212> DNA
<213> Vibrio cholerae strain 4874

<400> 1772
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caacacgtag ggttagaaga actgataatc aagtacctga ctaatattgc actaggcacc 420

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tgggaaggtg agacaatcat cattgatgat atacgcaaat atctcaaggg cgatagagcg 540

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agtattttaa agcgaataga cgaattggtt gatcgactaa aagatgccaa agagttaagt 960

caagacgaac tcaaagatat gcatttcctt atggctaatc taatcaaagg tgggctattt 1020

caggaaaaag gggaatga 1038

<210> 1773

<211> 594
<212> DNA
<213> Vibrio cholerae strain 4874

<400> 1773
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ggagtgtctt ttcctgagtg gggagaagag accatcggtg acaaaattag ttttatctca 180

cccaaccagc tcgaactgga ctttttactt caacaaacct atttttctga aatgacagcg 240

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aggctaaatt tgcaatatca acgactagat acagttccag atggacaatg ggcattttca 540

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<210> 1774
<211> 28
<212> DNA
<213> Vibrio cholerae strain 4874

<400> 1774
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<210> 1775
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<212> DNA
<213> Vibrio cholerae strain 4874

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agaaccactt caaaattaga aaacatataa tcattacagt tccgataacc ttgcatcagt 240

cacggacact nnnnnnnnnn cttagcactg acgtaacggt gtatgttttt cccacgcgac 300

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gaaggagaag gtagagcaga cataatattg cctcttcacg attttgtcgt aaacttacat 420

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<211> 687
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

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gattttaata aaaatatctc tcgattttgc tcacaaccta ttagatatag ttatgtcatt 240

gatggaatta ttcgtactta tgttcctgac tttttatgcg aattttattg tggtgagatg 300

gttctatacg aagttaaggc accaaatgct gttaattcaa aacgttttac taaagagttt 360

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cacgatatta gacatattcc tcttcttaaa aacttaaaac gtatgcacag atatgcatct 480

cattctgaat taacttatga gcaaacaact attcttaagt atttgaataa acatggctca 540

acaaagctag aaacaataat tgatcatttt agtaatagta aaaatataat tccgatgatt 600

tatgatttat tgtctaagta cttgataaat actgacctta gagttcttct gaataaccaa 660

actgaattaa agacaactta tgtctag 687

<210> 1777
<211> 1812
<212> DNA

<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1777

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aaagctcaaa atgaagctaa actcagatta agtatacttc gaaatatatt gaataaaagt 180

tcagaaataa acttagtttt aattgaacgc ttacgggctg atcttcaaca acaaggagag 240

cgatcaatac caagtgcaat tactatctat cgatggtggt taacttataa aaaatcaaac 300

tttagtattt tatctttagt accaaagact aagcaaaagg gaaatagaaa cacgaaggta 360

cctaaaacaa tatcagtcta tattgatcaa gctgttgaac aagtaatttc tgccaataaa 420

atcaatgtta gtacagcttt tagacgagtc agaagaaaag taagacaata taatcttacc 480

cataaaacaa agcataccta cccttcatat gaagccataa gaaagcgcgt aaaaaaaatc 540

acccccctatg aaaaattagc tgcaagcaaa ggagatcgaa tagcaaaacg agaattccgt 600

cgtatgggga aaaaaatcca aactgagtac ttactagaac gagtagaagt tgatcataca 660

tggttagatt tatttgctgt tcatgaagaa catcgagtac ctataggtcg tccttattta 720

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cgaggtaaga aaggtaatca taaagttgcg ataaaatata accgcgaaaa tatgggcttc 1440

atatgggttc ttgatgaaga tacagaatct tatttcaaag tccctgctat tgattatgaa 1500

tatgcgagta cagtaacttt atggatgcat aaaaaaaacc taaaaataaa acaagaactc 1560

aatattaccg aacataactt agactctgaa attgatgctg aattaagaat tgatgaaatt 1620

gttgatcaat ctattcaaaa gaaaaaaaca acaataacaa ataaacgtcg tgctgctcga 1680

tatcaagaaa acgaacaaat ggctgctaat gctcgacaac ctaaagaaaa aaaatctgct 1740

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gattatgtat ag 1812

<210> 1778
<211> 987
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1778
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gtagctgcta tcataaacaa tatagatcga tgcagaaggc tctctaaatt tggggcagaa 120

ccatcgtgta tgatggtata tggcgcatct ggcgttggaa aaacctcaat tataagaaaa 180

tacctaaaag cgaatgataa agactcaaca gcacgacaag atattgtccc tgttgtttat 240

atcgaattac cagagaatgc aaaacctgta gatgccgctc gtgaactcct gctctacctt 300

gaagatccct tagctcttta tgaatcagac ttagctattt taacaaaacg aatagtagat 360

ttagtaccaa caatgaaaat agagcttatt atcattgatg aatttcaaca cttagtagaa 420

aaatcttcaa atagaatact ctcaagagtt ggtgactggt taaagatgtt aataaataag 480

acaaaatgtc ctgtcattct ttttggtatg ccctattcaa aagtagtctt ggcagcaaac 540

agtcagctga gaagccgctt ttcgatacag tttgaattaa aaccatttag ttatatcaat 600

aattatggca tttatgctgg ttttctcaga cgtttagatg aagccttacc ttttgatcaa 660

ttatcaaacc ttgcatcaga acctatagca aaaaaaatct atgcattttc gcaaggaaat 720

atgcgttcac ttcgaaattt agtctttcat gctgcggtaa atgcaattga aaacgacaat 780

aactgcatca gtaaaaacga ctgggaattt gcctctaatt tgacatctgg caataaactc 840

tcaacatgga aaaacccttt tgctcaaggc gtcaagatca cagatagaat gttgcaagac 900

caacctaatg acttaggttg ggaagattat atgcgcaaca atagaggaaa aagaaaacct 960

ttcgatgaga gtaagatctt tagctaa 987

<210> 1779
<211> 1179
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1779
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gttgcgaaca aaaatggcta tgaagatatc catcggttcc tcattgtaac aaaaaagtat 120

ttacaagatg aaaaccacga tagatttaag gctttcccta ctgatattaa aacaatcaat 180

ccttactcgt ctaaaaacaa tcatggttca agagtagcag cactgcacaa aatagccctt 240

atgactttta atgagcaacc tgagatactg tctttagcaa taaataggac atctctaata 300

tattcgccat caacaaccgc tctagtacgt ggtagtgagg ttattcctcg ctcattatta 360

cgaaaaaaca ttattccatg ttgcccaaga tgtttacatg aggaaggttt tggacattat 420

ttatggcatt tcaacggtta taattactgc cacaaacata atactccatt aatatataag 480

tgcgcatgtg gcgcagatta tgattatcga atagcaggct taaatggatt ttgcagagaa 540

tgtgatacgt accttaatcc aaaccaacaa catccagata gtgccgaaag caaaacttcc 600

gcttggcttt caggcaagac tatcgagcaa ctgcctgact tgccccagag ctatcgttgg 660

ggtctaattc attggtggac tcaccttact caaaaagagt ttgatggtgc ttcctttatt 720

gacttttggc atcgttggcc tgaatccttt catcatttaa tacaacaaaa aattgaattt 780

aatttagagc attcaattat tcatcatgat aatttgaagc taaaagatct actgggagat 840

ttgttcttta actgtattcg attacctgaa aggaatttaa agtacaacat tgtgcttaat 900

gagttattga gatttataga tgataattta tggggtaaca atggacggct tgcaaatcta 960

aaaatgaatg ctgtagaagt ctctattttc ctcaattgct cgtgcgatca aattgtatta 1020

atggtcgaac aacggttttt aaaacccagc cggaaagcta aaccaaataa accattaagt 1080

tttactgatt acttgtttca cctaggagat gtttattgcc tttggttagc tgaatttcaa 1140

accgatgagt ttaatcgaac atttatcatt tcgaggtag 1179

<210> 1780
<211> 1911
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1780
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atcattttaa cgaacctagc cgcaaaagta gacgcaaaaa aaaatttgac cgatagagaa 180

aactgtaaaa aaaaattaaa agataacaac tggtggtcac gttgtattaa tacaatgaaa 240

tttcgacaaa gccacaatgt taaatttccc gagataaaag caaccggaat aattagagct 300

cacccaatgg gtgaaatacc caagtactta ctatcttctt caaaattaaa acaaaaaact 360

ttggcttatg cgaatgattc aaaggatgtc agtgtcgcta atttttaat cagtgaattt 420

atcttgcacg gcaaaatttg ttgcttgggc gtcttgctta cagatgagca gcatcctctc 480

tgggatcgtt taacaaaact gggctgttat caaaaaacac gcaagtacgt agcaaaacaa 540

cttaaaaaaa ttccaaattc ttgtattgaa gtacagctag gtgctaattc tgttcgacag 600

atttcattac ctgacgggaa taactcttac ttatctctat cccctgttac ctctcaaaca 660

atgcagagtt catgctatca gtctcttcat aaacactatt ggttaagtaa aattacccgt 720

tatagcagag cttcaaatat gggtgtactt ccgatgacct gcggtggaac attacgcatg 780

ttaagtcata ctataagctt tgaagatgtc aaacattgcc aaatatcgcc caactcatct 840

tggttaacta aagattcaat acaagctttc tacgactatt ttgattcttc aaactggatg 900

atgcctcaca ttcaaaagca acaaaagtta aaaatactaa aaatcacaat cacagaaatg 960

atatctcgtt ggttagcatt acaaaaaaac acaatacaac ataatcagtt agagcttgta 1020

cataaactaa atttcgatct atcaaataca aaatccttaa gacaatttgc ctacgatcca 1080

aaaacaacta gatttctatt taccttaatt gaaaatagat caaacacaca gcaacctaat 1140

gagaactttg ataatcaata tcttcttttg cctcaaattt ctgtttgtgg tgcatctgct 1200

atgagttcat ccatcactat tggaataccc tctttaaccg cattttatgg ctttattcat 1260

gcatttgagc gaaacatgca aaaggtcttt tcaaacctaa aagtcgattc atttgctatc 1320

tgcattcata cttttcactt acaaaaaaga gggatgacta gggaaagtat aataaaattg 1380

acaagtaata tatcttcccc tgcaactcat gatgaatggc attgtgatct gaaatttagt 1440

ctggctctca aagtaaataa tcttactcac ctcaaccaaa gcgaaatatt gtatgcattg 1500

ccaaaacgac ttgctggagg ctacgcaaga ataaatatag atgacataaa gacgattcaa 1560

gtatcttcta gctttaagga tttggttaaa caaataccca cttttcaagg acaatggcta 1620

tccttataca aggcgaaaat tgattccttt gaaagcatta ttcaacaaat aaaagcatcg 1680

caaaatataa tcccaacttg tgttggatat cattacctag aaaagccgac agaacgcact 1740

tttgccctaa gagactacaa acatgcgttt gctgagccta tcattggtct catcaaacca 1800

ataactatta aagaagatac aagtttgcat gatttgtttt gggaccaaat taacaagcca 1860

cactacacca caatagagac aaggaatatg aataatgaag ctccctatta g 1911

<210> 1781
<211> 1050
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1781
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tttaccattt ggccagatgg aaataaagcc cctttatctt ttatgagccg aacagtactt 120

ggtcaaatgg aaaccgcatc actcgcttac gatactaaag gaaaccctaa acaaacggct 180

actcctgaag ttcttgcaca aggaaaccct catcatatgg atttctgtag cgttcccttt 240

ggcgcagagc atattgaatg cgtttttca gtttcattct cttcagagct tcgcaaacct 300

tacaagtgta gcgagcctga ggttaaaaac actttgattg agctggtcaa attatatgag 360

tcaaaaatcg gttgggatga actcgcaggt cggtttctaa ccaatatttg tcaaggaaaa 420

tggttgtgga aaaacacgaa aaaaacgtac caactaaata ttgaaattaa accttggcct 480

tggaaaaata accccgtcat tttcgaagat attagaacaa attacagtac ttataatgac 540

tgccaatctg ataccaaatg gcaagaatta aaacaactca tcatcaatgc tttctcctca 600

aaaaatggcc tcgctatttt cgagataaaa gcacaattaa ctctaccaac aaatgctgag 660

ctttacccaa gccaagcatt tattgaaaaa gataagaaag aaaaaaaaca tcaatctagc 720

cgtatatttc aacatacatc aatcaatgga caaaaaagcc ctatcatagg ctgctataaa 780

gcaggagctg gcatttttat gattgatgat tggtacccta atgcagaaga acctattcgt 840

atagggagat tcggtgtaca ccaacaagat gtaacttgct atcgcccccc ttcaactcat 900

caagatctct tttctttatt ggagcagtct gaaaaatata tagctttatt aaaaaataga 960

aaaaaaacac ctcaaaaaac aataaatgaa ctgcactttt taatggctaa ccttatcaaa 1020

ggcgggttgt tccagcataa aggagaataa 1050

<210> 1782
<211> 600
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1782
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gcagctaagt gtatcaatat attacacggt tttagctacc gttatgatac tcactctatt 120

ggtatttctt ttccaaactg gtgtaatgag accgtaggag atcggatttc atttgtaagc 180

atcgaaaaaa tggcattaga ttacctactc actcaaaatt actttaaaga aatgcaagat 240

cttggttact tcgatatatc aaaaacattg attgttccaa ttgaatgtaa ctttgcatgt 300

tttaagcgtt atcaaaagat cgacaaatcg tcagcggctg gttttcatcg aaagataaag 360

aggcttgcta aaagagcgca taatagaggt gaggtttttg ataacaagaa gtataacatt 420

tacaaacaat gcgatattgg acactatcat tcattagcag aagaaagtaa aagtaaaggg 480

tatggattta gattaaacat tcaaagaact aatgaaatca gcatcaataa tatacctatt 540

tttagtagct atggattagc aaacacagca cacgcattac aatctgttcc cataatttaa 600

<210> 1783
<211> 28
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1783
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<210> 1784
<211> 510
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

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<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1784
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tactaattat gaagattgat tgtaagaaag ttacttacat ctttttttact gtttaagtat 180

atttatggca ttagtattga atattgtaag attctcgctg tggttgaaac aattctgata 240

ctaggggat nnnnnnnnnn tttaatgcta acgtaacgat gtatattttt cccacgagat 300

tttgttaact ttctagctgg ttgagtaaat gcgaactcaa gaggagagtc tgtttgatat 360

gtcgttgcag gagaaggttg cataaaattg cctctttcac catatgtagt aaacttacat 420

aagtatggtc taaaaagagg caatatcaag ttatggttgt attaaatatc agcttatggt 480

tgtaaatatc aacttatggt tgtttcaaca 510

<210> 1785
<211> 630
<212> DNA
<213> Pseudoalteromonas sp. P1-25

<400> 1785
atgtacagaa gaaaactcaa acactcccgt gttaaaaacc ttcataaatt tgctagtcaa 60

aaaaataaat ctacctgttt agttgaatcc tctttagagt ttgatgcctg ttttcatttt 120

gaattttcac catcaatagc cgcatttgag gcacaaccac taggttatga atatgagttt 180

gataaccgta tttgccgtta cacacctgac tttttactta cccacacaga cggcacgcaa 240

aaatttatag aagtaaaacc gcaaagcaaa attgctgacg aagactttcg tgcacgtttt 300

attgaaaagc aaaccatcgc taagcaagat ggacgcgact taatactggt tactgataaa 360

caaatccgtg tatacccaac actcaataac ttaaagcttt tacatcgcta ttctggtttt 420

cagtctttaa cagagctgca agcatcggtg ttagaacttg ttaagcaata cggctctatt 480

aaagtgggcc agttagttaa ctttttaaaa gtaactgccg gtgagctact tgctactgtg 540

ctacgcttat tatcactagg gcagttattt gccgacttaa ctacaaatga aatatcaata 600

gaaacagcaa tttggtctaa caatgtttaa 630

<210> 1786
<211> 1824
<212> DNA
<213> Pseudoalteromonas sp. P1-25

<400> 1786
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aaactacctc aaaattacgc caaagattta caagcccttc ctgaaaaaat taaaaataca 120

acatttgcta agcttaaata tattcaatgg cttgaggcta atattcaagg tggttggaca 180

caaaaaaacc ttgagccttt attgaaagta atgcctgaag ttgagggtga aaaaaagcct 240

agctggagaa cagctgcacg atggtatagc gcttatacaa atgcagataa aaatatcatg 300

gcgctaatac caagccatca aaaaaagggt aacagggagc gcgatacagc caccgataag 360

ttttttgaaa aagcacttga gcgttactta gtaaaagaaa agccatcagt ggcttctgct 420

tacaagtatt acgcagactt agttatcatt gaaaacgaca gcgttgtggg cagtgtttta 480

aagcctttaa catacaaagc gtttaaaaat agaatcgata atttaccgca atacgacgtg 540

atggtttctc gctatggtaa gcgtcttgct gatattgctt ttaataaagt agaagggcat 600

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gtgtatagcc attgtattgt tggcttctac tttagcttca gcgagcctag ctatgatgca 780

gtaaggcgag caatgctaaa tgcaatgaaa cctaaaagtg atgtggcaaa actataccca 840

gatacgataa atgagtggaa atgtgctggc aaaattgaaa ctctcgttgt tgataatggc 900

gctgaatttt ggagtaacag ccttgaactt gcttgtgaag aaattggtat taatactcaa 960

tataaccctg ttgcaaagcc gtggttaaaa ccctttgtag aacgtatgtt tggcacaatt 1020

aacactgaat tattagaccc tgttcctggt aaaacctttt ctaacatttt acaaaagcat 1080

gaatacaatc ccaaaaaaga tgcaatcatg cgctttacaa cctttatgca gctattccat 1140

aaatgggtag tagacgttta ccatcaagat gccgatagcc gctttaagta catacctagc 1200

caactatggg agcaaggctt taatacgtta ccgccaacag tgctgagtaa tgctgatctt 1260

caacaattgg atgttgtgct cagtatttca aaccataggg tgcttcgtaa aggtggaata 1320

cggctagaaa acttaagcta cgacagtact gaactagcca actatagaaa acagtttagc 1380

cataaagtat ctcaagaagt tttaattaaa ttaaaccccg atgatatttc ttatatatat 1440

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tcgggctcta tcgataatgt aggcttagca aaagcgcgta tgtttattca taataaaatt 1620

caaaacgagt ttgaagagtt aaaaaatgca ccaaaacact caaaagtaaa agggggtaaa 1680

gcattagcta agcatcaaaa tgtaagtagt gactcacaaa aatcaatagc tcagagcgag 1740

ccattagaac ccaaaaaggt tacacctaaa gagcaaccaa cagatagctg ggatgacttt 1800

atttcagacc tagatggatt ttaa 1824

<210> 1787
<211> 1002
<212> DNA
<213> Pseudoalteromonas sp. P1-25

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ccaataataa ctactgtatt taacgacttt gacagattaa gacttggtaa aggattagcg 120

ggcgaaaagc cctgcatgct gttaaatggc gatacaggca caggtaaaac agcactaata 180

aaacagtata aagaacgcca tttaccgcaa tttattaatg gagtgatgaa ccaccctgta 240

ttagtaagcc gcatacctag taatccgaca ctagaatcta ctttagccga gcttcttaaa 300

gacttagggc aagtaggtag tacagagcgc aagctgagaa taaacggtac gcggttaacg 360

acatcattaa taaaatgcct aaaaacgtgt ggcacagagc ttataattat tgatgagttt 420

caagagctga ttgagcacaa ccaaggtaaa aagcgccgcg agattgctaa tcgattaaaa 480

tacattaacg atgaagcggg tgtatcaatt gtattggtgg gtatgccgtg ggcagaaaaa 540

atagcagacg aaccccagtg gtcatcgcgt ttattagtaa ggcggcagct gccttatttt 600

aaattatcag aaaacccaaa gcattttgta cagttaataa ttggcctagc taaccgtatg 660

ccattcaccg aaaagccaaa attaagtgag caagcaacag tatttgcttt gttctcattg 720

tcaaaaggct gttttagaac tcttaaatac tttttagatg atgccgtact ttatgcatta 780

atggataacg cgaaaaccct cacaaccaag catctagtta aagcatttgg agtactgttt 840

cctgatgtac caaacctatt taccttgccc gttgcagaaa ttacagcaag tgaagttgag 900

cgctattcac tttataaact tgaaagcgcc caagatgaag atccgtttat agcgactaag 960

tttactgacc aaatgccgat tagtcagttg ttgaggaagt aa 1002

<210> 1788
<211> 1176
<212> DNA
<213> Pseudoalteromonas sp. P1-25

<400> 1788
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tggcttgtag agcaagatca tgatcttgaa ggtgcgttgc cgttagagct gggtaaagtt 180

gatgtttatc atgctaggca agcgagtagc tttagaataa gagcgcttaa gttggtagct 240

caattagctg atgtaaacgc tggtaatatt cttgcgcttg catggcggcg cagtaatttt 300

aaatttggca acttagtagc agtaagccgt aatgagcaga caattcctct tgagttactt 360

cgcactgata atatacctgt ttgcattgaa tgcttgtttg aatcttctta cgttcctttt 420

cattggcatt taaagcccta taagacgtgc cataagcata aatcacaatt aactacacat 480

tgtaaggaat gccataactt aattgattac agagcttctg aggagttttt agagtgcagt 540

tgtggttgta aactaaccaa tagtgaacag ttaaacgatg cagactttaa aattgcattt 600

gcgcttgcaa gtagtaacag ccataaaata gtggggttaa tatcttggtt tgcgaaggtt 660

aagcaacttg atgtaagcga tgctgacttt aaccgtactt ttgttgatta ctttagtact 720

tggcctgaaa gccttactac tgaattagat ttactcacaa acaatgcgcg cctcaagcaa 780

cttaaccctt ttaataaaac taagttcaac tctgtttatg gaaatgtgat ccgtgatggt 840

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agtcatgttt tttatttacg ccaagtgatt gagctacagc aagcattcgc agctgaaacg 1140

cctcaaacaa aaaaacaatt tatagcgccg tggtaa 1176

<210> 1789
<211> 2052
<212> DNA
<213> Pseudoalteromonas sp. P1-25

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actgtgctca ttaacctagt ttataaacga agtgagattg atgatttaac aagtacaaga 180

accgctaaaa gtgtattacg tgatgaagtg ttactgagta aatgtattaa cgaagttaaa 240

tggtttcata ctcataattt aaaatatcct gatatacgcg taagccatca acgtttaatt 300

agtaaggtag taagtgaaga tattgcgggt atttgtagcc ggtcattacc tttaagtttt 360

ggatggtcgc acaacagtgc tgaaattaat catgcaaagt tatttttaac ctcatttact 420

tggcaaggtg aagtaacttg tttagcaaat ttactaataa atgaagagcc tgtttggatt 480

aatttaataa ggacatacgg gtttactaaa aaggcggttt taggcatcgc gggtaaaata 540

aaacagcttt tgccagtggc agagctccca ttagaagtaa gctctttttc accacaatta 600

caaatgccat ttcagcaaag ctaccttgcg gttacgcctg tagtaagtca cgcaatgcta 660

gctaaaattc agcaattaac aacagatcgt aagttaaatt ttggtttagt tgagcactca 720

agacctgcca atgttggcga tttagcaagc tcagtaggtg gtaatattag agtgctgcgt 780

tactttccta aaacatattc aaaggctgtt aactgctctg aagtattcaa taatgatagt 840

gagaaagcat ttaaaattcg tgcgctatta aacagtcaat ttcaacaggc gcttttggta 900

ttggtcggta ttaaacagtt taatacgtta aggcaaaagc gattagcgcg agtagcggct 960

attaggcaag tacgtgttag cttgcagttg tggctggata acattctgga agctaaaaat 1020

aacgctcaag ggcaagctta ccctgagtgg gcaaagcatt acttagatca gagtattact 1080

aactgcatta gccaatttag taacgtacta aatgagagcc ttggtaattt aagtaagctc 1140

aaacgctttg cgtatcaccc taatttaatg ggggtgttta aaacgcagtt aaactatgtg 1200

tttactcact gtattcctga tgaagaaaca ttaaatgatg agcaaatagt gtatgtgcat 1260

tgccaagata tgcgagtgtt tgatgctgag gcaatggcta atccgtatat tcaaggtatg 1320

ccgtcactta cagctttaaa tgggcttgct cataactttg agcgtaagct aaaaaatttt 1380

atagaccctt caattaagtg tattggtagt gccattaaca ttgaaagtta tcaactacat 1440

acaggtaaac cattacctga accaagtaag ttaaaacaag ttgctggccg tagtcatgtc 1500

ataagatcag gaattatcga taaacctaaa tgcgatataa cactcgattt agtctttagg 1560

ctttttgtac caaacattaa gctgttagat aagttaaata gtcagcttgt gaaacccgca 1620

ctaccatcta tgtttgcagg cgggactatg catccacctt cgttatacca aaatattgac 1680

tggtgccatt tacatactaa accaagtgag ctgtttaaaa atataaaggc aaaatcgtta 1740

aatggcagtt ggttgtaccc ttcaaaaaaa gtagtcaaaa gttttgaaca attgattgat 1800

gcgcttaacg gtaactttaa tttaagacct gctgcaattg gttttgctgc gcttgaagaa 1860

cccataaagc gagatgtagc cttacatgaa taccattgtt atgctgagcc cgtaattggg 1920

cttttagagt gtgttagcaa tacatcagtt aagtacgcag gggctaagca gttcttccat 1980

gacgcatttt gggttatgga tgttcaaaaa gagtctatgc ttatgaaaaa gtctaagttt 2040

gagtatgaat aa 2052

<210> 1790
<211> 1029

<212> DNA
<213> Pseudoalteromonas sp. P1-25

<400> 1790
atgcaattac ctcggcactt aagttacacg cgttcgcttt cacccagtaa agcggtattt 60

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gggcaaaagt cagggtttgg cgatgcgtat caaaagcaaa atgtggctaa aaatttagcg 180

ccacaagatc tagcgtttgg aaacccacaa acaattgatg tgtgctacgt acctccagca 240

gtaaatgagc tattttgccg tttttcactc agggttgagg ctaatagcaa tgaaccacat 300

gtttgtgatg accctaaagt tatttattgg ttaaaacggt ttttgaaac ctacaaaaaa 360

cacaatggtc ttaatgaagt tgcaactcgc tatgctaaaa atatactgat ggggaactgg 420

ctttggcgta accgccaatc accaaatgtt gatattgaaa tccttactga acatgcagcc 480

ccgatcattg ttgaaggtgc acaaaaacta aaatggcaag gcaattggca aaacaatcaa 540

acagcattaa taacattatc agaagctatt caagaagggc ttagcaatcc tcaaaattat 600

tgttatttag atataaccgc aaaaattaaa aatgcattta gccaagaggt tcaccctagt 660

caaaagtttg tagacaatgt tgaacaaggc atgtcatcta aacaacttgc atacactcaa 720

gtcggcgata aaaaagcagc cagtttaaac tcacaaaaag taggggctgc gattcaaact 780

attgatgatt ggtatgaggg aggttacaaa cctttacgca ctcacgagta tggtgcagat 840

aagcaaatat tagttgcaca tagaacgcct aagagccatt cagactttta ttcattactt 900

ccgcgcattg ccttgcatat taagcacatg gaaaagcatg gtttagagca aagtgaagaa 960

tcaaacgcag ttcactttat tgcagcagtg ttgatcaaag gcggcttgtt ccaaaggagt 1020

aaagcttga 1029

<210> 1791
<211> 600
<212> DNA
<213> Pseudoalteromonas sp. P1-25

<400> 1791
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gcagggcgtt gtatcggcat attgcatggg tttatgagtt cgcgtgaaat tagtaatata 120

ggtgtgtgtt ttcctaaatg gaatgagcaa gagataggta atgaattggc gtttgtatcg 180

acagataaaa agcaattaac caatctatct cagcaaagct attttgagat gatggctcag 240

gataaattat ttggcttatc aaaaatactc gaagtaccaa caaaccaaaa tgaggttatg 300

tttattcgca accaatcagt agctaaggct tttgttggcg aaaagcaaag acgtttaaaa 360

cgcgctaaaa aacgagctga agccagaggt gaagtttata atcctgaata tcaatttgag 420

gcaaaagaca taggccattt tcattcaata cctgtatcaa gcaaagccaa cggccaaagt 480

tatgttctgc atatacaaaa aattgaaaat actaatgcga cagaaaatca atttaataat 540

tatggctttg ctacaaatca aacatttcaa ggtacggttc cttctttgaa tacccaataa 600

<210> 1792
<211> 28
<212> DNA
<213> Pseudoalteromonas sp. P1-25

<400> 1792
gtgaactgcc gagtaggtag ctggaaat 28

<210> 1793
<211> 510
<212> DNA
<213> Pseudoalteromonas sp. P1-25

<220>
<221> misc_feature
<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1793
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agtgaagtgt atattggcat agtattgaag caatagatgg cataaagcta ccaaatacag 120

ctttataaaa cgcaaagtaa acatgctacg cgttgtaaat cactcttaaa cagtttggaa 180

aatggtttac actggcacaa aaactttgat gaataaatca tcacctttta ctttaattgg 240

taagtccatt nnnnnnnnnn cggctattga tggtgaaaat tcaaaatgaa aacaggcatc 300

aaactctaaa gaggattcaa ctaaacaggt agatttattt ttttgactag caaatttatg 360

aaggttttta acacgggagt gtttgagttt tcttctgtac atgtgagtca accatctaac 420

catttggtta aatactagac tatgccacct tatacttcca atttatgcca tcttttagta 480

caaatatgtc aacttatact tcaaacaaca 510

<210> 1794
<211> 633
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1794
atgtatagac gcaatcccaa gtcatctaga gtcaaacacc aattcaaatt cgctagtcaa 60

aagagcaaga acacttgttt cgcagaatca gcattagagt tcgatgcttg tttccacttt 120

gagtattcct cagcgattgt cgcgttcgag actcagcctc ttggctttaa gtacgacttt 180

gaaggccgta cttgcccata tacacctgat tttctattaa ctcacagcga tggcacgcaa 240

aagtatatcg agataaagcc ggtaaaagag cttgctaagg atgagtttcg gcaacgcttt 300

gagcagaagc aattggcatc aaagcaactg ggtattgagc ttatattggt gacagataag 360

caaattcgag tatttcctgt tttagataat ctgaagctat tacatcgtta ctcgggtttc 420

caggtattga ctgaattaca tacggttgtg gtcgggttag taaaaagtac tgggttagtg 480

aaggtcgcgc agcttgtaaa ttacctaaag gtttctgccg gagaagtttt atccatcgtt 540

gcaaggctgt tgtgcatcgg gcaattggca acagatctca ctacagatgc actttcatta 600

gactctgtaa tttgggcctc agatgaacag taa 633

<210> 1795
<211> 1839
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1795
atgaacagta aaagtctggg gttgtttgac gatgaattcc aacatccgat accccaagta 60

gaagcaccaa aaagcaccaa agctgaaaaa gatctcagtg cctacccgca agaaatacag 120

cagacaacat atgcacggct taagtacatt cggtggctta aagagcgtat agttgggggc 180

tggactgaga aaaaccttgc gccactcata aacgaaatgc ctaaagtcga aggtgcagat 240

aaacctaact ggcgtactgc ggctcgttgg tttaaatctt attctgaatc tgatgaatcc 300

atttttgctc ttattcccaa acaccaaaag aaagggaaaa gaacacaaag aacagacaca 360

gacaagttct ttgaaaaagc acttgaacga tttttggtaa aagaaaggcc ttctgttagc 420

tcagcttatc aatattacaa agacttagtg gtaatagaga acgaaaaagt aataggtgaa 480

gatttaaggc ctttaacgta caaggcgttt aagaaccgaa tagataaatt accacattat 540

gaagtattac gagcccgcta tggtaaacgt atcgcagatt tagcttacaa caaagtagag 600

agccacaaga ggccgacacg agtgttggaa agggtagagg tagatcacac tccattagac 660

ttaattttat tggatgatga gttacaaata ccgctaggac ggccaaccct aaccatttta 720

attgatgtct atagccattg tattgtcggg ttttaccttg gtttcaatga tcctagttac 780

gatgcaattc ggcgggcgat gctaaacgca atgaaaccca aaaactggat aaaagagcag 840

tatccggata taacccacga ttggcattgt tgcggaaaga ttgaaaccct cgtagtagac 900

aatggtgttg aattttggag taatagtttt gagtctgcgt gcgcgcagat cggcattagt 960

ttgcaataca acccagttgg caagccctgg cttaaaccat ttgtggagcg aatatttgga 1020

gtaataaata cccagttatt ggatcctatt ccaggaaaaa ccttttcaaa tatgatgaaa 1080

aaggagggct atgacccaaa taaagacgcc atcatgcgct ttagcgcgtt tatggaagta 1140

ttccaccact ggattataga cgtctatcac caagaagctg acagccgctt tagttacatt 1200

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gatatccaac gattggaaat cgtgctgggt ataagcactt ggcggcatat ccgtaagggc 1320

ggtattcatt ttgaaaattt acgttacgac agtaacgaac ttgctgatta cagaaagcgc 1380

tttagcccca aggcttcagt aaaactgatg ttgaaggtga atccggaaga cctttctagg 1440

gtctatgcct ttttacctga gttagatcac tacattgaag tgctatgtat cgatcctaat 1500

ggttatacag cgggcttgag tctacaccaa cataaggtca atgttcgctt acagcgtgat 1560

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aaaattcaaa atgaagttga gttgttagcc aactcgacaa aaaaacctaa agcaaggggc 1680

ggtaaggcat tggccaaata tcaaaatgtc gccagtgaca atcttgtatc ggtgaagcct 1740

agttcaccca ctaaaaagcc acctgagaaa gtagaaacag aggaagcgca gaataaaggt 1800

gattgggacg acttcgtgtc agatttagag ggcttctga 1839

<210> 1796
<211> 1002
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1796
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ccattaatga ctacaatcct caatgatttt gaacgattaa ggacgggtca aaaacttgcc 120

ggcgagaagc agtgtatgtt gctaacgggt gacacaggct gtgggaaatc ttctgtaatt 180

aaccactaca agaataaaca tccggcatgt cacattgacg gtgtttacca tcacccagta 240

ttagtttccc gcatccccag ccgtccaacg ttggaatcaa ccatagcgca gctacttagc 300

gaccttggtc aggtaggagc tgcaaaaagg aaattaaaac gcaatgatgc caatcttacc 360

gattcattaa ttactaattt aaaatcgtgt ggcactgagc tcatcattat taatgaattt 420

caggaactag tggaatccaa ccaagggaaa aagcgcaacg aaattgcaaa taggctcaaa 480

tacctaaacg aagaggcggg tattccgatc gttttggtag gtatgccatg ggccgaacaa 540

atagccgaag agcctcagtg gtcctcgaga ttgatggtta gacgctttat accttacttt 600

aaactctcaa aagatttaac actgttcgtt cgggtattga tgggcttggc tacacgtatg 660

ccgtttcgtg ataagccccg tttgcaagag caagatattg tctatgcctt gtttgcggta 720

tcgaaaggct gtttccgtac cttgaagtat tttctgaatg aagctgtaaa acaggctttg 780

atgtacggct cagagacgtt aaccaagcag catctcagcg ccgcatttga agtgttttac 840

ccgggtatag aagacccgtt taaactatcg gtggatgaga taacggcctg tgaggtagag 900

agctactcgg tatatcacac cgacagtagc tcggataacg aggcgcataa tcggacgagg 960

tttacggaaa aaatgcctat caaccagttg ctaaaaaaat aa 1002

<210> 1797
<211> 1179
<212> DNA

<213> Pseudoalteromonas ruthenica strain S3245

<400> 1797
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cgtttaacgc gagataacgc ttataccgac taccatgagc tggccgatat tatttggcag 120

agattggttg agtgtgacca tgagttggaa ggggcatttc cgctagaact gaagactgcc 180

aatctatacc acgccagcca atcaagctgt tttcgcgtca gggcgttcaa gctcgttgcg 240

cagtgggctg ctctggagcc gcttgaactt attcgcttgt cctggctgcg aagcaatact 300

cagtttgggc atttatcggc gcttattcgc gatcagttgc tcattccccg aacgctccta 360

agagagagtc acatcccggt gtgcctaagt tgtttaaagg aagagggcta cattccctat 420

tattggcatt taaagcccta caaggcctgt cacaagcaca aaatgcaatt acagtctcat 480

tgtgctgagt gtggcgaact aatcgattac agagcgtctg agcggttctc tcagtgcaat 540

tgtggtgcaa agctaaagac tacagctcct gcaagtgaag cggacatagc ggttagtgaa 600

gggctcagcg gtgcggatgc gcacgatttg gtgggtaagt tgacatggtt tgcttaccag 660

tacggccaag accaagagca cgctagcttc aatgaagctt tcatcgctta tttcaaatat 720

tggcctgata acttttcgc tgagctcgat gaaaaagcat ctagggcacg agaaaaacag 780

ctaaggccat tcaatcatac aaaatttgat agtgtttttg gtgatgtgat caaagtcagc 840

aaagtagccg ggcccaatgt cttaagaacg aatattatcg ttgattcatt actggagttt 900

ttcagtgacc tagttgagaa gaacccaaaa caaaagcacc caaatatcgc agacttgctg 960

gtaaatagtt cggatgccgc aactttgatc ggtacgacct tggagcaggt gtttaggcta 1020

taccaagagg ggcaattgac ttgttgcgag aggttgaaca agaacgaacg tttgcagcca 1080

gacaggtgtg ttttctactt gcgtcaggta gttgaattgg cgcaatcaca aggacgctat 1140

gtcggtgact tcaaaaatca acttatcacg ccttggtga 1179

<210> 1798
<211> 2082
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1798

atggacttag ctgaagcatt ggcaatcaaa tctgtgcgtg agaaatctga tgcgctgcga 60

aagctttttg ctccatatgc ttcatccgtt gcggtcgacg gatatgagca gcaggtggct 120

accgtgctaa tcaacttggt ttacaagcgc aatgaacaaa ttgatctggc aagcatcaaa 180

gcggcgaaag atgtgcttaa agatacagag ctaatggcga agtgtatcag tgaggtgaaa 240

tggtttcaca cccataacct gaaatatccc gatattcgag tcagtcacca acgcttgatt 300

gcacaagtaa tcgataagga tattccagct atcaccagcg cttctttacc taaattgctg 360

ggctggtctc acaacagtgc cgagatcaat catgcaaaac tgtttttgac ctcatttaag 420

tggcagggcg aagtaaataa tctagcgggt gttttggttg acgaacatcc cgcttggata 480

gaagcgatga gaaacttggg tttaaccaaa aagtccgtaa tggcattagc tacgcatatc 540

cgagagttat tacctgccac tgacttgccg ggcgaggtca gcgagttcac ccctcaattg 600

atgatgccct atggaaaaga ctacctcagt gtttctcctg tgctgagcca tgcaatgctg 660

gtcagggttc agcaactggc tcgggataaa gtagtgaatt ggggagtggt tgaacataca 720

cgacctgcaa atgttggtga tttacctagt tccttaggtg gtaatgtacg cgtgctcagg 780

tattttcctg caacatcgct aaaaggcagc ttaggagaat atatagaaaa cgacccgaac 840

gaaagactat tcaagcataa ggtactaacg agcaaaagct ttaaaacgtc acttattatt 900

ttgactggta aatcagttta taacaccttg aggcagaaac gattagcgcg tattgctgcg 960

atacgtcaat tacgaagtac tttgatgcac tggttagata aaattataga gtttcaaaat 1020

aatggtaacc acaatcttgt gccagagcct atgaagtcgt tcatagaaaa tttgaaaccg 1080

aatcttaatg gtgtagtttg cgagttaagt ggcttgttga atgagcagtt gtcttcccat 1140

cactcattga agaaatttgc ataccatcct gacttaatgt cggtattgaa acgccagctg 1200

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caattacata ccggcaagcc attgcctgag cagaatcagc ttaaaactaa ccaaggaata 1500

acctcggcaa aaagaccggg gatagttgat aagcccaaat gtgatatgac gattgatttg 1560

gtatttcggc tttttgtgcc tcacgagagc actcggactc aattaaccga caatatgttt 1620

aaggcagctt tccctacctc ttttgctggc ggcaccatgc acccgccatc gctgtatgaa 1680

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gcaattggtt tattagaatg cgttaaccca attactacac gcatgggagg agcaaaggca 1980

ttctttcata atgccttctg ggtaatagga gtcgagaaaa cgtctatgct tatgaaaaaa 2040

gccaagtttg agtacactca atgcgactcc cgcgacacct aa 2082

<210> 1799
<211> 1029
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1799
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ttttatcaaa ctcctgaatc cgacttcgaa ccattgcaga tagagcagaa caagctgatt 120

gggcagaaat ccggttttac cgatgcatat caaaagctcg gagaacccaa aagccttgca 180

ccccaagatc tagcttttgg gaatccacag accatagacg tatgctatgt gccaccgact 240

gtgaatgaga ttttttgccg tttttctctg cgggtagagg cgaacagtgt tgaaccatac 300

gtttgcgatg accgtaaagt gagctattgg ctgaagcgct ttgtcgagac ctacaaggag 360

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tgctatttgg acattaccag cagaattaaa acggcctttt gccaggagat ccaccccagt 660

cagaagtttg tagacaatgt tgaacaagga atgtcatcca agcaactagc ctacactcag 720

gtggatggta aacaagttgc aagtttgaat gcgcaaaaag ttggcgctgc aattcaaacc 780

atagacgact ggtacacaga agatctcaag cgtttgcgta ttcacgaata cggtgcagac 840

aagcaggtat tagttgcgca tagaacgcca aagaatggtt tggattttta ctctctactt 900

ccaaaggtcg ctgtttatat caggcatatg gagagggatg gtctggaaga tgatgaagag 960

tctaagcaca ttcactatct ggcatcgatc ctgttgaaag gtggtttatt ccaaaggtct 1020

aaaggatga 1029

<210> 1800
<211> 606
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

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gctggcaggt gtattggcat tttgcatggc tatttaagca gatttgaact tgatggaata 120

ggtgtgagtt ttcccaaatg gaacgaggag actgtaggta atcaaatcgc atttgtctcc 180

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gacggcctat tcaaattatc tgtgactaga acagttccag agcaggttga tgaaattcag 300

tttgtgcgca accagtccat atccaaagcc tttgtcggcg aaagacgcag aagaatggta 360

agggcaaagc taagagctga agcccgaggg gaagagtaca acccgattta tgaatttgag 420

cccacagaaa tagagcattt tcactcaata ccgatcacaa gtaaaagcaa taacaatgag 480

tttgtattac atatccagcg gcgggaatgt tctggtacag cgggtggatt taataaatac 540

ggttttgcca caaacgaaca tcacctcggt acagtaccga gcctttctgg ccttttaatt 600

agttaa 606

<210> 1801
<211> 26
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1801
gtgaactgcc gagtaggcag ctgaaa 26

<210> 1802
<211> 510
<212> DNA
<213> Pseudoalteromonas ruthenica strain S3245

<220>
<221> misc_feature
<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1802
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tacggaagta taagttgaca taagtttgaa gtaaaagatg acaaaaagtc ccttactgtc 120

ctaatattgc ccctcgcgcg tacctttttgt gcattttcag tcgttcggct agtgcgtcat 180

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tggtgtttga ctctagatga cttgggattg cgtctataca tagccgtttc tttttttagc 420

gcactgacta aaaaataggc tatgacaact tattgttcaa atttatgtca actttaactt 480

caaatttgtc aacttatact tcaaacaaca 510

<210> 1803
<211> 630
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1803
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aaaatgaatc aggctatgac ggttgaatcc tacttagagt tcgatacctg ctttcaccta 120

gaatattcat catccatcat ctcttttgcg gctcagccgg aaggtttcat ctatcgtatt 180

gatggccgag attgctctta tacgccagat tttcaaatac ttgaaaatga agaggtaaag 240

tggattgaag tgaagccttt cgtgaaaact caacgtccag attttcttca gcgttttaaa 300

gtgaaacaag aaaaagcctt agcgcttggt gttcctctca ttttggtgac agagaaacaa 360

atcagggtga atcccgtctt gaataatctc aagatactgc accgttattc gggttttcag 420

tcgcttacag atttacatat ccgtcttttg tcattggtta aaacggtcgg aaaaataagc 480

gtgagtgatg cagcctgtcg gttaggtatt gatcagggga tgatggtgaa atcggctttt 540

agcttggtgt catccggtat gctaacggct gatttagtac atgatgaatt gggtttacat 600

tccattgttt ggagtgaaca caatggctaa 630

<210> 1804
<211> 1868
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1804
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gagccagttg aagcattacc cagttcaacg gatgattttt tcgaacgtga cctcgcttct 120

tatcctgatg aaattcaaat agaagtcaga cgtaggattg aataccttca atggattgaa 180

aagcaccttg tcggaggctg gacacaaaaa aacttagacc cactgattga aaaagcagcc 240

agagaaatag actttcctcc tccaaaatgg cgagcattag cgaagtggtg gagtgtctat 300

tcatcatctg ggaaaatgtt ggcgtcatta gtgcctaagc tgcatcgtaa aggtaatcga 360

aatctaaaaa taaccaatga attatcattt tttgatcgcg ctgttgaacg ttatttagtc 420

cccgaacgtc cttctatttc cgctgtttat cagtattaca ccgatcttat tcgcattgag 480

aatcagcatc ttgtcggcga gaaagttcaa gccctctcat acaaaggctt ctataaccga 540

ataaaaaaat gccagcttat gaggttgcag tagcaagaca tggtaaatac ctcgctgaca 600

tggaattcaa caagatcgat gcgcatcaac cacctagccg agtattggaa aaggttgaaa 660

tagaccattc accattagat cttatcctac ttgatgatga gctaaatatt ccgctaggac 720

gcccttatct gacactactg attgatcagt acagtaaaag cattatgggt tttcatttag 780

ggtttaaaga acccagctac tattcggtaa tgaaggccat ccttaatgcg ataaagccta 840

aagatgatat tgcggagcga tttccaggtg ttgtgcatga ctggtattgt cagggcaaga 900

tggagtcact ggttgttgat aatggggcgg aattttggag taagagtctt gagcagtcct 960

gccttgaagt tggtattcat attcaatata accccgttcg caaaccttgg ttgaagccgt 1020

tggtggagcg aatttttaga accatcggca gcaagttgct agtgactatt cccggaaaga 1080

ccttctctaa tattttagcg cgtgaagagt atgatccgcg aaaagatgcg gtgatgcatt 1140

tttcagtatt caatgaactg tttcataaat ggattattga tgtgtatcac tatgaatcgg 1200

attcccgaaa gcgtgcaatt ccttatgtga aatggcagga aggggttgtg gtgatgccac 1260

ccattagtta tgagccggaa gatctggaaa agctatctgt ggttttaggg atcaaagaat 1320

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gcatcgaccc tatcggttac acgaagagcc tatctctcac tcagcatcat attaatcaac 1560

gcttgcatcg agatttcatt gacagtcaac tagacctaga agggttggct cgcgtcagaa 1620

tgtatattca tgatcggatt gaacaagaag cagacgagat taagaacctt aaccgaggga 1680

ggcctcgacg tactacaaaa ggtatggcga gattagctaa acataacggt gttgctagcg 1740

atgttcaaac cagttgtgta ccagaaacac taccggaact gtcgatgcca gataaaggga 1800

aagaatccaa acagttgccg gactctgatg aatgggatga tttcatatct gatctggaac 1860

catattga 1868

<210> 1805
<211> 1017
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1805
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gagcagccga tagccacaat ggttatggct gattttgacc gattgagata caaccgacaa 120

tttggtggtg atcagcaatg tatgttactc acgggagata cgggttctgg gaagtctttt 180

ttaatcaaag agtattgtcg gcgtcttgct caaaccaacc caatgaaaca agcattggta 240

ctttcaagtc gcatccccag taaaccgact cttgaatcca cgatcattga attgctcaaa 300

gattttggcc attttggtgc gacgtaccga aaagggaaaa gcaaagatca atccttaacc 360

gtctcattga ttaaatgctt aaaggcatct tgcgtagaac tcattatcat taatgagttt 420

caggagttgg tagagtttaa aacagggcga gcattgaatg agatagcaac gcgcttgaag 480

cacatcagtg aagaggcgac agtaccaatt gtgttggttg gcatgccctg ggctgcgaag 540

atagccaatg agccgcaatg ggcgtcaaga ctgcttatca ggcgagaatt accatacttt 600

aaactctccg aagaaccaga acacttcatc cggtttatca aagggcttgc cgccagaatg 660

ccttttaccg aactgccaaa actggataac aagcagacga tactggctct gttctctgcc 720

tctaacggcc agactcggcg tttaaagcaa ttattaaatg aagccgttaa actggcttta 780

gttcagaatg cggtgacgtt aaccaatgaa catttagcgg atgtcttccg tatgatattc 840

cctgccatcc ctaatccatt cttagcgtcg atagagcaaa tagaagggca agaagtgagt 900

ttaccctctc attacgacag tggtgcagac aatgaatttg aagccattat cccgactcag 960

tacacagatc gccttccttt atcgcaacta ttgcgtaaaa gtagaaaaac taagtaa 1017

<210> 1806
<211> 1218
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1806
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cggctttgtg agtgtaatgg ctttgagtcg tttcggttgt tgagtggtgc gctatgggaa 120

tggctcgttg ataacgacca tcaagcagca ggggcgcttt cccgtcagtt gtgtgagata 180

aacctttatc atgccaagca ttccagtggt tttagagtac gagcttttga gctactagat 240

tcattgttta aggggaacgc tagaccattg atgcaacatg cgctgttgca ttcagccgta 300

acttttttccc ccaacttaac gtcagtcttt cgggctggta tacatatccc tcgctgtttt 360

cttcggcaaa gttacacgcc tgtctgtccg gcatgtttaa cggaagctcc atacattcgc 420

caatattggc acttaaagcc ttatcagagc tgtcatcgtc atggtgttgc catgttgttc 480

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agttgtgggt ttgatcttcg tgatgcaggg acaaatgttg cttcatcaga gcaaattgca 600

atcagccagc ttgttgttga aggggaaatg caaaatgctc tctcaattag tcattggtta 660

ggcgcactac tttggtttta tcggtacaag cagtctcagc tttctctcaa tgtggtcaaa 720

gaacctgagt ttggccgggc agttgaatat ttttcacagt ggcccaatgc gtttgtgcgt 780

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aacccgaaag ccaaagagac gaatattgct gatgtgaagt tgacggtcgt ggaggccgca 1020

gccctgttaa caacttcgac agaacaagtg tatcggcttt atgaagaagg gtacttgcaa 1080

tcatctgtgc gttttaaact gcattcaaag ttatcgccta atgatgcggt gttttttcta 1140

cggcatgttg tggagttacg tatggctggg atggcatcgg attacagtgc taatgatgtt 1200

tatcttccat catggtga 1218

<210> 1807
<211> 2076
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1807
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cagttattga gaaaagcact tgcgccttat acatgtctcg ttgacgtaac aggctatgaa 120

cgccagctat tgatgattgc tattaatata acggtgccga gaaaagatgt agacgatgtt 180

ttggataaga agctagccaa atcattgctg accaatacaa agcaccttca acgttgtatt 240

gatgaagtgc aatggttcca tacccacaat gtgaaatacc ctgattctcg ggtaaagggg 300

caacgcatta tctccctgaa acaagatgag gttgacgggg ttttgtgtag tgccaatctt 360

ccttcatcat tgggttgggc gcataacagt tctcaggtta atcctgctaa atttttctct 420

attcgcttta tttggcaagg ccgagcaatg tcactgcttg agaccgtgat tgatgctcct 480

tctgaatgga aggtggcatt tcgatcttta gggataataa aaaaacagtt atcggagttc 540

agggaaatat tttcgaccta ctatacctct agtcagatcc catctgaagt cagtgattat 600

tcaacgcaaa tacgcgtgcc atatcagggc tattattgtg ctctaacccc tgtcatcagt 660

cacagcgttc aatcgaaaat ccaaaagatg gcatttggcc gaaaggtgaa atcgagcaat 720

gtagaacatc atcatcccgc gagtgtggga agtttggttg ctgcgttagg ggggaatatt 780

cgggtactgg attatcctcc taatgttcgt cagaaaacat cagaagcttt ttcactgtac 840

cgagcggtaa gtgaaaagga ggtatttgat cactcgatta ttaaagagaa gcgctttctg 900

gatgcattga gtcggattgc gggagagaac cctacaccaa cactgaggca gcgacgacaa 960

ctgcgagtat ctgcattacg ctttgtacga aagcagcttg ccttatggct agctccgatg 1020

atggagtggc gagatagtat tggtggggaa tctcgtcatt ctcccattga aacactagaa 1080

gaacagttgc tttacctgcc cattgcacac ttaccggatg tccttagcga tttaaacaca 1140

cgttttcatc aagcattgca ataccatcgt cgaggggcgc gttatgccta ccatccagag 1200

gtcttgtttc cgattaaaca gcaattgaaa tggctgcttc gttatatggc aaatcaacaa 1260

gatgcactta taacgcctga gccaaattgt gtgtacctgc atcttcagca acttgtggtt 1320

catgacgctt cacttctgtc taacccttat gtttcaggaa tacctgcctt aacagcgttg 1380

gggggattga tgcataacta tcagagaaga ttgagtgcat tgatggagtg tgaatgctta 1440

attcaacgag gtgcttggtt tattgcccac tatcatcagc agaagatcaa gaagcttccc 1500

gaaccggata aggtgagata tctgaagaaa agatcagatg ttcagcgacc aggtattacc 1560

gatggaaaat atggtgactt aaccatgaat ttggtgctgg aattacagtt acccgagtca 1620

gtatcaatac ctgaactatc ccttttacaa gccgcgttcc catcgcgttt tgcaggcggg 1680

acgcttcacc ctccatcatt gtttgagcaa acagattggt tatcggttta ctccaaccaa 1740

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gcgccttacc attgttatgt cgaaccatgc attggtgttg ttcggtgtat gaaccccatt 1980

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gcaaatgacg ctatgcttat gaaaaaggca acatga 2076

<210> 1808
<211> 1035
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1808
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tactatcaaa cacccgagtc tgattttgta ccgattcagg tagaaacgaa ccgaattaga 120

gcagcaaaaa gtggttttac tgaagcgtat gataagaacc aaaatctcaa aaatgttgcc 180

ccgcaagatc tcgcttacag taatcctcag tgcattgatg cttgttatgt cccgccgaat 240

atttcagaga tacattgccg tttttcactc agagtagaag ctaactctct tcagcctgat 300

agctgtgaag atcagaaagt aaggcgatat cttattcaat tagcatcaat ttatgcgcaa 360

gtgggcggct accaagaatt ggcaaagcgt tactgtaaaa atattctgat gggtacatgg 420

ttatggcgca ataatcacac gttaggaact cggattgatg tgattacgtc gagtggccgc 480

tgttacgcca ttgacgatgc ccgttatttg gattggattg attggccgga agaagaacaa 540

gtaatgctga atgacttggc ttcagaaatg gcggcggcat tgtgtgaacc caaacaattt 600

tggtttgcag acataaaagc gacgttgaaa acggggtttt gtcaggagct tcatcccagc 660

cagaagttta ctgatagtca tgaacaagga gagtcatcta aacagtacgc cacggtagaa 720

tgtcctaatg gtattcaagc tgcatgtttt catgccgaga aggttggggc ggcgctacat 780

ctgattgatg attggtggga tgaggttgca gataagaggc tgcgaactca tgaatacggg 840

gcagatcgag actacctgat cgctcgccgc cacccaatga agaagcaaga cttttattcg 900

ttactgacac taactgctgt gtttatcagg cagcttagga acgtcaggga taaaggggg 960

gaaattccgc ctcaagttca ttacctaatg gctgtgttgt gcaaagccgg tatgtttcag 1020

cgaggtaaaa gctga 1035

<210> 1809
<211> 624
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1809
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ttagctgggc gttgtattag tatcttgcat ggtgtgttgt cctcggatca gaatgatatt 120

gatggcggta ttggcgtggt ttttccgcaa tggagctgta cgtctttagg gcggagtatc 180

gcatttgttt ccgataatca gcgacattta gaacagttaa gccagcaaca ttactttgct 240

gtgatgaagg gggataacct ctttgatatc tcgcatatcc aagcagtacc atcaggctta 300

tcagaaatac gattcaaacg taaccaagga atcgcgaagt gctttgcagg tgaaaaacgt 360

agaaggttag ctagggcaaa gcgtcgagca gaagcaagag gtgaagtctt taatccaaag 420

cacggtatgt cagatcgtga agtgagccta tttcacaaag cggttatgac cagtaaaagc 480

acaggccaaa aatacttact gcatattcaa agagaaacag ttacaggatc gagtgtgagt 540

cagtattcgc aatatgggct agcaaccaac attgagtgca tgggcacggt gcctgattta 600

agtccgataa tacccttttt ttga 624

<210> 1810
<211> 28
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

<400> 1810
gtgacctgcc ggataggcag ctgagaaa 28

<210> 1811
<211> 510
<212> DNA
<213> Photobacterium ganghwense strain JCM 12487

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<400> 1811
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attctgcctc tcagttacat gtaagttatt ttcttacatg aagaacagaa ccagatgcct 180

caaagaaaca aaacccgcat caagcgggct tatcttgctt agagctatta acgactctta 240

ttggattgcg nnnnnnnnnn gatggatgat gaatattcta ggtgaaagca ggtatcgaac 300

tctaagtagg attcaaccgt catagcctga ttcattttgg cactgacgaa cttaaaaaga 360

ttttttacgc gggaatgttt gagctttcgg cggtacatag tagaccagcc tgtttgttgt 420

taaactacaa caaaaatagc ttatgcacgc ttattgtacc aattatgcag ggtatcaagg 480

aagatatgca ggcttatggt gcaaactaca 510

<210> 1812
<211> 630
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1812
atgtatattc gaaatttacg taagccttcg cccaataaaa acgtctttaa attcgcgagt 60

gcaaaagtga gcgaaacgat aatgtgtgaa agtacattgg agttcgatgc atgtttccac 120

catgaatata atgagacaat cgagactttt ggcagccagc ctaaagggtt ttattactgt 180

tttgagggga aaaggttacc ttatacgcct gatgcgttac ttcactacat tgatgggacg 240

acaaagtttc atgaatataa accttacagc aagacattcg accctatttt tagagcaaag 300

tttgtagcta agaaagaggc tgctcaggca ctcggcactg agcttatact tgttactgat 360

aagcaaattc gtgtaaatcc aatcttaaat aatctcaaat tgcttcatag atactctggt 420

atctatggtg tgactgatat ccaacgtgag ttgctacagt tgattcgaca ctcaggaaag 480

attcagttgg atgatgttgc tgatgaatat gagctttcag tcggtgaaac tcgctcgttt 540

ctttattcac taatcaataa aggcttgcta gaggcagatc taactcaaga tgaccttagc 600

tgtaatccat ttgtttggtg taatgcatga 630

<210> 1813
<211> 1854
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1813
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ggtcaataca tcaagttaga tgatgctgag atacttaagc gcgatcttga tacttttcct 120

gactttctta aagaaaaagc ctttgataaa tataaactaa ttagttttat tgagcaggaa 180

aactcagggg gatggacgca aaaaaagcta gatccaattc ttgataaact atttgaaggc 240

aatagagata aacggcctaa ttggcgtacc gtggttcgtt ggcgtaagag ttatatcgat 300

agtaatggtg atttagcctc tttggttgtt aagcgccata aaatgggcaa ccgaaagaaa 360

cgagtggaag gcgacgaggt atttttgag cgagcattat ctcgttttct agatgccaaa 420

agaccgaaag tgacaacggc ctaccagtac tataaagatg ccatcacgat tgagaatgaa 480

acaatcgtcg atggggaaat ccctattatt tcctataccg ccttcaatca aagaataaag 540

tcactgccac cttatcctat agctgtcgct aggcatggta agttcaaagc tgatcagtgg 600

tttgcatatt gttcttctca tataccacca actcggattt tagaacgggt tgaaatagat 660

catactccac ttgatttaat ccttctcgat gatgaattac agctccctct tggaagaccc 720

tacctgactt taatcgttga tgtttttagt aattgtgttt taggttttca tttgagttat 780

aaagctccct cttatgtatc agcggctaaa gctattgtgc atgcgataaa gcctaaaact 840

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cgtttctttg gcatgattaa ccaatatttt ttaaccgaac tcccagggaa aacgttttca 1080

aatattctag aaaaagaaga ctacaaacct gaaaaagacg ccattatgcg tttttcagta 1140

tttgttgaag agtttcatcg ttggattgtt gatatttatc atcaggattc agactctcga 1200

gatacgcgta ttccaataaa gcagtggcag catggctttg atgtctatcc tccattgcag 1260

atgagtgtgg aagatgagaa acgttttaat gttctcatgg ggatcactga tgaaagaaca 1320

ttaactcgaa atggttttaa attcgaagag ttgatgtatg actcaactgc attagcggat 1380

tatcgtaagc actacccaca aactaaagac acaataaaaa agctgattaa aatagaccct 1440

gatgatctct ctaatatcca tgtttacctc gaagagttag agggctacct caaagtacct 1500

tgtaccgata ctacagggta tgccaatggt ttgagtctgc atgagcataa agtgattaag 1560

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ggtactatta ggcttgaaaa cagtgacacc ctttcagaca taaccaacaa accagagtct 1800

aatatcagtg atatcctcga taactgggat gataatatag aggggtttga atga 1854

<210> 1814
<211> 1032
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1814
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atgcatcctc aagctaaggt cattttcaat gattttgatg atctaaggtt aaatcgaaac 120

tttcaatcag accaacagtg catgttgttg accggagata caggtgtagg taaaagtcat 180

ctgattaaca actataaaaa acgagtgtta gctagtcaaa catatagccg tacttcaatg 240

ccggtattag ttacccggat ctcaagtcat aaaggtcttg atgcgactct gaggcagatg 300

ttaactgatt tggaatcatt tggcagccaa caacgaaaag ggcagaatta taaaatagat 360

ttgaaaactc aattggttaa aaatttagtt agagcgaatg tagagctact tattttcaat 420

gaatttcaag agttaataga gtttaaaaca cctaaagagc gtcaaacaat agctaatgaa 480

ttgaaattca tcagcgaaga agcaagagtt ccaattgtct tagttggcat gccttggact 540

gaacaaatcg ctgaagaacc acaatggtca tctcgcttaa tacgtagaag aaagcttgaa 600

tattttagtc tccaaaaaga cagtaaatat tatcgtcaat atctaatagg cttagccaag 660

catatgccct ttgatgagcc tcccaagatt gaagataaac atattgctat accattattt 720

gcagcctgcc gaggtgaaag tagggtatta aatcatctac tatcagagac attaaaactt 780

gtaatggtga atggtgatcg cagtcttgat attaggcatt tagctcaaac ttatagaaaa 840

ctttatgaga gtcaggaaag tgaggctgct tcggtttttt ttaacccttt tcttgagccg 900

ctagataagg tccttatttc agaagttgtt aagccatccc gatataaccc caatgcgatg 960

acccctgatg agatgttgat taagcgcgag ttttctgcgc cgagtacctt agctcaatta 1020

ctcagtaaat ga 1032

<210> 1815
<211> 1236
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1815
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agggaagagt tacatgaact tgattttgaa gctcatggcg catttcctgt agaactaaaa 180

cgacttaatg tttatcacgc taagcacaat agccacttta gaatgcgggc attaggctta 240

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ctgaaagaag agccctatat tcgtcaggct tggcatatta agccaattga agtgtgtgcc 480

aagcatgagt gtgaactgat tcatcattgc cctgattgcc aacaacctat cagttacatt 540

gagaatgaat ctattactca ctgctcatgc ggttttgagt ttgccaccgc ttcgagcgag 600

aaagccgata gccaagcggt tgtattgtcc cgtagcttgt ttgatggtga tgcattatct 660

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cagtctcaat gtttattgcc agaagataaa acaccacact ttatcgatat ggggttaatg 960

gaataccttg gcaaattagt tgagtcacat cctaagtcta aaaagcctaa tgtggctgac 1020

atgttggtgt ctgtgactga aaccgcagtt ttgctctcta ccagtcatga gcaagtgtat 1080

cggctttatc aagatggtgt gttaactgct ggatttaaac aaaagattcg cactcgaatc 1140

gatcctcata ttggtgtgtt ctacttaaga caagttattg agtacaaaac gagttttggt 1200

aacgataaac aagggatgta tttatcagca tggtag 1236

<210> 1816
<211> 2100
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1816
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attgctttaa ggcgagcatt tactggctat acagtgccga tggatgtgac gggcaatgag 120

gcctctgcgt taactatttt acttaatctg acttacccta gaaaacgggt tgatgatcta 180

cttgataaac ggttagccaa gcagacactc aatactgatg cacatctaga tgccagtatt 240

gacgaagtgc aatggttaca tacgcataat ttaaagtatc cagacatacg agtaagcaag 300

caaaggctga ttacagcatc tccgctatca cactctcata tattgagtag tgcaaactgc 360

ataagcacct tgggttggtc acatgacagt gccaaagtga atttagcaaa gttgttttca 420

tgtcatttta attggcaaga ccgtgtttgt tgtcttgcaa ctttgttgtc agatcctcct 480

aaaatttgga aagaagcttt tcaagcgtta ggcatgcttg tgaaggactt tatgaatttg 540

tgtggcagga ttaaagcttc attgcctagc tatgagagtc ccagtcgtgt cgataaatat 600

tcgattcaag ttcgcctgcc ttatcgagat ggctatttgg cgatcacacc agttgttagc 660

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ccattattag agtggcgttt agaggttgaa gagaacaaga ataatgttag cgaactcgcc 1080

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cagctattga agctaaatgt agcactctgc ccagtcatgt caggatatct gatgttagga 1920

ccccctgaaa gccgcaagaa ttcgttagag ccattacatt gttatgctga gcccgcgata 1980

ggagtggttg agtgtgccac tgctattgat ataaggttgc aagggatgag taacttttt 2040

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<210> 1817
<211> 1098
<212> DNA
<213> Shewanella sp. UCD-KL21

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ggtcaaaaag caggctttac agaagccttt actcctcagt tcaaatccaa aaacttagca 180

ccccaagatt tagcccactg caatcccctt atccttgaag agtgttatgt tccgccaaat 240

gttgagtata tttattgtcg tttctcattg agagtacaag ctaactctct taaaccagct 300

ggttgcagcg aaccgacagt atttgcttta cttgaagagt tcgctgccat atttaaagcg 360

tgtggcggtt acaaagaact agctactcga tactgtaaaa acgtgctgtt aggcacctgg 420

ctctggcgta accaaaatac ggggaactct caaatagata ttaaaactag cgctggtaat 480

tgctatcaaa tagctaatac tcgccaactt gcttgggaca gtcgttggcc tgccgatgct 540

cagcaagtat tggaagagtt aagtgatgag gttcatcaag cgttaactga tcctactgta 600

ttttggcatg ccaatatcac cgcaaaaatt gaaacggctt tctgccaaga gatctatcca 660

agccagtctt ttggcgaaaa ggcggcacag ggtgaagcat caaaacaatt tgctaaagtg 720

aagtgtgttg atggtcgtta tgccgttagc tttaattcgg taaaaatcgg cgctgcactg 780

caattaatag atgattggtg ggatgttgac gattccaagc gattacgtat tcatgaatac 840

ggtgcagaca aagaattagg tgttgcgcgc cgagctcccg aatctaagca gagtttttat 900

tctctattta tcaatacaga gctctatctt gcagagctta atcaacagct cgctgaggat 960

gaatattcca ttagcccaaa tatttactat ctgtttgcgg tgttaataaa gggcggcatg 1020

ttccagaaaa aggctgaagc taaaagcaaa tcaaaagccg aaacctccac cgctaaaata 1080

actcctgcta aggcctag 1098

<210> 1818
<211> 600
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1818
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atgggacgct gcatttcaat catgcatggc tttatttgta agcatgacat tcaagggctt 120

ggtgtgagtt ttccagcttg gtctgatgca tcaataggca atatgattgc ttttgtccac 180

acagatatag ctgcattgaa cgagttaaag ctacaaggct attttcaaga tatgcaggag 240

tgtggcgttt ttaaagtcga taatgttgaa gcggttcctg atgattgcgt ggaagttagg 300

tttaagcgca atcaaggtat tgcaaaaatg tttgttggtg aagctaggag acgattaaaa 360

cgtttagaaa aacgtgctct agcaagaggg gaggttttta atccaaataa aaacgatgag 420

ccgagagagt tagattgctt tcattgcata gcaataggaa gcaccagtac tgaacaggat 480

tttcttttgc atgttcaaaa agaaattgta caaaagtacg aagaacctga gtttaatcaa 540

tatggattag ctacaaataa gttactgaga gggacagttc ctgaatttag tgaattttaa 600

<210> 1819
<211> 28
<212> DNA
<213> Shewanella sp. UCD-KL21

<400> 1819
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<210> 1820
<211> 510
<212> DNA
<213> Shewanella sp. UCD-KL21

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<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1820
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atataaccat atcctgacat aaaatataac cgtaagctga caaattgaag caatctctgg 120

agccaaaact tttccatgta cttttatgac aacataatgc gacaaatatc atttacatta 180

tatgatttag aagaatggca ataatttagc tattctcatt ctttaaaact caagacctac 240

tcctaactcg nnnnnnnnnn tattgggcga aggcttacgt aaatttcgaa tatacatgcg 300

caaaactcaa gcaacttagg tacacttagt gtacagctgc tcgatgtttt gtcaaatttg 360

tcagactacg ctttaacttt taactcaagt aattgatttt aataatatta aattatgtag 420

ctaaaataca aaaatgctat tttatgtcaa actatgcttt aaatttgtca gactatggtt 480

gtcttatgtc aatgtatgct ttcagcgaca 510

<210> 1821
<211> 624
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1821
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tctaaaaacc gaagtgtcat tttgtgtgaa agttctttag aacgagattg ttgttaccat 120

ctcgaatact ctaaggacgt tttttcattc caatcacaac ccgaaggctt ctattattct 180

tcaggtaaca aacgttgtcc ctatactcct gattttctcg tgcgaaacca agatggttca 240

gagtattacc ttgaagttaa acctctcgct aaaaccttttt ctgaagattt caaacgttcc 300

ttcgctctaa agcgtattgc agcacagcat caaggaaaac cattagtatt agtcacagat 360

aaacagatac gtaatggagt gtatctagaa aaccttaact taatacatcg atatagtgga 420

ctagtggatt tcagcttgtc ctcaacaaaa attgttgagg agttgagtac tgcaggaaga 480

atgtgtattc gttcgcttgc ggataacctg aaactatcga ttggtgaagt gatagcagtc 540

gtctttcgtt taattggatt aggcagagtt aatgtgcctt tagattctgc aattaatgag 600

atgtctgtga tctcggtgaa ttga 624

<210> 1822
<211> 1908
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1822
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acttctgagg ctaagctagt tcgaaaacaa tacctaccac ttgattcagt cactattcat 120

gaacgagacc tgtcatcttt ttctgaagaa cagaaaaaca aggcattaga gcggtacaaa 180

cttatttctg ctgtcgctaa agagatatcc ggtggttgga cacctaaaaa tattaaccct 240

ttaattgata aatacggtct caatttatcg atcaaacggc caagttacaa atcagttatt 300

cgttggtata aatccttttg tgggagcgat ggaaacattg tgtgtttagt ggatcacaat 360

cactcaaaag gaaatagaac caaacgaatt attgatgacg aatccttttt tgttgaggcc 420

actgaacgtt ttcttgatgc aaaaagaccc aactattcac aagcgtatca gttttactgc 480

gacagaatcg aaattgaaaa cagcaatatt atctccggtc aaatatccaa agttagttat 540

caggcgttta aagaaagatt gaaaaaactt ccccccttatg aagttgcatt aaaacgattt 600

ggtcaaaatt atgcgaacaa gcttttcaat tactaccaat catcggttcc gaccacgaga 660

atattggaac gtgtagagct agaccataca ccactcgatt taatccttct tgatgatgac 720

ttactgatac ctttaggtcg agcctatttg acgttattgg tcgatgtgtt tagtggctgt 780

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ggatgggttc cgggaaaaac tttttcgaat atattggaaa aagatcggta tgacccacaa 1140

aaagacgccg taatgcggtt tagtagtttt gttgaagagc tacatcgttg gatcattgat 1200

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atgtatgaca atgtggcgtt agaacaatat cggaagcagt acccacaaac aaaaaagtct 1440

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gtggatgctt tatcattagc gaaagctcgg caggcacttc atgaacgtat taaaacggag 1680

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gaaaacaaaa acaagccgtt agatgacaac tttgacgagc ctactcctgt agacaatcta 1860

aaatcgctct ggaataaacg caaagcgatg aaaaggtcta aagaatga 1908

<210> 1823
<211> 987
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1823
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tcattcgtta tttatccaga tgtgcaacag atattcgatg gccttgattg gattgtacgt 120

cgcagtcaat ttggaaattt tacgccatct atgcttataa ctggtggcac aggtgcgggc 180

aaaacatcac ttattaatca ttatgcaaaa tatcatttta atgacaatga agtgttaatc 240

actcgcgtca gaccaagttt tatcgaaaca cttatctggg caattgataa gttgggtatt 300

ccttataaca ctcgttctaa acgttcagaa attggtttac aggattattt catcaatagt 360

gttaagaaat ccaatcttaa actgttggtc atagaagagg ctcaagaatt gtttgaatgt 420

gcatctccta aagaaagaca aaaaatacgt gaccgattaa agatgataag tgatgagtgc 480

cggttaccta tagtctttat tgggattcct actgctaaac ttattttgga agattcacag 540

tgggatagac gaattatggt taaaagagaa ctgccttata ttcgaataac atcggaatct 600

tcgttagatg tatacatcga tttacttgaa gagcttgaaa agcagcttcc tatttctgtt 660

caaccggagc tttcagagat ggatatcgca atgcgattat tatcggctac caaagggatg 720

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acgaatccgt ttacaacaga gttggaaaag ctattggtac cgcaagttat tgagtacgag 900

gggttcatca ttgaccccga aaatggcgaa atcaaattta ctaaacaaat atttaaagac 960

ataccattag cagctctatt gggttag 987

<210> 1824
<211> 1212
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1824
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tcgcaagaac aaggctacga gcgattttct cattttgctg aagacatctg gttcgacacg 120

ttggatcagc atgaagcgat tcccggtgct ttccccttag agctcaaccg aatcaatatc 180

taccatgcgc aaaccacaag ccaaatgcgg gtgcgagttc ttatccatct tgagaaccaa 240

ttaaaactca ataactttgg tgcactgcgc cttgcgttgt cacattcaaa agctcaattt 300

tctcccgaat acaaagccgt gcatcggttg ggagctgatt atccttttgt ttttcttgct 360

aaacgcttca cgcctatttg ccctttatgt attagtgagg ctccatacat tcgccagcag 420

tggcaatttc tttctcagca agtttgtgag cgccatggct gtaaattggt tcatcactgc 480

ccagagtgcc aatcgagatt ggaataccaa accaccgaaa gtattagcca atgcgaatgc 540

ggttttgaac tccgcaactc accggtagca gatgcgccag tggctgcgct actggttgca 600

agatggttgt caggaaatga ctcaaaacct ttgggattac tgaaggctga aatgacgccc 660

tctgagcgct atggtttttt actatggtac gttaatcgtt acggtgatat tgagaacatc 720

agtttcgagt catttgttga gtattgctct tgttggccaa gagtgctgca ggaagaactt 780

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cgtaatagcg tgctcacgca agtgttagcc tactttacaa agttaatggc aacactacct 960

tcaagcagca aagggaatgt aggcgatgtg ctgttgagcc ccttagaagt gtctacattg 1020

ctttcttgca caacggatga ggtgtatcgg ttgtatgagt ttggtgagat taaagcagcg 1080

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gtcatcgaaa caaagctgac tcgcatgtgc tctgaaaatg acggtttaag cgtgtatcta 1200

cctgagtggt aa 1212

<210> 1825
<211> 2088
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1825
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aaaaagatgt ttatgcccta tacagaagac gtttgtgttg atgggtatga acaagaaacg 120

ttgacgattt tgcttaatct cagttctagt catcaagctg ataggtgctc ggattggttg 180

gatgtagctc gggctcaaag gtatttaaaa gaccgcgaaa acttagatgc ctctcttgct 240

gaaatccagt ggttccacac acataaccta aagtttccag actgtcgagt taaggaccaa 300

cggataattg cgcgacctct ttctacagcc gaggagttta tttcaagtgc agtattggat 360

cagcgattgg gctgggctca taactctgct gtctatcgtc acacattatg gttactgaat 420

cctttaaat ggcaatcaca gccagtgtgt attctttcgc ttattcagca gaaaaatcca 480

gtttggcttg atctgcttac agaatttggc ttggatgtga agtcacttgc tcgcttacaa 540

cgtgcaattg aagaacagct tcctgagaat agttttcccg acagtgttag tacttacagt 600

aagcaattac ggtttccttt gggggatgat tatgtttcga tcacccccgt tgtgagtcac 660

gctcttcagt gcgaactaga aataagagcg cgaagtccag aaaacaagtt cagttttgtc 720

tcttcgtcac tgcctaactc tgccagtatt gggaacctgt gtggcagttt gggtgggtat 780

atgagagtcc taaattaccc gctaggtgtt aagcaggcca agggtgggac gttaacggaa 840

aaccgtcaaa agagtggtca ttactttgat gactatcagg taactaacgc caaaatttgt 900

caggtgctaa atcgcctaat tgggtctgag ccatccaaaa cacagcggca aagagaaaga 960

gctcgtaagg ttagaagtaa gattttacga aagcaaatag ccttatggat gctgccactc 1020

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catcccaaac tgatgcaggt agctaaagca caagtgacat gggtgcttga gcaactaagt 1260

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gatgataact tgcccgtttc tcttggctac catttattag agcatccaac taagaggggt 1920

aacgcaatca caggttgtca tgcttatgcg gagaatgcga tagggttagc taagcggata 1980

aacccgatag aggtccgttt tagtggacga gatcactttt taaaccacgc cttttggtcg 2040

atagaatgca gtagcgaaac tattcttata aaaaactata gggattaa 2088

<210> 1826
<211> 1032
<212> DNA
<213> Vibrio cholerae strain OYP7G04

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gcaccaaaag ggagttattc agaagcatat aaggggaaca agttcgtcga caagaatgtt 180

gccccccaag acttggcata ttcaaaccct cagttcatcg aagagtgcta tgtaaagccc 240

ggcgttgatg aaatctattg cgcattttca cttcgaattc gggccaattc gttaacccca 300

gatatctgta gtgatgatga agtgcgcagt aaactgtcta tgtttgctaa gatttataaa 360

gagctcaacg gatacaaaga gttagctaat cgttatgcga agaacatctt gcttggtact 420

tggttatggc gaaatcgtga gtgcagaaat atcactattg aagtgacgac cagtgaattg 480

gataccttg ttgtcgaaca tgctcaaaaa ctctcttggt atggtcattg ggatggtgat 540

tcaacagaat gcttagaaag gcttactgcc tatctggagc gagcattgtc tgacccaact 600

gaatacttct acatggacgt caaagcgaaa atgcgggttg gctggggaga tgaggtttac 660

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ttgcaatcga ttgacgattg gtggcatgaa gaggctgata agcctttaag agtgaacgaa 840

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tatcaattac tcagaaatac agagaactgg attgaaagta tgactgcttc tgaatccatt 960

ccgaatgacg tgcactttat tatgtctgtt ttgatcaagg gcggattgtt taattgcgcc 1020

aaggccaatt aa 1032

<210> 1827
<211> 639
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1827
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ctagcagggc gttgtatctc acaaatgcac ttgtttatgg ttaatcacca ccaagcaatg 120

aatagagtag gtgtgagttt tcctgattgg aatgaatctt cagttggtca aaccattgcc 180

tttgtttccg aggacaaaga gatgatgatt ggcctctctt ttcagcccta tttttcattg 240

atggttaatg aaggtttgtt tgagatctcc agtgtttatg aggtgccaga tacttccgaa 300

gaagtaaggt ttgttcgtaa tcagacgatt gggaaaaact ttttgggttc caaaaagcgt 360

cgaatcaaac gcagtatggc tagggccgag ttatttggta ttcaacaatc attaccagta 420

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cggcaggatt atattctgtt tattcaaaag gaactcgcag atgagcgtgc tgaatctggc 540

tttaatagct atggttttgc aaccaatcaa gaaaaaagag cgacggtacc tgacttacgt 600

tttaaccctt ttgacgaaga ctcttttttа gttcagtag 639

<210> 1828
<211> 28
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<400> 1828
gtgttctgcc gaataggcag ccaagaaa 28

<210> 1829
<211> 510
<212> DNA
<213> Vibrio cholerae strain OYP7G04

<220>
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<223> n is a, c, g, or t

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acaagcgata tctgggcatg aaagaaactt acttacgaaa aacgagtgtt ttcagcatta 180

acattgaaca aatactggca tcttacgtat aacaattttt tggacataaa tcagttaggc 240

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taaagaactt tcacacaaaa tgacacttcg gtttttagaa ctcgcaaact tgtacacatt 360

ttttgttgca gatggtttgc ggagatttcg aacgtacata acttgtccct taacgttgta 420

ataaaacaac caaattaagt ttaggacact ttatgagttt taaaaggaca gcttatgctt 480

ttaattggac actttatgct ttcagcgaca 510

<210> 1830
<211> 624
<212> DNA
<213> Vibrio cholerae strain M1517

<400> 1830
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gaatacaacc caaacatcaa aagttttacc tctcaacctt ttggtttcca ctatctattc 180

aataaccgta agtgtcgata tacccctgac tttttagcaa taggtcacaa tgagcaatca 240

acattcttcg aggtcaaaca ctctagccag attcctaaac ctgattttag ggagcgcttt 300

gaagaaaagc agagagtagc gttgagtgag ttcaacagac ggttagttct cgttactgag 360

aagcaaatca ggatggggcc aacgctagat aactttaagt tgttacaccg ctactcagga 420

ttgcgaacag tgaccgaatt tcaaaagcga gttttggcat ttattcaacg taagcaaatg 480

gtgaagttgc aagaggtgtc tttgtatttt ggtctatcag agcaagacac gcttatctct 540

actctacctt ggatctcttc ggggcacgtt aaaacagatc tcaacactat tggctttggt 600

ctagaaactt gcgtttggtg ctaa 624

<210> 1831

<211> 1866
<212> DNA
<213> Vibrio cholerae strain M1517

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gatagtttgc cagcaaaaat tcaggaggag gttcttcgcc gcataaaagt gattactttt 180

gtggagaagc gcttgaaagg tgggtggaca gagaaaaact tgaaccccat tttaagtctc 240

gttgaatcag aattacagct tactcccct agttggcgga ctgtagcaac ttggaaaaaa 300

tcctacgctg aagcaggtag agaagcttcg gcacttattc cgaagcatac gtttaagggc 360

aaccgccaga aagaaatgga ttcgcaatcc ttgattgacg aggcaattca gaacgtatac 420

ctgacacgtg aacgacttag cgttgcagaa gcataccgat attataagag tcgagtgatt 480

caaatgaatc gagggattgt tgaaggaaaa atcaagccaa ttgccgaacg ttctttttat 540

aatagaataa atgagttacc cccttatgaa gtggcgattg caagatttgg taaacgatat 600

gcagatcggg agtatcggtc ggttggtcag caggtagttg caactaaacc tatggagttt 660

gttgaaatag accatacccc agttccagtg atcttgattg acgatgaact agatattcct 720

ttgggccgcc cttatttgac gatgctttat gaccgtttca gtaagtgcat tgttggttgc 780

agtatcaact ttagagagcc aagctttgac tctgttagaa aggctctgtt gaattcactt 840

ttggataaaa gctggcttaa agcaaagtat ccatcgattg agaatgagtg gccttgccac 900

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gattcgttac ggcctttggt gtccgacatt caatacagtc aagcagcgaa gccttggcga 1020

aagtcaggga tcgaaaagtt gttcgatcaa atgaataaag ggttagttaa cgcgctgcct 1080

ggaaaaacct tcaccaatcc tactcaacta caagattaca atccaaagaa ggatgcggtg 1140

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gcaccagatt ctagagagcg cgagatccca taccacaagt ggcaccaatc gaaatggacg 1260

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cacaggacga ttggagtggc cgggatcagg ctgcataact tacgctatca gtccgccgag 1380

cttattgaat accggaaata ttgcacacct aataatggca aacagctctt tgttaagacc 1440

aaaacagatc cttctgatat cagctacatt catgtttacc tagaatcaga aaagaagtac 1500

ataaaagttc cagcagtaga caacagcggg tatacaaacg gactttcact ttttgaacac 1560

caacgcatac aaaaagtacg cagactgaac accaaggatc ttgctgatga tgaggctctt 1620

gcggatacat ttctgtatat gaaaaaacgt atccacgaag aaaccgatag attccgtcgt 1680

gttaaaagta gcaagcccaa ccttcctaaa acaggtaaca cgtcgagact agcaaagttt 1740

aatgatgtcg gatctgaggg accaaactca atcaacgtga ctcctgttag gctcaaatct 1800

gaggttgttt ccgatgcctc agagtactta gatgacgatg attttgaaga tattgaaggg 1860

tattag 1866

<210> 1832
<211> 1098
<212> DNA
<213> Vibrio cholerae strain M1517

<400> 1832
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tccattttcg atcaacttcg tttcaatcac tctttaggtg gtgaaccaga atctttcttg 180

ttaactggtg aggctggaag tggaaagaca gctttgatca acaactactt gtcacgcttt 240

caatcgggtt caacttgggg aaagcagcca gtattaagca ctagagtgcc aagtcgtatc 300

aatgaacaga atacgctgac ccaatttttg gttgatttag attgtaaatc aggaggacga 360

ggaattcggc gccgtaatga aattgcgctt ggcgaagcgg ttgtaaagca acttaaacgt 420

aaatctgttg agctgattat tgttaatgaa attcaagagc ttgttgagtt ttcaaccgca 480

gaacagagac aagttattgc caacacattc aaatatatga gtgaagaagc aagagtttct 540

tttgtgcttg tgggtatgcc ttatgctgat gtgatagcga cagaaccaca atggaattcg 600

cggctaagct ggagaagaaa gatagattat ttcaaattgt tgaaagcgaa tagtcattcg 660

agtaaaacgg catcttatgg gtttgactta gaacaaaaaa aacattttgc cagatttgtc 720

gcgggtctga gttcaaggat ggggtttgat gagccaccag tacttacaaa gaatgaactg 780

ctatatcctt tgtttgcaat gtgccgagga gaatgccgag cgttaaaaca cttcttgaaa 840

gacgcgttgc ttacgagctt caacgacaat gcggatacga tagacaaagc aatattgtca 900

cgcacttttg catttaagtt cccctaccta gataacccgt ttgatcgtcc tttagagcag 960

cttagtcttc atcaaattga ctctggttct gcttaccact taaatgcaat caccactgaa 1020

gataaaatag tagcccctcg ttttacggac gccattccgt tgagcatgct attgagcaaa 1080

aatgggctta aagcttag 1098

<210> 1833
<211> 1212
<212> DNA
<213> Vibrio cholerae strain M1517

<400> 1833
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atggagcagc atgaagcgat tgctggtgct ttccccttag agctcaaccg aatcaatatt 180

tatcacgccc aaaccacaag ccaaatgcgg gtgcgagttc ttatccatct tgagaaccaa 240

ttaaaactca ataactttgg tgtactgcgt ctcgcgttgt cacattcaaa agctcaattt 300

tctcccgaat acaaagccgt tcatcggttg ggttctgatt atcctttcgt ttttcttggt 360

aaacgcttca cgcctatttg ccctttatgt attagtgagg ctccatacat tcgccagcag 420

tggcaatttc tttctcagca agcttgtgag cgccatggtt gtaaattggt tcatcactgc 480

ccagagtgcc aatcgagatt ggaataccaa acaactgaga gtattagcca atgcgaatgc 540

ggttttgaac tccgcaactc accggtagaa gatgcgccag tggctgcgct actggttgct 600

cgatggttgt caggaaatga ctcaaaacct ttgggattac tgaaggctga aatgacgctc 660

tctgagcgct atggtttttt actatggtac gttaatcgtt acggtgatat tgagaacatc 720

agttttgagt catttgttga gtattgctct tgttggccaa gagtgctgaa ggaagaactt 780

gatgagttgg taaacaaagc cgatctcatt cgaatcaaag attggaaaaa gacgtttttc 840

aatgaagttt ttggcgcttt gcttaaagat tgccgccagt taccaagtag gcagttagag 900

tgtaatagcg tgctcactca agtgttagcc tactttacaa agttaatggc agcaatacct 960

tcaagcagca aagggaatgt aggcgatgtg ctgttaagcc ccttagaagc ttctacatta 1020

ctttcttgca caacggatga ggtgtatcgg ttgtatgagt ttggtgagat taaagcagcg 1080

attaggccgc ggatgcatac caaaattgcc agtcatgaat cggcgttcac cctaagaagt 1140

gtcatcgaaa caaagctgac tcgcatgtgc tctgaaaatg acggtttaag cgtgtatcta 1200

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<210> 1834
<211> 2088
<212> DNA
<213> Vibrio cholerae strain M1517

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ttgacgattt tgcttaatct cagttctagt catcaagctg ataggtgctc ggattggttg 180

gatgtagctc gggctcaaag gtatttaaaa gaccgcgaaa acttagatgc ctctcttgct 240

gaaatccagt ggttccacac acataaccta aagtttccag actgtcgtgt taaggaccaa 300

cggataattg cgcgacctct ttctacagcc gaggagttta tttcaagtgc agtattggat 360

cagcgattgg gctgggctca taactctgct gtctatcgtc acacattgtg gttactgaat 420

ccttttaaat ggcaatcaca gccagtgtgt attcttttgc ttattcagca gaaaaatcca 480

gtgtggcttg atctgcttac agaatttggc ttggatgtga agtcacttgc tcgcttacaa 540

cgtgcaattg aagaacagct tcctgagaat agttttcccg acagtgttag tacttacagt 600

aagcaattac ggtttccatg gggtgatgat tatgtttcga tcacccccgt tgtgagtcat 660

gctcttcagt gcgaactaga aataagagcg cgaagtccag aaaacaagtt cagttttgtc 720

tcttcgtcac tgcctaattc tgccagtatt gggaacctgt gtggcagttt gggtgggtat 780

atgagagtcc taaattaccc gctaggtgtt aagcaggcca agggtgggac gttaacggaa 840

aaccgtcaaa agagtggtca ttactttgat gactatcagg taactaacgc caaaatttgt 900

caggtgctaa atcgcctaat tgggtctgag ccatccaaaa cacagcggca aagagaaaga 960

gctcgtaagg ttagaagtaa gattttacga aagcaaatag ccttatggat gctgccactc 1020

attgagttaa gagatatcgc cgaatctgaa cccaatcagc aacaactaga gcatgacgac 1080

actttagctc aagccttttt gtcgttgcca gaatgggagc ttggctcttt ggctggtgag 1140

tttaaccgac gcttacatct cgcgtttcaa aataatatct attctgccaa gtttgcttat 1200

catcccaaac tgatgcaggt agctaaagca caagtgacat gggtgcttga gcaacttagt 1260

aagccaatta acaatcaaga tacggtgacg ggggagcaat atatctacct gtcgtcaatg 1320

agagtgcaag acgcggtagc gatgagtaac ccttgtttgt gtggtgtgcc gtctttgacg 1380

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acaggcagga gtgaactttt ccatgtttta aaaggattac ctgcatacgg gcgatggtta 1800

tacccaagtg aaaagcaacc tactaatttt gatgagttag agcggttgct cactcaagac 1860

gatgataact tgctcgtttc tcttggttac catttgttag agcatccaac taagcgggat 1920

aacgcaatca caggttgtca tgcttatgcg gagaatgcga tagggctagc taagcgaata 1980

aacccgatag aggtacgttt tagtggacga gatcactttt taaaccacgc cttttggtcg 2040

atagaatgca gtagcgaaac tattcttata aaaaactata gggattaa 2088

<210> 1835
<211> 1032
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<213> Vibrio cholerae strain M1517

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gcaccaaaag ggagttattc agaagcatat aaggggaata agttcgtcga caagaatgtt 180

gccccccaag acttggcata ttcaaaccct cagttcattg aagagtgcta tgtaaagccc 240

ggcgttgatg aaatctattg cgcattttca cttcgaattc gagccaattc gttaacaccg 300

gatatgtgta gtgatgatga agtacgcagt aaactgtcta tgcttgctaa aatttataaa 360

gatctcaacg gatacaaaga gttagcccat cgttatgcga agaacatctt gcttggtact 420

tggttatggc gaaatcgtga gtgcagaaat atcactattg aagtgacgac cagtgaattg 480

gataccttg ttgtcgaaca tgctcaaaaa ctctcttggt atggtcattg ggatggtgat 540

tcaacagaat gcttagaaag gcttacagcc tatctggagc gagcattgtc tgacccaact 600

gaatacttct acatggacgt caaagcgaaa atgcgggttg gctggggaga tgaggtttac 660

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gtagagcttt tgagcggaaa agaaaccgtc gcgttccacg gacaaaaagt tggtgcggcg 780

ttacaatcga ttgatgattg gtggaatgaa aacgcagata agccattaag agtgaatgaa 840

tatggtgctg accgagagta cgttatagca aggcgacacg taacccatgg aaatgacttt 900

taccaattag tcagaaatac agagaattgg attgagacaa tgacagcttc tcgaaccatc 960

ccaaatgatg tgcactttat tatgtctgtt ttgatcaagg gcggattgtt taattgcgcc 1020

aaggccaatt aa 1032

<210> 1836
<211> 630
<212> DNA
<213> Vibrio cholerae strain M1517

<400> 1836
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aatagagtag gtgtgagttt tcctgattgg aatgaatctt cagttggtca aaccattgcc 180

tttgtttccg aggacaaaga gatgatgatt ggactctctt ttcagcccta tttttcattg 240

atggttaatg aaggtttgtt tgagatctcc agtgtttatg aggtgccaga tacttccgca 300

gaagtaaggt ttgttcgtaa tcagacgatt gggaaaaact ttttgggttc caaaaagcgt 360

cgaattaaac gcagtatggc tagggccgag ttatttggtg ttgaacaatc attaccagta 420

acgaatgaag accgtgtcat cgatagtttt catcgaatcc ctatttctag cggctcttca 480

cggcaggatt ttattctgtt tattcaaaag gaactcgcag atgagcgtgc taaatctggc 540

tttaatagct atggttttgc aaccaatcaa gaaaaaagag cgacggtacc tgacttacgt 600

tttaaccttt ttgaagaaga ttctttttag 630

<210> 1837
<211> 27
<212> DNA
<213> Vibrio cholerae strain M1517

<400> 1837
gtgttctgcc gaataggcag ccaagaa 27

<210> 1838
<211> 510
<212> DNA
<213> Photobacterium iliopiscarium strain NCIMB 13355

<220>
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<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1838
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attctacgtt gtaaagttac tacaacaata ttctttcaat gatcgatgtc ttacatttct 180

actcacagag tacaatttga ggatgtgata ggcgtcagta tttcttggac aacatataaa 240

acagagaaag nnnnnnnnnn ttgatgtttg ggttgtattc gaggtgaaaa cagaaatcga 300

actccagaat ggagagagtg cgaacaacag catcattctt caagctcatg aacttacaga 360

tgttgtgcac atgagatgat ttcttagttt ggtcaaacat agctaagtca cttttgttgt 420

aaacctacaa caaaacgtag tctatgcaga cttatagtgc aaatttgcga aatattctgc 480

aatttatgcg aacttatttt gcaaacatca 510

<210> 1839
<211> 229
<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1839

Met Ser Ala Leu Pro Ser Pro Ser Thr Thr Thr Leu Ile Ala Leu Glu
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Ser Ala Phe Val Thr Pro Ala Arg Asn Leu Thr Lys Ser Arg Gly Lys
20 25 30

Asn Ile His Arg Tyr Val Ser Ala Lys Met Gly Lys Arg Val Thr Val
35 40 45

Glu Ser Phe Leu Glu Cys Val Ala Cys Tyr His Phe Asp Phe Glu Pro
50 55 60

Ser Ile Val Arg Phe Cys Ser Gln Pro Ile Arg Phe Ser Tyr Gly Leu
65 70 75 80

Asn Gly Lys Thr His Thr Tyr Val Pro Asp Phe Leu Val Gln Phe Asp
85 90 95

Thr Gly Glu Phe Lys Leu Tyr Glu Val Lys Ser Asp Met Glu Ser Ser
100 105 110

Lys Glu Glu Phe Gln Cys Glu Trp Glu Ala Lys Val Gln Gly Ala Phe
115 120 125

Glu Leu Gly Leu Glu Leu Glu Leu Val Thr Glu Glu Glu Ile Leu Asp
130 135 140

Glu Val Ile Phe Ser Asn Leu Lys Leu Leu His Arg Tyr Ala Ser Arg
145 150 155 160

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Asp Asn Leu Asn His Phe His Gln Thr Leu Leu Ala Thr Phe Lys Leu
                165                 170                 175


Asn Gly Thr Gln Thr Ala Lys Ser Leu Gly His His Leu Gly Leu Asn
            180                 185                 190


Gly Arg Lys Ile Leu Pro Phe Leu Cys Asp Leu Leu Ser Arg Asn Leu
        195                 200                 205


Leu Gln Thr Ser Leu Glu Thr Pro Leu Ser Leu Glu Ser Glu Phe Glu
    210                 215                 220


Leu Gly Cys Tyr Ala
225


<210>  1840
<211>  603
<212>  PRT
<213>  Vibrio cholerae strain 4874

<400>  1840

Met Pro Asn Lys Ser Phe Ser Ser Phe His Arg Lys Ser Ala Phe Gln
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Gln Glu Lys Leu Glu Pro Asn Asp Arg Val Val Asp Asp Asn Asp Val
            20                  25                  30


Asp Glu Ala Thr Tyr Gln Asp Ile Ser Ala Phe Pro Asp Asn Ile Ala
        35                  40                  45


Thr Gln Ile Thr Phe Arg Leu Ser Ile Leu Arg Tyr Leu Ala Ser Lys
    50                  55                  60


Cys Glu Arg Ile Ile Pro Lys Thr Ile Glu Pro His Arg Val Gly Leu
65                  70                  75                  80


Gln Arg Leu His Asp Arg Lys Ile Pro Ser Ala Ile Ser Ile Tyr Arg
                85                  90                  95
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Trp Trp Leu Val Phe Arg Ala Ser Gly Cys Asn Pro Val Ser Leu Ala
            100                 105                 110

Pro Lys Asn Lys Asn Lys Gly Asn Ser Lys Ala Lys Val Pro Thr Phe
        115                 120                 125

Val Asp Ala Leu Met Glu Gln Ala Val Asp Arg Val Ile Ser Gly Arg
    130                 135                 140

Lys Val Arg Ile Arg Ser Ala Tyr Arg Arg Val Arg Arg Lys Leu Arg
145                 150                 155                 160

Gln His Asn Leu Asn Asn Gly Thr Lys Tyr Lys Tyr Pro Thr Tyr Glu
                165                 170                 175

Ser Leu Arg Lys Arg Val Lys Lys Lys Thr Pro Phe Glu Leu Leu Ala
            180                 185                 190

Ala Lys Lys Gly Glu Arg Val Ala Lys Arg Glu Phe Arg Arg Met Gly
        195                 200                 205

Lys Lys Ile Leu Thr Ser Tyr Val Leu Glu Arg Val Glu Ile Asp His
    210                 215                 220

Thr Val Val Asp Leu Phe Ala Val His Glu Glu His Arg Val Pro Leu
225                 230                 235                 240

Gly Arg Pro Trp Leu Thr Gln Leu Val Asp Cys Tyr Ser Lys Ala Val
                245                 250                 255

Ile Gly Phe Tyr Leu Gly Phe Glu Pro Pro Ser Tyr Val Ser Val Ser
            260                 265                 270

Leu Ala Leu Lys Asn Ala Ile Leu Arg Lys Asp Asp Leu Leu Ser Ser
        275                 280                 285

Phe Asp Ser Val Glu Asn Glu Trp Leu Cys Tyr Gly Ile Pro Asp Leu
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    290                 295                 300

Leu Val Thr Asp Asn Gly Lys Glu Phe Leu Ser Lys Ala Phe Asp Lys
305                 310                 315                 320

Ala Cys Glu Ser Leu Leu Ile Asn Val His Gln Asn Arg Val Glu Thr
                325                 330                 335

Pro Asp Asp Lys Pro His Val Glu Arg Ser Tyr Gly Thr Ile Asn Thr
            340                 345                 350

Ser Leu Leu Asp Asp Leu Pro Gly Lys Ala Phe Ser Gln Tyr Leu Gln
        355                 360                 365

Arg Glu Gly Tyr Asp Ser Val Gly Glu Ala Thr Leu Thr Leu Asp Glu
    370                 375                 380

Ile Lys Glu Ile Tyr Leu Ile Trp Leu Val Asp Ile Tyr His Pro Lys
385                 390                 395                 400

Ser Asn Gln Arg Gly Thr Asn Cys Pro Asn Val Ala Trp Lys Arg Gly
                405                 410                 415

Cys Gln Glu Trp Glu Pro Glu Glu Phe Asn Gly Ser Lys Asp Glu Leu
            420                 425                 430

Asp Phe Lys Phe Ala Ile Val Asp Gln Lys Gln Leu Thr Lys Ala Gly
        435                 440                 445

Val Thr Val Tyr Lys Glu Leu Thr Tyr Ser Ser Glu Arg Leu Ala Glu
    450                 455                 460

Tyr Arg Gly Lys Lys Gly Asn His Lys Val Gln Phe Lys Tyr Asn Pro
465                 470                 475                 480

Glu Cys Met Ala Val Ile Trp Val Leu Asp Glu Asp Leu Asn Glu Tyr
                485                 490                 495
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Phe Thr Val His Ala Ile Asp Tyr Glu Tyr Ala Ser Arg Val Ser Leu
            500                 505                 510

Trp Gln His Lys Tyr Asn Met Lys Tyr Gln Ala Glu Leu Asn Ser Ala
        515                 520                 525

Glu Tyr Asp Glu Asp Lys Glu Ile Asp Ala Glu Ile Lys Ile Glu Glu
    530                 535                 540

Ile Ala Asp Arg Ser Ile Val Lys Thr Lys Lys Ile Arg Ala Arg Arg
545                 550                 555                 560

Arg Gly Ala Arg His Gln Glu Asn Ser Ala Arg Ala Lys Ser Ile Ser
                565                 570                 575

Asp Ala Lys Pro Val Pro Ser Gln Lys His Glu Asp Glu Ile Val Ile
            580                 585                 590

Val Asp Asn Glu Asp Trp Asp Ile Asp Tyr Val
        595                 600
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<210> 1841
<211> 329
<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1841

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Met Asn Glu Thr Arg Glu Ala Arg Ile Ser Lys Ala Lys Arg Ala Phe
1               5                   10                  15

Val Ser Thr Pro Ser Val Thr Lys Ile Leu Cys Tyr Met Asp Arg Cys
            20                  25                  30

Arg Asp Leu Ser Asp Phe Asp Ser Glu Pro Thr Cys Met Met Val Tyr
        35                  40                  45

Gly Ala Ser Gly Val Gly Lys Thr Thr Ile Ile Lys Lys Tyr Leu Asn
    50                  55                  60
```

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Gln Asn Arg Arg Asp Ser Glu Val Gly Gly Asp Ile Ile Pro Val Leu
65                  70                  75                  80

His Ile Glu Leu Pro Asp Asn Ala Lys Pro Val Asp Ala Ala Arg Glu
                85                  90                  95

Leu Leu Val Glu Met Gly Asp Pro Leu Ala Leu Tyr Glu Thr Asp Leu
            100                 105                 110

Ala Arg Leu Thr Lys Lys Leu Ile Asp Leu Ile Pro Val Val Gly Val
        115                 120                 125

Lys Leu Ile Ile Ile Asp Glu Phe Gln His Leu Val Glu Glu Arg Ser
    130                 135                 140

Asn Arg Val Leu Thr Gln Val Gly Asn Trp Leu Lys Met Ile Leu Asn
145                 150                 155                 160

Lys Thr Lys Cys Pro Ile Val Leu Phe Gly Met Pro Tyr Ser Lys Val
                165                 170                 175

Val Leu Gln Ala Asn Ser Gln Leu His Gly Arg Phe Ser Ile Gln Phe
            180                 185                 190

Glu Leu Arg Pro Phe Ser Tyr Gln Gly Gly Glu Gly Val Phe Lys Thr
        195                 200                 205

Phe Leu Glu Tyr Leu Asp Lys Ala Leu Pro Phe Glu Lys Gln Ala Gly
    210                 215                 220

Leu Ala Asn Glu Ser Leu Gln Lys Lys Leu Tyr Ala Phe Ser Gln Gly
225                 230                 235                 240

Asn Met Arg Ser Leu Arg Asn Leu Ile Tyr Gln Ala Ser Ile Glu Ala
                245                 250                 255
```

```
Ile Asp Asn Gln His Ala Thr Ile Thr Glu Glu Asp Phe Val Phe Ala
            260                 265                 270

Ser Lys Leu Thr Ser Gly Asp Lys Pro Ile Thr Trp Lys Asn Pro Phe
        275                 280                 285

Asp Glu Gly Val Lys Val Thr Glu Asp Met Leu Arg Pro Pro Pro Lys
    290                 295                 300

Asp Ile Gly Trp Glu Asp Tyr Tyr His Asn Val Lys Pro Lys Asn Gln
305                 310                 315                 320

Arg Arg Lys Gly Ser Asn Met Phe Glu
                325
```

<210> 1842
<211> 397
<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1842

```
Met Lys Thr Met Leu Leu Gln Arg Pro Lys Pro Phe Glu Asp Glu Ser
1               5                   10                  15

Leu Glu Ser Tyr Leu Ile Arg Ile Ala Asn Arg Asn Gly Tyr Gln Asp
            20                  25                  30

Val Asp Arg Phe Leu Ser Ala Leu Lys His Tyr Leu Cys Asp Gly Asp
        35                  40                  45

Ser Glu Lys Phe Ser Ser Phe Pro Thr Asp Ile Arg Arg Ile Asn Pro
    50                  55                  60

Tyr Ser Ser Lys His Ser Ser Ala Ala Arg Ser His Ala Leu His Lys
65                  70                  75                  80

Ile Gly Gln Leu Thr Phe Thr Glu Ser Val Asp Leu Leu Lys Leu Ala
                85                  90                  95
```

```
Ile Asn Arg Ser Pro Leu Lys Tyr Ser Pro Ser Val Thr Ala Val Ile
            100                 105                 110

Arg Gly His Glu Val Phe Pro Arg Ser Leu Leu Arg Thr Asn Ile Ile
        115                 120                 125

Pro Val Cys Pro Val Cys Leu Gln Glu Asn Gly Tyr Ala Ser Tyr Leu
    130                 135                 140

Trp His Phe Glu Gly Tyr Asp Tyr Cys His Ile His Asp Leu Ala Leu
145                 150                 155                 160

Thr Tyr Asn Cys Gln Cys Gly Lys Pro Cys Asp Tyr Arg Val Ser Gly
                165                 170                 175

Leu Gln Leu Val Cys Ser Ser Cys Gly Thr Thr Leu Thr His Leu Leu
            180                 185                 190

Glu Lys Pro Thr Asp Arg Ser Ser Asp Ile Ser His Trp Leu Ala Gly
        195                 200                 205

Glu Thr Ile Lys Trp Leu Pro Ala Val Pro Val Ser Tyr Arg Trp Gly
    210                 215                 220

Leu Val His Trp Trp Met Asn Asn Lys Lys Ser Lys Glu Leu Glu Thr
225                 230                 235                 240

Glu Ser Phe Thr Ile Phe Trp Lys Asn Trp Pro Asn Ser Phe His Asn
                245                 250                 255

Leu Ile Gln Glu Thr Leu Ser Tyr Asn Gln Thr Tyr Ser Leu Val Ala
            260                 265                 270

Pro Thr Gln Trp Arg Leu Lys Asp Leu Leu Gly Glu Ile Leu Phe Ser
        275                 280                 285

Ser Ile Asn Leu Pro Gly Arg Asn Leu Gln Tyr Asn Leu Ile Leu Arg
```

```
    290                 295                 300

Glu Leu Phe His Tyr Leu Glu Asn His Leu Trp Glu Asn Asn Gly Leu
305                 310                 315                 320

Ile Ala Asn Leu Arg Leu Ser Ala Phe Glu Val Ser Leu Ile Leu Gly
                325                 330                 335

Cys Ser Thr Glu Glu Val Ala Ser Met Ser Glu Gln Gly Leu Leu Ile
            340                 345                 350

Pro Ile Gln Asn Arg Lys Arg Tyr Glu Pro Met Ser Leu Thr Asn Cys
        355                 360                 365

Ile Phe His Phe Gly Asp Val Phe Cys Ile Trp Leu Ala Glu Phe Gln
    370                 375                 380

Thr Asp Glu Phe Asn Arg Ser Phe Tyr Thr Ser Arg Trp
385                 390                 395
```

<210> 1843
<211> 642
<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1843

```
Met Thr Leu Asp Glu Leu Leu Ala Thr Thr Lys Tyr Glu Glu Leu Val
1               5                   10                  15

Ser Ser Thr Lys Arg Ser Phe Arg Pro Leu Ser Pro Leu Ile Asp Ile
            20                  25                  30

Thr Asn Asn Pro Met Thr Ala Leu Thr Ile Leu Val Asn Leu Thr Glu
        35                  40                  45

Lys Gly Ile Ser Asn Lys Asn Leu Leu Asp Lys Glu Arg Cys Lys Glu
    50                  55                  60
```

```
Lys Leu Arg Asp Asp Lys Trp Trp Ala Ala Val Leu Lys Pro Ala Gln
65                  70                  75                  80

Tyr Arg His Ser His Asn Val Lys Phe Pro Asp Ile Arg Ser Thr Gly
                85                  90                  95

Thr Ile Arg Thr Val Ala Pro Asp Asn Leu Pro Ala Tyr Phe Ile Thr
            100                 105                 110

Ser Ser Lys Leu Pro Asn Val Gly Trp Thr Tyr Ser Lys Asp Ser Ser
        115                 120                 125

Asp Ile Asn Arg Cys Leu Phe Phe Thr Ser Glu Phe Leu Trp Ala Gly
    130                 135                 140

Gln Pro Cys Cys Leu Ala Arg Ala Leu Thr Asp Ser Glu His Pro Leu
145                 150                 155                 160

Trp Ser Thr Leu Lys Lys Leu Gly Cys Tyr Glu Lys Asn Lys Lys Leu
                165                 170                 175

Ala Ala Lys Leu Leu Ser Gln Ile Pro Gly Glu Leu Ile Asp Val Asp
            180                 185                 190

Leu Thr Gly Asn Tyr Leu Ser Gln Val Ser Phe Pro Asp Gly Arg Asp
        195                 200                 205

Ser Tyr Leu Ser Phe Ser Pro Val Ala Ser Gln Ala Met Gln Ser Cys
    210                 215                 220

Val Tyr Gln Ser Leu Glu Gln His Tyr Arg Gln Thr Ala Leu Met Arg
225                 230                 235                 240

Phe Asp Arg Ala Thr Asn Met Gly Leu Leu Ser Ala Ser Cys Gly Gly
                245                 250                 255

Arg Phe Arg Leu Ile Glu Thr Lys Pro Tyr Ile Lys Asp Lys Arg His
            260                 265                 270
```

```
His Tyr Ile Ser Glu Leu Pro Asn Trp Leu Thr Lys Glu Ala Ile Gln
        275                 280                 285

Ser Val Glu Gln Phe Leu Arg Ser Glu Gln Trp Leu Val Thr His Asn
    290                 295                 300

Asp Lys Pro Arg Asn Met Ala Ile Val Lys Ser Ser Ile Arg Ser Met
305                 310                 315                 320

Val Asn Arg Trp Leu Ser Ser Arg Thr Asn Thr Glu Ala Leu Ser Pro
                325                 330                 335

Ala Glu Leu Ala Glu Gln Leu Asn Asn Asp Ile Ala Ser Lys Arg Ile
            340                 345                 350

Ile Lys Arg Tyr Ala Tyr Gln Pro Lys Leu Thr Arg Leu Phe Ile Gln
        355                 360                 365

Leu Ile Glu Asn Thr Gly Glu Asp Asn Ala Tyr Lys Glu Asp Arg Lys
    370                 375                 380

Pro Thr Thr Asn Ser Gln Tyr Leu Leu Ile Pro Glu Leu Arg Ile Ser
385                 390                 395                 400

Gly Gly Ser Ala Ile Ser Ser Ser Val Ser Val Gly Leu Phe Ser Met
                405                 410                 415

Met Ser Leu Tyr Gly Phe Ile His Ala Phe Glu Arg Asn Met Gln Leu
            420                 425                 430

Val Leu Thr Ser Phe Thr Ile Asp Ser Phe Ala Ile Cys Val His Asp
        435                 440                 445

Tyr His Leu Glu Lys Arg Gly Leu Thr Lys Glu Pro Ile Lys Lys Ala
    450                 455                 460
```

```
Lys Val Arg Lys Asp Glu Gln Glu Lys Ile Ala Pro Pro Ala Ile Tyr
465                 470                 475                 480


Asp Asp Tyr Gln Phe Asp Ser Cys Ile Ser Leu Ile Ile Lys Thr Ser
                485                 490                 495


Glu Ser Lys Thr Ile Pro Ala Glu Lys Met Val Ala Leu Leu Pro Lys
            500                 505                 510


Arg Phe Ala Arg Gly Ala Ile Arg Leu Ser Ile Asp Gly Ile Gln Glu
        515                 520                 525


Ile Gly Ala Phe Pro Lys Pro Leu Pro Ala Ile Gln Ala Ile Lys Asn
    530                 535                 540


Pro Leu Gly Ser Trp Leu Ser Phe Glu Pro Asp Leu Ser Leu Ile Ser
545                 550                 555                 560


Thr Asp Ser Ile Val Asp Ile Ala Thr Asn His Asn Asn Leu Trp Leu
                565                 570                 575


Thr Val Met Gly Tyr Gln Tyr Leu Glu Pro Pro Thr Thr Lys Pro Ser
            580                 585                 590


Ser Leu Arg Asp Tyr Pro His Ala Leu Val Glu Asn Ile Leu Gly Phe
        595                 600                 605


Val Lys Pro Arg Thr Val Thr Lys Ser Thr Asn Leu Asp Asp Leu Phe
    610                 615                 620


Trp Arg Tyr Gln Ile Gln Pro Phe Gly Val Cys Leu Leu Pro Arg Ser
625                 630                 635                 640


Ile Lys
```

<210> 1844
<211> 345

<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1844

```
Met Lys Leu Pro Ile His Leu Ala Tyr Glu Arg Ser Ile Ser Pro Ser
1               5                  10                  15


Asp Val Ala Phe Leu Val Ile Trp Pro Asp Gly Tyr Lys Glu Pro Leu
            20                  25                  30


Pro Cys Tyr Ser Arg Thr Ile Leu Gly Leu Asn Glu Gly Ser His Val
        35                  40                  45


Gly Tyr Asp Gly Ser Gly Ala Val Arg Asn Asn Leu Lys Met Asn Thr
    50                  55                  60


Leu Val Asp Gly Asn Ile His Glu Leu Asp Tyr Cys Ser Val Pro Tyr
65                  70                  75                  80


Gly Ala Lys Ser Ile Glu Cys Cys Phe Ser Val Ser Phe Ser Ser Glu
                85                  90                  95


Leu Leu Lys Pro Tyr Lys Cys Ser Asp Ala Gly Val Lys Lys Thr Leu
            100                 105                 110


Arg Glu Phe Val Ser Leu Tyr Asn Gln His Val Gly Leu Glu Glu Leu
        115                 120                 125


Ile Ile Lys Tyr Leu Thr Asn Ile Ala Leu Gly Thr Trp Leu Trp His
    130                 135                 140


Asn Thr Lys Arg Ser Tyr Cys Val Ser Ile Glu Ile Arg Pro Trp Pro
145                 150                 155                 160


Trp Glu Gly Glu Thr Ile Ile Ile Asp Asp Ile Arg Lys Tyr Leu Lys
                165                 170                 175


Gly Asp Arg Ala Thr Asn Asp Leu Leu Asn Trp Asn Lys Leu Ile Glu
```

```
            180                 185                 190

Gln Val Lys Glu Ala Phe Thr Asp Pro Met Gly Leu Cys Ile Leu Glu
        195                 200                 205

Val Lys Ala Asn Leu Ile Lys Pro Ser Met Ala Gln Leu Tyr Pro Ser
    210                 215                 220

Gln Met Phe Lys Glu Ala Ala Lys Lys Glu Asn Asn Arg Leu Tyr Gln
225                 230                 235                 240

Ser Thr Ile Ile Asp Gly Ile Lys Ser Pro Ile Met Gly Cys Tyr Lys
                245                 250                 255

Thr Gly Ala Ala Ile Ala Thr Ile Asp Thr Trp Tyr Pro Asp Ala Glu
            260                 265                 270

Glu Pro Ile Arg Val Gly His Tyr Gly Val Asp Arg Glu Asn Ser Thr
        275                 280                 285

Ala Tyr Arg His Pro Asp Thr Gly Lys Asp Phe Phe Ser Ile Leu Lys
    290                 295                 300

Arg Ile Asp Glu Leu Val Asp Arg Leu Lys Asp Ala Lys Glu Leu Ser
305                 310                 315                 320

Gln Asp Glu Leu Lys Asp Met His Phe Leu Met Ala Asn Leu Ile Lys
                325                 330                 335

Gly Gly Leu Phe Gln Glu Lys Gly Glu
            340                 345
```

<210> 1845
<211> 197
<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1845

```
Met Ile Leu Tyr Tyr Arg Thr Val Thr Phe Leu Pro Lys Ile Lys Asn
1               5                  10                  15

Asn Glu Ala Leu Val Gly His Cys Leu Lys Val Leu His Gly Val Cys
            20                  25                  30

Thr Lys Tyr Thr Ile Asn Thr Ile Gly Val Ser Phe Pro Glu Trp Gly
        35                  40                  45

Glu Glu Thr Ile Gly Asp Lys Ile Ser Phe Ile Ser Pro Asn Gln Leu
    50                  55                  60

Glu Leu Asp Phe Leu Leu Gln Gln Thr Tyr Phe Ser Glu Met Thr Ala
65                  70                  75                  80

Leu Gly Tyr Leu Asn Ile Ser Gln Ser Lys Ser Val Pro Glu Gln Tyr
                85                  90                  95

Asn Leu Ala Val Phe Arg Arg Asn Gln Lys Ile Asp Gln Ala Thr Pro
            100                 105                 110

Asn Gly Gln Arg Ile Arg Ala Glu Arg Leu Ala Lys Arg Ala Met Asn
        115                 120                 125

Arg Gly Asp Ser Pro Ile Arg Phe Thr Pro Glu Asp Leu Val Phe Glu
    130                 135                 140

His Tyr His Ser Ile Pro Ile Thr Ser Thr Arg Ser Gly Lys Ser Phe
145                 150                 155                 160

Arg Leu Asn Leu Gln Tyr Gln Arg Leu Asp Thr Val Pro Asp Gly Gln
                165                 170                 175

Trp Ala Phe Ser Ser Tyr Gly Leu Ala Asn Gln Glu Leu Glu Ser Ser
            180                 185                 190

Pro Val Pro Val Ile
        195
```

<210> 1846
<211> 228
<212> PRT
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1846

Met Gln Pro Ser Pro Ala Thr Thr Tyr Gln Thr Asp Ser Pro Leu Glu
1 5 10 15

Phe Ala Phe Thr Gln Pro Ala Arg Lys Leu Thr Lys Ser Arg Gly Lys
20 25 30

Asn Ile His Arg Tyr Val Ser Ile Lys Met Asn Thr Ile Ile Ser Val
35 40 45

Glu Ser Thr Leu Glu Phe Asp Ala Cys Phe His Phe Asp Phe Asn Lys
50 55 60

Asn Ile Ser Arg Phe Cys Ser Gln Pro Ile Arg Tyr Ser Tyr Val Ile
65 70 75 80

Asp Gly Ile Ile Arg Thr Tyr Val Pro Asp Phe Leu Cys Glu Phe Tyr
85 90 95

Cys Gly Glu Met Val Leu Tyr Glu Val Lys Ala Pro Asn Ala Val Asn
100 105 110

Ser Lys Arg Phe Thr Lys Glu Phe Glu Ala Lys Arg Gln Tyr Ala Arg
115 120 125

Lys Leu Phe Asp Val Asp Leu Glu Leu Ile Glu Glu His Asp Ile Arg
130 135 140

His Ile Pro Leu Leu Lys Asn Leu Lys Arg Met His Arg Tyr Ala Ser
145 150 155 160

His Ser Glu Leu Thr Tyr Glu Gln Thr Thr Ile Leu Lys Tyr Leu Asn

```
                165                 170                 175

Lys His Gly Ser Thr Lys Leu Glu Thr Ile Ile Asp His Phe Ser Asn
            180                 185                 190

Ser Lys Asn Ile Ile Pro Met Ile Tyr Asp Leu Leu Ser Lys Tyr Leu
        195                 200                 205

Ile Asn Thr Asp Leu Arg Val Leu Leu Asn Asn Gln Thr Glu Leu Lys
    210                 215                 220

Thr Thr Tyr Val
225
```

<210> 1847
<211> 603
<212> PRT
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1847

```
Met Ser Arg Thr Ser Phe Ser Ser Phe His Gly Thr Pro Thr Ser Asp
1               5                   10                  15

Ser Glu Asn Ala Ser Ser Lys Leu Thr Phe Ile Glu Asn Asp Asp Leu
            20                  25                  30

Gln Asp Leu Thr Ser Phe Ser Lys Lys Ala Gln Asn Glu Ala Lys Leu
        35                  40                  45

Arg Leu Ser Ile Leu Arg Asn Ile Leu Asn Lys Ser Ser Glu Ile Asn
    50                  55                  60

Leu Val Leu Ile Glu Arg Leu Arg Ala Asp Leu Gln Gln Gln Gly Glu
65                  70                  75                  80

Arg Ser Ile Pro Ser Ala Ile Thr Ile Tyr Arg Trp Trp Leu Thr Tyr
                85                  90                  95
```

```
Lys Lys Ser Asn Phe Ser Ile Leu Ser Leu Val Pro Lys Thr Lys Gln
            100                 105                 110

Lys Gly Asn Arg Asn Thr Lys Val Pro Lys Thr Ile Ser Val Tyr Ile
        115                 120                 125

Asp Gln Ala Val Glu Gln Val Ile Ser Ala Asn Lys Ile Asn Val Ser
    130                 135                 140

Thr Ala Phe Arg Arg Val Arg Arg Lys Val Arg Gln Tyr Asn Leu Thr
145                 150                 155                 160

His Lys Thr Lys His Thr Tyr Pro Ser Tyr Glu Ala Ile Arg Lys Arg
                165                 170                 175

Val Lys Lys Ile Thr Pro Tyr Glu Lys Leu Ala Ala Ser Lys Gly Asp
            180                 185                 190

Arg Ile Ala Lys Arg Glu Phe Arg Arg Met Gly Lys Lys Ile Gln Thr
        195                 200                 205

Glu Tyr Leu Leu Glu Arg Val Glu Val Asp His Thr Trp Leu Asp Leu
    210                 215                 220

Phe Ala Val His Glu Glu His Arg Val Pro Ile Gly Arg Pro Tyr Leu
225                 230                 235                 240

Thr Gln Leu Val Asp Cys His Ser Lys Ser Val Ile Gly Phe Tyr Leu
                245                 250                 255

Gly Phe Glu Pro Pro Ser Tyr Met Ser Val Ala Leu Ala Leu Lys Asn
            260                 265                 270

Ala Ile Lys Arg Lys Asp Asn Leu Leu Gln Asn Tyr Pro Ser Ile Gln
        275                 280                 285

Asn Glu Trp Leu Cys Tyr Gly Ile Pro Asp Leu Leu Val Thr Asp Asn
    290                 295                 300
```

```
Gly Lys Glu Phe Leu Ser Lys Asp Phe Thr Leu Ala Cys Asp Ser Leu
305                 310                 315                 320

Leu Ile Asn Ile His Gln Asn Arg Val Glu Thr Pro Asp Asn Lys Pro
                325                 330                 335

His Thr Glu Arg Gln Tyr Gly Thr Thr Asn Thr Glu Leu Leu Asn Asp
            340                 345                 350

Leu Pro Gly Lys Thr Phe Ser Asn Tyr Leu Gln Arg Glu Gly Tyr Asn
        355                 360                 365

Ser Ser Asp Glu Ala Ser Leu Thr Leu Ser Glu Ile Lys Gln Ile Tyr
    370                 375                 380

Leu Thr Trp Leu Val Asp Ile Phe His Pro Arg Pro Asn Ser Arg Gly
385                 390                 395                 400

Thr Asn Cys Pro Asn Arg Val Trp Lys His Ala Glu Lys Asn Trp Pro
                405                 410                 415

Pro Asn Glu Phe Leu Gly Thr Asp Glu Glu Leu Asp Phe Tyr Phe Thr
            420                 425                 430

Lys Leu Asp Lys Arg Met Leu Arg Lys Glu Gly Ile Gly Leu Ala Thr
        435                 440                 445

Glu Leu Phe Tyr Ser Ser Glu Arg Leu Ala Glu Tyr Arg Gly Lys Lys
    450                 455                 460

Gly Asn His Lys Val Ala Ile Lys Tyr Asn Arg Glu Asn Met Gly Phe
465                 470                 475                 480

Ile Trp Val Leu Asp Glu Asp Thr Glu Ser Tyr Phe Lys Val Pro Ala
                485                 490                 495
```

```
Ile Asp Tyr Glu Tyr Ala Ser Thr Val Thr Leu Trp Met His Lys Lys
            500                 505                 510

Asn Leu Lys Ile Lys Gln Glu Leu Asn Ile Thr Glu His Asn Leu Asp
        515                 520                 525

Ser Glu Ile Asp Ala Glu Leu Arg Ile Asp Glu Ile Val Asp Gln Ser
    530                 535                 540

Ile Gln Lys Lys Lys Thr Thr Ile Thr Asn Lys Arg Arg Ala Ala Arg
545                 550                 555                 560

Tyr Gln Glu Asn Glu Gln Met Ala Ala Asn Ala Arg Gln Pro Lys Glu
                565                 570                 575

Lys Lys Ser Ala Asn Asn Gln Lys Thr Ser Thr Lys Asn Ile Glu Lys
            580                 585                 590

Glu Asp Ser Ser Gly Trp Asp Ile Asp Tyr Val
        595                 600
```

<210> 1848
<211> 328
<212> PRT
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1848

```
Met Asp Asp Asn Ile Thr Arg Ile Thr Lys Ala Lys Lys Ala Phe Val
1               5                   10                  15

Ser Thr Pro Asp Val Ala Ala Ile Ile Asn Asn Ile Asp Arg Cys Arg
            20                  25                  30

Arg Leu Ser Lys Phe Gly Ala Glu Pro Ser Cys Met Met Val Tyr Gly
        35                  40                  45

Ala Ser Gly Val Gly Lys Thr Ser Ile Ile Arg Lys Tyr Leu Lys Ala
    50                  55                  60
```

```
Asn Asp Lys Asp Ser Thr Ala Arg Gln Asp Ile Val Pro Val Val Tyr
65                  70                  75                  80


Ile Glu Leu Pro Glu Asn Ala Lys Pro Val Asp Ala Ala Arg Glu Leu
                85                  90                  95


Leu Leu Tyr Leu Glu Asp Pro Leu Ala Leu Tyr Glu Ser Asp Leu Ala
            100                 105                 110


Ile Leu Thr Lys Arg Ile Val Asp Leu Val Pro Thr Met Lys Ile Glu
        115                 120                 125


Leu Ile Ile Ile Asp Glu Phe Gln His Leu Val Glu Lys Ser Ser Asn
    130                 135                 140


Arg Ile Leu Ser Arg Val Gly Asp Trp Leu Lys Met Leu Ile Asn Lys
145                 150                 155                 160


Thr Lys Cys Pro Val Ile Leu Phe Gly Met Pro Tyr Ser Lys Val Val
                165                 170                 175


Leu Ala Ala Asn Ser Gln Leu Arg Ser Arg Phe Ser Ile Gln Phe Glu
            180                 185                 190


Leu Lys Pro Phe Ser Tyr Ile Asn Asn Tyr Gly Ile Tyr Ala Gly Phe
        195                 200                 205


Leu Arg Arg Leu Asp Glu Ala Leu Pro Phe Asp Gln Leu Ser Asn Leu
    210                 215                 220


Ala Ser Glu Pro Ile Ala Lys Lys Ile Tyr Ala Phe Ser Gln Gly Asn
225                 230                 235                 240


Met Arg Ser Leu Arg Asn Leu Val Phe His Ala Ala Val Asn Ala Ile
                245                 250                 255


Glu Asn Asp Asn Asn Cys Ile Ser Lys Asn Asp Trp Glu Phe Ala Ser
```

260 265 270

Asn Leu Thr Ser Gly Asn Lys Leu Ser Thr Trp Lys Asn Pro Phe Ala
275 280 285

Gln Gly Val Lys Ile Thr Asp Arg Met Leu Gln Asp Gln Pro Asn Asp
290 295 300

Leu Gly Trp Glu Asp Tyr Met Arg Asn Asn Arg Gly Lys Arg Lys Pro
305 310 315 320

Phe Asp Glu Ser Lys Ile Phe Ser
325

<210> 1849
<211> 392
<212> PRT
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1849

Met Phe Leu Gln Arg Pro Glu Pro Tyr Ser Asp Glu Ser Leu Glu Ser
1 5 10 15

Phe Phe Ile Arg Val Ala Asn Lys Asn Gly Tyr Glu Asp Ile His Arg
20 25 30

Phe Leu Ile Val Thr Lys Lys Tyr Leu Gln Asp Glu Asn His Asp Arg
35 40 45

Phe Lys Ala Phe Pro Thr Asp Ile Lys Thr Ile Asn Pro Tyr Ser Ser
50 55 60

Lys Asn Asn His Gly Ser Arg Val Ala Ala Leu His Lys Ile Ala Leu
65 70 75 80

Met Thr Phe Asn Glu Gln Pro Glu Ile Leu Ser Leu Ala Ile Asn Arg
85 90 95

```
Thr Ser Leu Ile Tyr Ser Pro Ser Thr Thr Ala Leu Val Arg Gly Ser
            100                 105                 110

Glu Val Ile Pro Arg Ser Leu Leu Arg Lys Asn Ile Ile Pro Cys Cys
        115                 120                 125

Pro Arg Cys Leu His Glu Glu Gly Phe Gly His Tyr Leu Trp His Phe
    130                 135                 140

Asn Gly Tyr Asn Tyr Cys His Lys His Asn Thr Pro Leu Ile Tyr Lys
145                 150                 155                 160

Cys Ala Cys Gly Ala Asp Tyr Asp Tyr Arg Ile Ala Gly Leu Asn Gly
                165                 170                 175

Phe Cys Arg Glu Cys Asp Thr Tyr Leu Asn Pro Asn Gln Gln His Pro
            180                 185                 190

Asp Ser Ala Glu Ser Lys Thr Ser Ala Trp Leu Ser Gly Lys Thr Ile
        195                 200                 205

Glu Gln Leu Pro Asp Leu Pro Gln Ser Tyr Arg Trp Gly Leu Ile His
    210                 215                 220

Trp Trp Thr His Leu Thr Gln Lys Glu Phe Asp Gly Ala Ser Phe Ile
225                 230                 235                 240

Asp Phe Trp His Arg Trp Pro Glu Ser Phe His His Leu Ile Gln Gln
                245                 250                 255

Lys Ile Glu Phe Asn Leu Glu His Ser Ile Ile His His Asp Asn Leu
            260                 265                 270

Lys Leu Lys Asp Leu Leu Gly Asp Leu Phe Phe Asn Cys Ile Arg Leu
        275                 280                 285

Pro Glu Arg Asn Leu Lys Tyr Asn Ile Val Leu Asn Glu Leu Leu Arg
    290                 295                 300
```

```
Phe Ile Asp Asp Asn Leu Trp Gly Asn Asn Gly Arg Leu Ala Asn Leu
305                 310                 315                 320


Lys Met Asn Ala Val Glu Val Ser Ile Phe Leu Asn Cys Ser Cys Asp
                325                 330                 335


Gln Ile Val Leu Met Val Glu Gln Arg Phe Leu Lys Pro Ser Arg Lys
            340                 345                 350


Ala Lys Pro Asn Lys Pro Leu Ser Phe Thr Asp Tyr Leu Phe His Leu
        355                 360                 365


Gly Asp Val Tyr Cys Leu Trp Leu Ala Glu Phe Gln Thr Asp Glu Phe
    370                 375                 380


Asn Arg Thr Phe Ile Ile Ser Arg
385                 390


<210>  1850
<211>  636
<212>  PRT
<213>  Photobacterium iliopiscarium strain NCIMB 13355

<400>  1850

Met Ser Thr Leu Ala Lys Ile Ile Asn Ser Ser Ser Ser Asp Ile Asn
1               5                   10                  15


Val Glu Leu Lys Arg Ala Phe Arg Pro Leu Ser Pro Asn Ile Asp Ile
            20                  25                  30


Thr Asp Asn Glu Asp Ile Ala Leu Ile Ile Leu Thr Asn Leu Ala Ala
        35                  40                  45


Lys Val Asp Ala Lys Lys Asn Leu Thr Asp Arg Glu Asn Cys Lys Lys
    50                  55                  60


Lys Leu Lys Asp Asn Asn Trp Trp Ser Arg Cys Ile Asn Thr Met Lys
```

```
65                  70                  75                  80

Phe Arg Gln Ser His Asn Val Lys Phe Pro Glu Ile Lys Ala Thr Gly
                85                  90                  95

Ile Ile Arg Ala His Pro Met Gly Glu Ile Pro Lys Tyr Leu Leu Ser
            100                 105                 110

Ser Ser Lys Leu Lys Gln Lys Thr Leu Ala Tyr Ala Asn Asp Ser Lys
        115                 120                 125

Asp Val Ser Val Ala Asn Phe Leu Ile Ser Glu Phe Ile Leu His Gly
    130                 135                 140

Lys Ile Cys Cys Leu Gly Val Leu Leu Thr Asp Glu Gln His Pro Leu
145                 150                 155                 160

Trp Asp Arg Leu Thr Lys Leu Gly Cys Tyr Gln Lys Thr Arg Lys Tyr
                165                 170                 175

Val Ala Lys Gln Leu Lys Lys Ile Pro Asn Ser Cys Ile Glu Val Gln
            180                 185                 190

Leu Gly Ala Asn Ser Val Arg Gln Ile Ser Leu Pro Asp Gly Asn Asn
        195                 200                 205

Ser Tyr Leu Ser Leu Ser Pro Val Thr Ser Gln Thr Met Gln Ser Ser
    210                 215                 220

Cys Tyr Gln Ser Leu His Lys His Tyr Trp Leu Ser Lys Ile Thr Arg
225                 230                 235                 240

Tyr Ser Arg Ala Ser Asn Met Gly Val Leu Pro Met Thr Cys Gly Gly
                245                 250                 255

Thr Leu Arg Met Leu Ser His Thr Ile Ser Phe Glu Asp Val Lys His
            260                 265                 270
```

```
Cys Gln Ile Ser Pro Asn Ser Ser Trp Leu Thr Lys Asp Ser Ile Gln
        275                 280                 285

Ala Phe Tyr Asp Tyr Phe Asp Ser Ser Asn Trp Met Met Pro His Ile
    290                 295                 300

Gln Lys Gln Gln Lys Leu Lys Ile Leu Lys Ile Thr Ile Thr Glu Met
305                 310                 315                 320

Ile Ser Arg Trp Leu Ala Leu Gln Lys Asn Thr Ile Gln His Asn Gln
                325                 330                 335

Leu Glu Leu Val His Lys Leu Asn Phe Asp Leu Ser Asn Thr Lys Ser
            340                 345                 350

Leu Arg Gln Phe Ala Tyr Asp Pro Lys Thr Thr Arg Phe Leu Phe Thr
        355                 360                 365

Leu Ile Glu Asn Arg Ser Asn Thr Gln Gln Pro Asn Glu Asn Phe Asp
    370                 375                 380

Asn Gln Tyr Leu Leu Leu Pro Gln Ile Ser Val Cys Gly Ala Ser Ala
385                 390                 395                 400

Met Ser Ser Ser Ile Thr Ile Gly Ile Pro Ser Leu Thr Ala Phe Tyr
                405                 410                 415

Gly Phe Ile His Ala Phe Glu Arg Asn Met Gln Lys Val Phe Ser Asn
            420                 425                 430

Leu Lys Val Asp Ser Phe Ala Ile Cys Ile His Thr Phe His Leu Gln
        435                 440                 445

Lys Arg Gly Met Thr Arg Glu Ser Ile Ile Lys Leu Thr Ser Asn Ile
    450                 455                 460

Ser Ser Pro Ala Thr His Asp Glu Trp His Cys Asp Leu Lys Phe Ser
```

```
465                 470                 475                 480

Leu Ala Leu Lys Val Asn Asn Leu Thr His Leu Asn Gln Ser Glu Ile
                485                 490                 495

Leu Tyr Ala Leu Pro Lys Arg Leu Ala Gly Gly Tyr Ala Arg Ile Asn
            500                 505                 510

Ile Asp Asp Ile Lys Thr Ile Gln Val Ser Ser Ser Phe Lys Asp Leu
        515                 520                 525

Val Lys Gln Ile Pro Thr Phe Gln Gly Gln Trp Leu Ser Leu Tyr Lys
    530                 535                 540

Ala Lys Ile Asp Ser Phe Glu Ser Ile Ile Gln Gln Ile Lys Ala Ser
545                 550                 555                 560

Gln Asn Ile Ile Pro Thr Cys Val Gly Tyr His Tyr Leu Glu Lys Pro
                565                 570                 575

Thr Glu Arg Thr Phe Ala Leu Arg Asp Tyr Lys His Ala Phe Ala Glu
            580                 585                 590

Pro Ile Ile Gly Leu Ile Lys Pro Ile Thr Ile Lys Glu Asp Thr Ser
        595                 600                 605

Leu His Asp Leu Phe Trp Asp Gln Ile Asn Lys Pro His Tyr Thr Thr
    610                 615                 620

Ile Glu Thr Arg Asn Met Asn Asn Glu Ala Pro Tyr
625                 630                 635
```

<210> 1851
<211> 349
<212> PRT
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1851

```
Met Lys Leu Pro Ile Ser Leu Ala Tyr Glu Arg Ser Ile His Pro Ser
1               5                  10                  15

Asp Val Cys Phe Phe Thr Ile Trp Pro Asp Gly Asn Lys Ala Pro Leu
            20                  25                  30

Ser Phe Met Ser Arg Thr Val Leu Gly Gln Met Glu Thr Ala Ser Leu
        35                  40                  45

Ala Tyr Asp Thr Lys Gly Asn Pro Lys Gln Thr Ala Thr Pro Glu Val
    50                  55                  60

Leu Ala Gln Gly Asn Pro His His Met Asp Phe Cys Ser Val Pro Phe
65                  70                  75                  80

Gly Ala Glu His Ile Glu Cys Val Phe Ser Val Ser Phe Ser Ser Glu
                85                  90                  95

Leu Arg Lys Pro Tyr Lys Cys Ser Glu Pro Glu Val Lys Asn Thr Leu
            100                 105                 110

Ile Glu Leu Val Lys Leu Tyr Glu Ser Lys Ile Gly Trp Asp Glu Leu
        115                 120                 125

Ala Gly Arg Phe Leu Thr Asn Ile Cys Gln Gly Lys Trp Leu Trp Lys
    130                 135                 140

Asn Thr Lys Lys Thr Tyr Gln Leu Asn Ile Glu Ile Lys Pro Trp Pro
145                 150                 155                 160

Trp Lys Asn Asn Pro Val Ile Phe Glu Asp Ile Arg Thr Asn Tyr Ser
                165                 170                 175

Thr Tyr Asn Asp Cys Gln Ser Asp Thr Lys Trp Gln Glu Leu Lys Gln
            180                 185                 190

Leu Ile Ile Asn Ala Phe Ser Ser Lys Asn Gly Leu Ala Ile Phe Glu
        195                 200                 205
```

```
Ile Lys Ala Gln Leu Thr Leu Pro Thr Asn Ala Glu Leu Tyr Pro Ser
    210                 215                 220

Gln Ala Phe Ile Glu Lys Asp Lys Lys Glu Lys Lys His Gln Ser Ser
225                 230                 235                 240

Arg Ile Phe Gln His Thr Ser Ile Asn Gly Gln Lys Ser Pro Ile Ile
                245                 250                 255

Gly Cys Tyr Lys Ala Gly Ala Gly Ile Phe Met Ile Asp Asp Trp Tyr
            260                 265                 270

Pro Asn Ala Glu Glu Pro Ile Arg Ile Gly Arg Phe Gly Val His Gln
        275                 280                 285

Gln Asp Val Thr Cys Tyr Arg Pro Pro Ser Thr His Gln Asp Leu Phe
    290                 295                 300

Ser Leu Leu Glu Gln Ser Glu Lys Tyr Ile Ala Leu Leu Lys Asn Arg
305                 310                 315                 320

Lys Lys Thr Pro Gln Lys Thr Ile Asn Glu Leu His Phe Leu Met Ala
                325                 330                 335

Asn Leu Ile Lys Gly Gly Leu Phe Gln His Lys Gly Glu
            340                 345
```

<210> 1852
<211> 199
<212> PRT
<213> Photobacterium iliopiscarium strain NCIMB 13355

<400> 1852

```
Met Asp Trp Tyr Tyr Lys Thr Ile Arg Phe Ile Pro Thr Asn Cys Asn
1               5                   10                  15

Asn Glu Phe Leu Ala Ala Lys Cys Ile Asn Ile Leu His Gly Phe Ser
```

```
            20                  25                  30

Tyr Arg Tyr Asp Thr His Ser Ile Gly Ile Ser Phe Pro Asn Trp Cys
        35                  40                  45

Asn Glu Thr Val Gly Asp Arg Ile Ser Phe Val Ser Ile Glu Lys Met
    50                  55                  60

Ala Leu Asp Tyr Leu Leu Thr Gln Asn Tyr Phe Lys Glu Met Gln Asp
65                  70                  75                  80

Leu Gly Tyr Phe Asp Ile Ser Lys Thr Leu Ile Val Pro Ile Glu Cys
                85                  90                  95

Asn Phe Ala Cys Phe Lys Arg Tyr Gln Lys Ile Asp Lys Ser Ser Ala
            100                 105                 110

Ala Gly Phe His Arg Lys Ile Lys Arg Leu Ala Lys Arg Ala His Asn
        115                 120                 125

Arg Gly Glu Val Phe Asp Asn Lys Lys Tyr Asn Ile Tyr Lys Gln Cys
    130                 135                 140

Asp Ile Gly His Tyr His Ser Leu Ala Glu Glu Ser Lys Ser Lys Gly
145                 150                 155                 160

Tyr Gly Phe Arg Leu Asn Ile Gln Arg Thr Asn Glu Ile Ser Ile Asn
                165                 170                 175

Asn Ile Pro Ile Phe Ser Ser Tyr Gly Leu Ala Asn Thr Ala His Ala
            180                 185                 190

Leu Gln Ser Val Pro Ile Ile
        195

<210>  1853
<211>  209
<212>  PRT
```

<213> Pseudoalteromonas sp. P1-25

<400> 1853

```
Met Tyr Arg Arg Lys Leu Lys His Ser Arg Val Lys Asn Leu His Lys
1               5                   10                  15


Phe Ala Ser Gln Lys Asn Lys Ser Thr Cys Leu Val Glu Ser Ser Leu
            20                  25                  30


Glu Phe Asp Ala Cys Phe His Phe Glu Phe Ser Pro Ser Ile Ala Ala
        35                  40                  45


Phe Glu Ala Gln Pro Leu Gly Tyr Glu Tyr Glu Phe Asp Asn Arg Ile
    50                  55                  60


Cys Arg Tyr Thr Pro Asp Phe Leu Leu Thr His Thr Asp Gly Thr Gln
65                  70                  75                  80


Lys Phe Ile Glu Val Lys Pro Gln Ser Lys Ile Ala Asp Glu Asp Phe
                85                  90                  95


Arg Ala Arg Phe Ile Glu Lys Gln Thr Ile Ala Lys Gln Asp Gly Arg
            100                 105                 110


Asp Leu Ile Leu Val Thr Asp Lys Gln Ile Arg Val Tyr Pro Thr Leu
        115                 120                 125


Asn Asn Leu Lys Leu Leu His Arg Tyr Ser Gly Phe Gln Ser Leu Thr
    130                 135                 140


Glu Leu Gln Ala Ser Val Leu Glu Leu Val Lys Gln Tyr Gly Ser Ile
145                 150                 155                 160


Lys Val Gly Gln Leu Val Asn Phe Leu Lys Val Thr Ala Gly Glu Leu
                165                 170                 175


Leu Ala Thr Val Leu Arg Leu Leu Ser Leu Gly Gln Leu Phe Ala Asp
            180                 185                 190
```

```
Leu Thr Thr Asn Glu Ile Ser Ile Glu Thr Ala Ile Trp Ser Asn Asn
        195                 200                 205


Val



<210>  1854
<211>  607
<212>  PRT
<213>  Pseudoalteromonas sp. P1-25

<400>  1854

Met Phe Asn Asp Gly Leu Phe Asp Asp Glu Phe Asn Gln Pro Leu Pro
1               5                   10                  15


Lys Val Glu Thr Lys Leu Pro Gln Asn Tyr Ala Lys Asp Leu Gln Ala
            20                  25                  30


Leu Pro Glu Lys Ile Lys Asn Thr Thr Phe Ala Lys Leu Lys Tyr Ile
        35                  40                  45


Gln Trp Leu Glu Ala Asn Ile Gln Gly Gly Trp Thr Gln Lys Asn Leu
    50                  55                  60


Glu Pro Leu Leu Lys Val Met Pro Glu Val Glu Gly Glu Lys Lys Pro
65                  70                  75                  80


Ser Trp Arg Thr Ala Ala Arg Trp Tyr Ser Ala Tyr Thr Asn Ala Asp
                85                  90                  95


Lys Asn Ile Met Ala Leu Ile Pro Ser His Gln Lys Lys Gly Asn Arg
            100                 105                 110


Glu Arg Asp Thr Ala Thr Asp Lys Phe Phe Glu Lys Ala Leu Glu Arg
        115                 120                 125


Tyr Leu Val Lys Glu Lys Pro Ser Val Ala Ser Ala Tyr Lys Tyr Tyr
```

```
    130                 135                 140

Ala Asp Leu Val Ile Ile Glu Asn Asp Ser Val Val Gly Ser Val Leu
145                 150                 155                 160

Lys Pro Leu Thr Tyr Lys Ala Phe Lys Asn Arg Ile Asp Asn Leu Pro
                165                 170                 175

Gln Tyr Asp Val Met Val Ser Arg Tyr Gly Lys Arg Leu Ala Asp Ile
            180                 185                 190

Ala Phe Asn Lys Val Glu Gly His Thr Arg Pro Thr Arg Val Leu Glu
        195                 200                 205

Lys Val Glu Ile Asp His Thr Pro Leu Asp Leu Ile Leu Leu Asp Asp
    210                 215                 220

Glu Leu His Ile Pro Leu Gly Arg Pro Thr Leu Thr Met Leu Val Asp
225                 230                 235                 240

Val Tyr Ser His Cys Ile Val Gly Phe Tyr Phe Ser Phe Ser Glu Pro
                245                 250                 255

Ser Tyr Asp Ala Val Arg Arg Ala Met Leu Asn Ala Met Lys Pro Lys
            260                 265                 270

Ser Asp Val Ala Lys Leu Tyr Pro Asp Thr Ile Asn Glu Trp Lys Cys
        275                 280                 285

Ala Gly Lys Ile Glu Thr Leu Val Val Asp Asn Gly Ala Glu Phe Trp
    290                 295                 300

Ser Asn Ser Leu Glu Leu Ala Cys Glu Glu Ile Gly Ile Asn Thr Gln
305                 310                 315                 320

Tyr Asn Pro Val Ala Lys Pro Trp Leu Lys Pro Phe Val Glu Arg Met
                325                 330                 335
```

```
Phe Gly Thr Ile Asn Thr Glu Leu Leu Asp Pro Val Pro Gly Lys Thr
            340                 345                 350

Phe Ser Asn Ile Leu Gln Lys His Glu Tyr Asn Pro Lys Lys Asp Ala
        355                 360                 365

Ile Met Arg Phe Thr Thr Phe Met Gln Leu Phe His Lys Trp Val Val
    370                 375                 380

Asp Val Tyr His Gln Asp Ala Asp Ser Arg Phe Lys Tyr Ile Pro Ser
385                 390                 395                 400

Gln Leu Trp Glu Gln Gly Phe Asn Thr Leu Pro Pro Thr Val Leu Ser
                405                 410                 415

Asn Ala Asp Leu Gln Gln Leu Asp Val Val Leu Ser Ile Ser Asn His
            420                 425                 430

Arg Val Leu Arg Lys Gly Gly Ile Arg Leu Glu Asn Leu Ser Tyr Asp
        435                 440                 445

Ser Thr Glu Leu Ala Asn Tyr Arg Lys Gln Phe Ser His Lys Val Ser
    450                 455                 460

Gln Glu Val Leu Ile Lys Leu Asn Pro Asp Asp Ile Ser Tyr Ile Tyr
465                 470                 475                 480

Val Tyr Leu Asp Lys Leu Glu His Tyr Ile Lys Val Pro Cys Ile Asp
                485                 490                 495

Pro Asn Gly Tyr Thr Gln Asn Leu Ser Leu Asn Gln His Lys Ile Asn
            500                 505                 510

Ile Arg Ile His Arg Asp Phe Ile Ser Gly Ser Ile Asp Asn Val Gly
        515                 520                 525

Leu Ala Lys Ala Arg Met Phe Ile His Asn Lys Ile Gln Asn Glu Phe
```

530 535 540

Glu Glu Leu Lys Asn Ala Pro Lys His Ser Lys Val Lys Gly Gly Lys
545 550 555 560

Ala Leu Ala Lys His Gln Asn Val Ser Ser Asp Ser Gln Lys Ser Ile
565 570 575

Ala Gln Ser Glu Pro Leu Glu Pro Lys Lys Val Thr Pro Lys Glu Gln
580 585 590

Pro Thr Asp Ser Trp Asp Asp Phe Ile Ser Asp Leu Asp Gly Phe
595 600 605

<210> 1855
<211> 333
<212> PRT
<213> Pseudoalteromonas sp. P1-25

<400> 1855

Met Leu Thr Asp Lys Gln Lys Ala Lys Leu Asn Glu Phe Arg Asp Val
1 5 10 15

Phe Ile Glu Tyr Pro Ile Ile Thr Thr Val Phe Asn Asp Phe Asp Arg
20 25 30

Leu Arg Leu Gly Lys Gly Leu Ala Gly Glu Lys Pro Cys Met Leu Leu
35 40 45

Asn Gly Asp Thr Gly Thr Gly Lys Thr Ala Leu Ile Lys Gln Tyr Lys
50 55 60

Glu Arg His Leu Pro Gln Phe Ile Asn Gly Val Met Asn His Pro Val
65 70 75 80

Leu Val Ser Arg Ile Pro Ser Asn Pro Thr Leu Glu Ser Thr Leu Ala
85 90 95

```
Glu Leu Leu Lys Asp Leu Gly Gln Val Gly Ser Thr Glu Arg Lys Leu
            100                 105                 110

Arg Ile Asn Gly Thr Arg Leu Thr Thr Ser Leu Ile Lys Cys Leu Lys
        115                 120                 125

Thr Cys Gly Thr Glu Leu Ile Ile Ile Asp Glu Phe Gln Glu Leu Ile
    130                 135                 140

Glu His Asn Gln Gly Lys Lys Arg Arg Glu Ile Ala Asn Arg Leu Lys
145                 150                 155                 160

Tyr Ile Asn Asp Glu Ala Gly Val Ser Ile Val Leu Val Gly Met Pro
                165                 170                 175

Trp Ala Glu Lys Ile Ala Asp Glu Pro Gln Trp Ser Ser Arg Leu Leu
            180                 185                 190

Val Arg Arg Gln Leu Pro Tyr Phe Lys Leu Ser Glu Asn Pro Lys His
        195                 200                 205

Phe Val Gln Leu Ile Ile Gly Leu Ala Asn Arg Met Pro Phe Thr Glu
    210                 215                 220

Lys Pro Lys Leu Ser Glu Gln Ala Thr Val Phe Ala Leu Phe Ser Leu
225                 230                 235                 240

Ser Lys Gly Cys Phe Arg Thr Leu Lys Tyr Phe Leu Asp Asp Ala Val
                245                 250                 255

Leu Tyr Ala Leu Met Asp Asn Ala Lys Thr Leu Thr Thr Lys His Leu
            260                 265                 270

Val Lys Ala Phe Gly Val Leu Phe Pro Asp Val Pro Asn Leu Phe Thr
        275                 280                 285

Leu Pro Val Ala Glu Ile Thr Ala Ser Glu Val Glu Arg Tyr Ser Leu
    290                 295                 300
```

```
Tyr Lys Leu Glu Ser Ala Gln Asp Glu Asp Pro Phe Ile Ala Thr Lys
305                 310                 315                 320


Phe Thr Asp Gln Met Pro Ile Ser Gln Leu Leu Arg Lys
                325                 330


<210>  1856
<211>  391
<212>  PRT
<213>  Pseudoalteromonas sp. P1-25

<400>  1856

Met His Phe Leu Val Gln Thr Lys Leu Tyr Pro Asp Glu Ala Leu Glu
1               5                   10                  15


Ser Tyr Leu Leu Arg Leu Ala Arg Asp Asn Ser Tyr Asp Gly Tyr Ser
            20                  25                  30


Glu Leu Ala Asp Ile Leu Trp Gln Trp Leu Val Glu Gln Asp His Asp
        35                  40                  45


Leu Glu Gly Ala Leu Pro Leu Glu Leu Gly Lys Val Asp Val Tyr His
    50                  55                  60


Ala Arg Gln Ala Ser Ser Phe Arg Ile Arg Ala Leu Lys Leu Val Ala
65                  70                  75                  80


Gln Leu Ala Asp Val Asn Ala Gly Asn Ile Leu Ala Leu Ala Trp Arg
                85                  90                  95


Arg Ser Asn Phe Lys Phe Gly Asn Leu Val Ala Val Ser Arg Asn Glu
            100                 105                 110


Gln Thr Ile Pro Leu Glu Leu Leu Arg Thr Asp Asn Ile Pro Val Cys
        115                 120                 125


Ile Glu Cys Leu Phe Glu Ser Ser Tyr Val Pro Phe His Trp His Leu
```

```
    130                 135                 140

Lys Pro Tyr Lys Thr Cys His Lys His Lys Ser Gln Leu Thr Thr His
145                 150                 155                 160

Cys Lys Glu Cys His Asn Leu Ile Asp Tyr Arg Ala Ser Glu Glu Phe
                165                 170                 175

Leu Glu Cys Ser Cys Gly Cys Lys Leu Thr Asn Ser Glu Gln Leu Asn
            180                 185                 190

Asp Ala Asp Phe Lys Ile Ala Phe Ala Leu Ala Ser Ser Asn Ser His
        195                 200                 205

Lys Ile Val Gly Leu Ile Ser Trp Phe Ala Lys Val Lys Gln Leu Asp
    210                 215                 220

Val Ser Asp Ala Asp Phe Asn Arg Thr Phe Val Asp Tyr Phe Ser Thr
225                 230                 235                 240

Trp Pro Glu Ser Leu Thr Thr Glu Leu Asp Leu Leu Thr Asn Asn Ala
                245                 250                 255

Arg Leu Lys Gln Leu Asn Pro Phe Asn Lys Thr Lys Phe Asn Ser Val
            260                 265                 270

Tyr Gly Asn Val Ile Arg Asp Gly Gln Ile Ala Ala Thr Ser Asn Arg
        275                 280                 285

Lys Asn Lys Val Leu Asp Glu Leu Ile Lys Tyr Phe Val Glu Leu Val
    290                 295                 300

Asp Ser Asn Pro Lys Thr Lys His Pro Asn Ile Ala Asp Leu Leu Leu
305                 310                 315                 320

Cys Thr Phe Asp Thr Ala Val Leu Leu Asn Thr Thr Thr Glu Gln Val
                325                 330                 335
```

```
Tyr Arg Leu His Gln Glu Gly Phe Leu Asn Cys Ala Tyr Pro Gln Lys
            340                 345                 350

Lys His Glu Gln Leu Arg Ala Asp Ser His Val Phe Tyr Leu Arg Gln
        355                 360                 365

Val Ile Glu Leu Gln Gln Ala Phe Ala Ala Glu Thr Pro Gln Thr Lys
    370                 375                 380

Lys Gln Phe Ile Ala Pro Trp
385                 390
```

<210> 1857
<211> 683
<212> PRT
<213> Pseudoalteromonas sp. P1-25

<400> 1857

```
Met Asn Leu Gln Asp Ala Phe Ala Ile Glu Ser Leu Lys Glu Lys Thr
1               5                   10                  15

Thr Ala Leu Arg Lys Leu Phe Thr Pro Tyr Met Ser His Val Ala Val
            20                  25                  30

Asp Gly Phe Glu Glu Gln Ala Leu Thr Val Leu Ile Asn Leu Val Tyr
        35                  40                  45

Lys Arg Ser Glu Ile Asp Asp Leu Thr Ser Thr Arg Thr Ala Lys Ser
    50                  55                  60

Val Leu Arg Asp Glu Val Leu Leu Ser Lys Cys Ile Asn Glu Val Lys
65                  70                  75                  80

Trp Phe His Thr His Asn Leu Lys Tyr Pro Asp Ile Arg Val Ser His
                85                  90                  95

Gln Arg Leu Ile Ser Lys Val Val Ser Glu Asp Ile Ala Gly Ile Cys
            100                 105                 110
```

```
Ser Arg Ser Leu Pro Leu Ser Phe Gly Trp Ser His Asn Ser Ala Glu
        115                 120                 125

Ile Asn His Ala Lys Leu Phe Leu Thr Ser Phe Thr Trp Gln Gly Glu
    130                 135                 140

Val Thr Cys Leu Ala Asn Leu Leu Ile Asn Glu Glu Pro Val Trp Ile
145                 150                 155                 160

Asn Leu Ile Arg Thr Tyr Gly Phe Thr Lys Lys Ala Val Leu Gly Ile
                165                 170                 175

Ala Gly Lys Ile Lys Gln Leu Leu Pro Val Ala Glu Leu Pro Leu Glu
            180                 185                 190

Val Ser Ser Phe Ser Pro Gln Leu Gln Met Pro Phe Gln Gln Ser Tyr
        195                 200                 205

Leu Ala Val Thr Pro Val Val Ser His Ala Met Leu Ala Lys Ile Gln
    210                 215                 220

Gln Leu Thr Thr Asp Arg Lys Leu Asn Phe Gly Leu Val Glu His Ser
225                 230                 235                 240

Arg Pro Ala Asn Val Gly Asp Leu Ala Ser Ser Val Gly Gly Asn Ile
                245                 250                 255

Arg Val Leu Arg Tyr Phe Pro Lys Thr Tyr Ser Lys Ala Val Asn Cys
            260                 265                 270

Ser Glu Val Phe Asn Asn Asp Ser Glu Lys Ala Phe Lys Ile Arg Ala
        275                 280                 285

Leu Leu Asn Ser Gln Phe Gln Gln Ala Leu Leu Val Leu Val Gly Ile
    290                 295                 300
```

```
Lys Gln Phe Asn Thr Leu Arg Gln Lys Arg Leu Ala Arg Val Ala Ala
305                 310                 315                 320

Ile Arg Gln Val Arg Val Ser Leu Gln Leu Trp Leu Asp Asn Ile Leu
                325                 330                 335

Glu Ala Lys Asn Asn Ala Gln Gly Gln Ala Tyr Pro Glu Trp Ala Lys
            340                 345                 350

His Tyr Leu Asp Gln Ser Ile Thr Asn Cys Ile Ser Gln Phe Ser Asn
        355                 360                 365

Val Leu Asn Glu Ser Leu Gly Asn Leu Ser Lys Leu Lys Arg Phe Ala
    370                 375                 380

Tyr His Pro Asn Leu Met Gly Val Phe Lys Thr Gln Leu Asn Tyr Val
385                 390                 395                 400

Phe Thr His Cys Ile Pro Asp Glu Glu Thr Leu Asn Asp Glu Gln Ile
                405                 410                 415

Val Tyr Val His Cys Gln Asp Met Arg Val Phe Asp Ala Glu Ala Met
            420                 425                 430

Ala Asn Pro Tyr Ile Gln Gly Met Pro Ser Leu Thr Ala Leu Asn Gly
        435                 440                 445

Leu Ala His Asn Phe Glu Arg Lys Leu Lys Asn Phe Ile Asp Pro Ser
    450                 455                 460

Ile Lys Cys Ile Gly Ser Ala Ile Asn Ile Glu Ser Tyr Gln Leu His
465                 470                 475                 480

Thr Gly Lys Pro Leu Pro Glu Pro Ser Lys Leu Lys Gln Val Ala Gly
                485                 490                 495

Arg Ser His Val Ile Arg Ser Gly Ile Ile Asp Lys Pro Lys Cys Asp
            500                 505                 510
```

```
Ile Thr Leu Asp Leu Val Phe Arg Leu Phe Val Pro Asn Ile Lys Leu
        515                 520                 525

Leu Asp Lys Leu Asn Ser Gln Leu Val Lys Pro Ala Leu Pro Ser Met
    530                 535                 540

Phe Ala Gly Gly Thr Met His Pro Pro Ser Leu Tyr Gln Asn Ile Asp
545                 550                 555                 560

Trp Cys His Leu His Thr Lys Pro Ser Glu Leu Phe Lys Asn Ile Lys
                565                 570                 575

Ala Lys Ser Leu Asn Gly Ser Trp Leu Tyr Pro Ser Lys Lys Val Val
            580                 585                 590

Lys Ser Phe Glu Gln Leu Ile Asp Ala Leu Asn Gly Asn Phe Asn Leu
        595                 600                 605

Arg Pro Ala Ala Ile Gly Phe Ala Ala Leu Glu Glu Pro Ile Lys Arg
    610                 615                 620

Asp Val Ala Leu His Glu Tyr His Cys Tyr Ala Glu Pro Val Ile Gly
625                 630                 635                 640

Leu Leu Glu Cys Val Ser Asn Thr Ser Val Lys Tyr Ala Gly Ala Lys
                645                 650                 655

Gln Phe Phe His Asp Ala Phe Trp Val Met Asp Val Gln Lys Glu Ser
            660                 665                 670

Met Leu Met Lys Lys Ser Lys Phe Glu Tyr Glu
        675                 680
```

<210> 1858
<211> 342
<212> PRT
<213> Pseudoalteromonas sp. P1-25

<400> 1858

```
Met Gln Leu Pro Arg His Leu Ser Tyr Thr Arg Ser Leu Ser Pro Ser
1               5                   10                  15


Lys Ala Val Phe Phe Tyr Lys Thr Ser Glu Ser Asp Phe Glu Pro Leu
            20                  25                  30


Gln Ile Glu Gln Asn Lys Leu Val Gly Gln Lys Ser Gly Phe Gly Asp
        35                  40                  45


Ala Tyr Gln Lys Gln Asn Val Ala Lys Asn Leu Ala Pro Gln Asp Leu
    50                  55                  60


Ala Phe Gly Asn Pro Gln Thr Ile Asp Val Cys Tyr Val Pro Pro Ala
65                  70                  75                  80


Val Asn Glu Leu Phe Cys Arg Phe Ser Leu Arg Val Glu Ala Asn Ser
                85                  90                  95


Asn Glu Pro His Val Cys Asp Asp Pro Lys Val Ile Tyr Trp Leu Lys
            100                 105                 110


Arg Phe Phe Glu Thr Tyr Lys Lys His Asn Gly Leu Asn Glu Val Ala
        115                 120                 125


Thr Arg Tyr Ala Lys Asn Ile Leu Met Gly Asn Trp Leu Trp Arg Asn
    130                 135                 140


Arg Gln Ser Pro Asn Val Asp Ile Glu Ile Leu Thr Glu His Ala Ala
145                 150                 155                 160


Pro Ile Ile Val Glu Gly Ala Gln Lys Leu Lys Trp Gln Gly Asn Trp
                165                 170                 175


Gln Asn Asn Gln Thr Ala Leu Ile Thr Leu Ser Glu Ala Ile Gln Glu
            180                 185                 190
```

```
Gly Leu Ser Asn Pro Gln Asn Tyr Cys Tyr Leu Asp Ile Thr Ala Lys
        195                 200                 205

Ile Lys Asn Ala Phe Ser Gln Glu Val His Pro Ser Gln Lys Phe Val
    210                 215                 220

Asp Asn Val Glu Gln Gly Met Ser Ser Lys Gln Leu Ala Tyr Thr Gln
225                 230                 235                 240

Val Gly Asp Lys Lys Ala Ala Ser Leu Asn Ser Gln Lys Val Gly Ala
                245                 250                 255

Ala Ile Gln Thr Ile Asp Asp Trp Tyr Glu Gly Gly Tyr Lys Pro Leu
            260                 265                 270

Arg Thr His Glu Tyr Gly Ala Asp Lys Gln Ile Leu Val Ala His Arg
        275                 280                 285

Thr Pro Lys Ser His Ser Asp Phe Tyr Ser Leu Leu Pro Arg Ile Ala
    290                 295                 300

Leu His Ile Lys His Met Glu Lys His Gly Leu Glu Gln Ser Glu Glu
305                 310                 315                 320

Ser Asn Ala Val His Phe Ile Ala Ala Val Leu Ile Lys Gly Gly Leu
                325                 330                 335

Phe Gln Arg Ser Lys Ala
            340
```

<210> 1859
<211> 199
<212> PRT
<213> Pseudoalteromonas sp. P1-25

<400> 1859

```
Met Lys Arg Tyr Tyr Phe Thr Ile Thr Tyr Leu Pro Lys Asn Cys Asp
1               5                   10                  15
```

```
Val Ser Leu Leu Ala Gly Arg Cys Ile Gly Ile Leu His Gly Phe Met
            20                  25                  30

Ser Ser Arg Glu Ile Ser Asn Ile Gly Val Cys Phe Pro Lys Trp Asn
        35                  40                  45

Glu Gln Glu Ile Gly Asn Glu Leu Ala Phe Val Ser Thr Asp Lys Lys
    50                  55                  60

Gln Leu Thr Asn Leu Ser Gln Gln Ser Tyr Phe Glu Met Met Ala Gln
65                  70                  75                  80

Asp Lys Leu Phe Gly Leu Ser Lys Ile Leu Glu Val Pro Thr Asn Gln
                85                  90                  95

Asn Glu Val Met Phe Ile Arg Asn Gln Ser Val Ala Lys Ala Phe Val
            100                 105                 110

Gly Glu Lys Gln Arg Arg Leu Lys Arg Ala Lys Lys Arg Ala Glu Ala
        115                 120                 125

Arg Gly Glu Val Tyr Asn Pro Glu Tyr Gln Phe Glu Ala Lys Asp Ile
    130                 135                 140

Gly His Phe His Ser Ile Pro Val Ser Ser Lys Ala Asn Gly Gln Ser
145                 150                 155                 160

Tyr Val Leu His Ile Gln Lys Ile Glu Asn Thr Asn Ala Thr Glu Asn
                165                 170                 175

Gln Phe Asn Asn Tyr Gly Phe Ala Thr Asn Gln Thr Phe Gln Gly Thr
            180                 185                 190

Val Pro Ser Leu Asn Thr Gln
        195
```

<210> 1860
<211> 210
<212> PRT
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1860

Met Tyr Arg Arg Asn Pro Lys Ser Ser Arg Val Lys His Gln Phe Lys
1   5   10   15

Phe Ala Ser Gln Lys Ser Lys Asn Thr Cys Phe Ala Glu Ser Ala Leu
            20   25   30

Glu Phe Asp Ala Cys Phe His Phe Glu Tyr Ser Ser Ala Ile Val Ala
        35   40   45

Phe Glu Thr Gln Pro Leu Gly Phe Lys Tyr Asp Phe Glu Gly Arg Thr
    50   55   60

Cys Pro Tyr Thr Pro Asp Phe Leu Leu Thr His Ser Asp Gly Thr Gln
65   70   75   80

Lys Tyr Ile Glu Ile Lys Pro Val Lys Glu Leu Ala Lys Asp Glu Phe
                85   90   95

Arg Gln Arg Phe Glu Gln Lys Gln Leu Ala Ser Lys Gln Leu Gly Ile
            100   105   110

Glu Leu Ile Leu Val Thr Asp Lys Gln Ile Arg Val Phe Pro Val Leu
        115   120   125

Asp Asn Leu Lys Leu Leu His Arg Tyr Ser Gly Phe Gln Val Leu Thr
    130   135   140

Glu Leu His Thr Val Val Val Gly Leu Val Lys Ser Thr Gly Leu Val
145   150   155   160

Lys Val Ala Gln Leu Val Asn Tyr Leu Lys Val Ser Ala Gly Glu Val
                165   170   175

```
Leu Ser Ile Val Ala Arg Leu Leu Cys Ile Gly Gln Leu Ala Thr Asp
            180                 185                 190


Leu Thr Thr Asp Ala Leu Ser Leu Asp Ser Val Ile Trp Ala Ser Asp
        195                 200                 205


Glu Gln
    210


<210>  1861
<211>  612
<212>  PRT
<213>  Pseudoalteromonas ruthenica strain S3245

<400>  1861

Met Asn Ser Lys Ser Leu Gly Leu Phe Asp Asp Glu Phe Gln His Pro
1               5                   10                  15


Ile Pro Gln Val Glu Ala Pro Lys Ser Thr Lys Ala Glu Lys Asp Leu
            20                  25                  30


Ser Ala Tyr Pro Gln Glu Ile Gln Gln Thr Thr Tyr Ala Arg Leu Lys
        35                  40                  45


Tyr Ile Arg Trp Leu Lys Glu Arg Ile Val Gly Gly Trp Thr Glu Lys
    50                  55                  60


Asn Leu Ala Pro Leu Ile Asn Glu Met Pro Lys Val Glu Gly Ala Asp
65                  70                  75                  80


Lys Pro Asn Trp Arg Thr Ala Ala Arg Trp Phe Lys Ser Tyr Ser Glu
                85                  90                  95


Ser Asp Glu Ser Ile Phe Ala Leu Ile Pro Lys His Gln Lys Lys Gly
            100                 105                 110


Lys Arg Thr Gln Arg Thr Asp Thr Asp Lys Phe Phe Glu Lys Ala Leu
        115                 120                 125
```

```
Glu Arg Phe Leu Val Lys Glu Arg Pro Ser Val Ser Ser Ala Tyr Gln
    130                 135                 140

Tyr Tyr Lys Asp Leu Val Val Ile Glu Asn Glu Lys Val Ile Gly Glu
145                 150                 155                 160

Asp Leu Arg Pro Leu Thr Tyr Lys Ala Phe Lys Asn Arg Ile Asp Lys
                165                 170                 175

Leu Pro His Tyr Glu Val Leu Arg Ala Arg Tyr Gly Lys Arg Ile Ala
            180                 185                 190

Asp Leu Ala Tyr Asn Lys Val Glu Ser His Lys Arg Pro Thr Arg Val
        195                 200                 205

Leu Glu Arg Val Glu Val Asp His Thr Pro Leu Asp Leu Ile Leu Leu
    210                 215                 220

Asp Asp Glu Leu Gln Ile Pro Leu Gly Arg Pro Thr Leu Thr Ile Leu
225                 230                 235                 240

Ile Asp Val Tyr Ser His Cys Ile Val Gly Phe Tyr Leu Gly Phe Asn
                245                 250                 255

Asp Pro Ser Tyr Asp Ala Ile Arg Arg Ala Met Leu Asn Ala Met Lys
            260                 265                 270

Pro Lys Asn Trp Ile Lys Glu Gln Tyr Pro Asp Ile Thr His Asp Trp
        275                 280                 285

His Cys Cys Gly Lys Ile Glu Thr Leu Val Val Asp Asn Gly Val Glu
    290                 295                 300

Phe Trp Ser Asn Ser Phe Glu Ser Ala Cys Ala Gln Ile Gly Ile Ser
305                 310                 315                 320
```

```
Leu Gln Tyr Asn Pro Val Gly Lys Pro Trp Leu Lys Pro Phe Val Glu
                325                 330                 335

Arg Ile Phe Gly Val Ile Asn Thr Gln Leu Leu Asp Pro Ile Pro Gly
            340                 345                 350

Lys Thr Phe Ser Asn Met Met Lys Lys Glu Gly Tyr Asp Pro Asn Lys
        355                 360                 365

Asp Ala Ile Met Arg Phe Ser Ala Phe Met Glu Val Phe His His Trp
    370                 375                 380

Ile Ile Asp Val Tyr His Gln Glu Ala Asp Ser Arg Phe Ser Tyr Ile
385                 390                 395                 400

Pro Ala Leu Glu Trp Asp Arg Gly Tyr Glu Gln Leu Pro Pro Ala Pro
                405                 410                 415

Leu Ser Ser Asp Asp Ile Gln Arg Leu Glu Ile Val Leu Gly Ile Ser
            420                 425                 430

Thr Trp Arg His Ile Arg Lys Gly Gly Ile His Phe Glu Asn Leu Arg
        435                 440                 445

Tyr Asp Ser Asn Glu Leu Ala Asp Tyr Arg Lys Arg Phe Ser Pro Lys
    450                 455                 460

Ala Ser Val Lys Leu Met Leu Lys Val Asn Pro Glu Asp Leu Ser Arg
465                 470                 475                 480

Val Tyr Ala Phe Leu Pro Glu Leu Asp His Tyr Ile Glu Val Leu Cys
                485                 490                 495

Ile Asp Pro Asn Gly Tyr Thr Ala Gly Leu Ser Leu His Gln His Lys
            500                 505                 510

Val Asn Val Arg Leu Gln Arg Asp Phe Ile Gly Ser His Met Asp Val
        515                 520                 525
```

```
Ala Ala Leu Ala Arg Ala Arg Met Leu Ile His Glu Lys Ile Gln Asn
    530                 535                 540

Glu Val Glu Leu Leu Ala Asn Ser Thr Lys Lys Pro Lys Ala Arg Gly
545                 550                 555                 560

Gly Lys Ala Leu Ala Lys Tyr Gln Asn Val Ala Ser Asp Asn Leu Val
                565                 570                 575

Ser Val Lys Pro Ser Ser Pro Thr Lys Lys Pro Pro Glu Lys Val Glu
            580                 585                 590

Thr Glu Glu Ala Gln Asn Lys Gly Asp Trp Asp Asp Phe Val Ser Asp
        595                 600                 605

Leu Glu Gly Phe
    610
```

<210> 1862
<211> 333
<212> PRT
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1862

```
Met Leu Ser Glu Ile Gln Thr Gln Arg Leu Asn Glu Phe Ile Asp Val
1               5                   10                  15

Phe Ile Glu Tyr Pro Leu Met Thr Thr Ile Leu Asn Asp Phe Glu Arg
            20                  25                  30

Leu Arg Thr Gly Gln Lys Leu Ala Gly Glu Lys Gln Cys Met Leu Leu
        35                  40                  45

Thr Gly Asp Thr Gly Cys Gly Lys Ser Ser Val Ile Asn His Tyr Lys
    50                  55                  60

Asn Lys His Pro Ala Cys His Ile Asp Gly Val Tyr His His Pro Val
```

```
65                  70                  75                  80

Leu Val Ser Arg Ile Pro Ser Arg Pro Thr Leu Glu Ser Thr Ile Ala
                85                  90                  95

Gln Leu Leu Ser Asp Leu Gly Gln Val Gly Ala Ala Lys Arg Lys Leu
            100                 105                 110

Lys Arg Asn Asp Ala Asn Leu Thr Asp Ser Leu Ile Thr Asn Leu Lys
        115                 120                 125

Ser Cys Gly Thr Glu Leu Ile Ile Ile Asn Glu Phe Gln Glu Leu Val
    130                 135                 140

Glu Ser Asn Gln Gly Lys Lys Arg Asn Glu Ile Ala Asn Arg Leu Lys
145                 150                 155                 160

Tyr Leu Asn Glu Glu Ala Gly Ile Pro Ile Val Leu Val Gly Met Pro
                165                 170                 175

Trp Ala Glu Gln Ile Ala Glu Glu Pro Gln Trp Ser Ser Arg Leu Met
            180                 185                 190

Val Arg Arg Phe Ile Pro Tyr Phe Lys Leu Ser Lys Asp Leu Thr Leu
        195                 200                 205

Phe Val Arg Val Leu Met Gly Leu Ala Thr Arg Met Pro Phe Arg Asp
    210                 215                 220

Lys Pro Arg Leu Gln Glu Gln Asp Ile Val Tyr Ala Leu Phe Ala Val
225                 230                 235                 240

Ser Lys Gly Cys Phe Arg Thr Leu Lys Tyr Phe Leu Asn Glu Ala Val
                245                 250                 255

Lys Gln Ala Leu Met Tyr Gly Ser Glu Thr Leu Thr Lys Gln His Leu
            260                 265                 270
```

```
Ser Ala Ala Phe Glu Val Phe Tyr Pro Gly Ile Glu Asp Pro Phe Lys
        275                 280                 285


Leu Ser Val Asp Glu Ile Thr Ala Cys Glu Val Glu Ser Tyr Ser Val
    290                 295                 300


Tyr His Thr Asp Ser Ser Ser Asp Asn Glu Ala His Asn Arg Thr Arg
305                 310                 315                 320


Phe Thr Glu Lys Met Pro Ile Asn Gln Leu Leu Lys Lys
                325                 330


<210>  1863
<211>  392
<212>  PRT
<213>  Pseudoalteromonas ruthenica strain S3245

<400>  1863

Met His Phe Leu Val Gln Thr Lys Pro Phe Arg Asp Glu Thr Leu Glu
1               5                   10                  15


Ser Tyr Leu Leu Arg Leu Thr Arg Asp Asn Ala Tyr Thr Asp Tyr His
            20                  25                  30


Glu Leu Ala Asp Ile Ile Trp Gln Arg Leu Val Glu Cys Asp His Glu
        35                  40                  45


Leu Glu Gly Ala Phe Pro Leu Glu Leu Lys Thr Ala Asn Leu Tyr His
    50                  55                  60


Ala Ser Gln Ser Ser Cys Phe Arg Val Arg Ala Phe Lys Leu Val Ala
65                  70                  75                  80


Gln Trp Ala Ala Leu Glu Pro Leu Glu Leu Ile Arg Leu Ser Trp Leu
                85                  90                  95


Arg Ser Asn Thr Gln Phe Gly His Leu Ser Ala Leu Ile Arg Asp Gln
            100                 105                 110
```

```
Leu Leu Ile Pro Arg Thr Leu Leu Arg Glu Ser His Ile Pro Val Cys
        115                 120                 125

Leu Ser Cys Leu Lys Glu Glu Gly Tyr Ile Pro Tyr Tyr Trp His Leu
    130                 135                 140

Lys Pro Tyr Lys Ala Cys His Lys His Lys Met Gln Leu Gln Ser His
145                 150                 155                 160

Cys Ala Glu Cys Gly Glu Leu Ile Asp Tyr Arg Ala Ser Glu Arg Phe
                165                 170                 175

Ser Gln Cys Asn Cys Gly Ala Lys Leu Lys Thr Thr Ala Pro Ala Ser
            180                 185                 190

Glu Ala Asp Ile Ala Val Ser Glu Gly Leu Ser Gly Ala Asp Ala His
        195                 200                 205

Asp Leu Val Gly Lys Leu Thr Trp Phe Ala Tyr Gln Tyr Gly Gln Asp
    210                 215                 220

Gln Glu His Ala Ser Phe Asn Glu Ala Phe Ile Ala Tyr Phe Lys Tyr
225                 230                 235                 240

Trp Pro Asp Asn Phe Phe Ala Glu Leu Asp Glu Lys Ala Ser Arg Ala
                245                 250                 255

Arg Glu Lys Gln Leu Arg Pro Phe Asn His Thr Lys Phe Asp Ser Val
            260                 265                 270

Phe Gly Asp Val Ile Lys Val Ser Lys Val Ala Gly Pro Asn Val Leu
        275                 280                 285

Arg Thr Asn Ile Ile Val Asp Ser Leu Leu Glu Phe Phe Ser Asp Leu
    290                 295                 300
```

```
Val Glu Lys Asn Pro Lys Gln Lys His Pro Asn Ile Ala Asp Leu Leu
305                 310                 315                 320


Val Asn Ser Ser Asp Ala Ala Thr Leu Ile Gly Thr Thr Leu Glu Gln
                325                 330                 335


Val Phe Arg Leu Tyr Gln Glu Gly Gln Leu Thr Cys Cys Glu Arg Leu
            340                 345                 350


Asn Lys Asn Glu Arg Leu Gln Pro Asp Arg Cys Val Phe Tyr Leu Arg
        355                 360                 365


Gln Val Val Glu Leu Ala Gln Ser Gln Gly Arg Tyr Val Gly Asp Phe
    370                 375                 380


Lys Asn Gln Leu Ile Thr Pro Trp
385                 390
```

<210> 1864
<211> 693
<212> PRT
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1864

```
Met Asp Leu Ala Glu Ala Leu Ala Ile Lys Ser Val Arg Glu Lys Ser
1               5                   10                  15


Asp Ala Leu Arg Lys Leu Phe Ala Pro Tyr Ala Ser Ser Val Ala Val
            20                  25                  30


Asp Gly Tyr Glu Gln Gln Val Ala Thr Val Leu Ile Asn Leu Val Tyr
        35                  40                  45


Lys Arg Asn Glu Gln Ile Asp Leu Ala Ser Ile Lys Ala Ala Lys Asp
    50                  55                  60


Val Leu Lys Asp Thr Glu Leu Met Ala Lys Cys Ile Ser Glu Val Lys
65                  70                  75                  80
```

```
Trp Phe His Thr His Asn Leu Lys Tyr Pro Asp Ile Arg Val Ser His
                85                  90                  95

Gln Arg Leu Ile Ala Gln Val Ile Asp Lys Asp Ile Pro Ala Ile Thr
            100                 105                 110

Ser Ala Ser Leu Pro Lys Leu Leu Gly Trp Ser His Asn Ser Ala Glu
        115                 120                 125

Ile Asn His Ala Lys Leu Phe Leu Thr Ser Phe Lys Trp Gln Gly Glu
    130                 135                 140

Val Asn Asn Leu Ala Gly Val Leu Val Asp Glu His Pro Ala Trp Ile
145                 150                 155                 160

Glu Ala Met Arg Asn Leu Gly Leu Thr Lys Lys Ser Val Met Ala Leu
                165                 170                 175

Ala Thr His Ile Arg Glu Leu Leu Pro Ala Thr Asp Leu Pro Gly Glu
            180                 185                 190

Val Ser Glu Phe Thr Pro Gln Leu Met Met Pro Tyr Gly Lys Asp Tyr
        195                 200                 205

Leu Ser Val Ser Pro Val Leu Ser His Ala Met Leu Val Arg Val Gln
    210                 215                 220

Gln Leu Ala Arg Asp Lys Val Val Asn Trp Gly Val Val Glu His Thr
225                 230                 235                 240

Arg Pro Ala Asn Val Gly Asp Leu Pro Ser Ser Leu Gly Gly Asn Val
                245                 250                 255

Arg Val Leu Arg Tyr Phe Pro Ala Thr Ser Leu Lys Gly Ser Leu Gly
            260                 265                 270

Glu Tyr Ile Glu Asn Asp Pro Asn Glu Arg Leu Phe Lys His Lys Val
```

```
        275                 280                 285

Leu Thr Ser Lys Ser Phe Lys Thr Ser Leu Ile Ile Leu Thr Gly Lys
    290                 295                 300

Ser Val Tyr Asn Thr Leu Arg Gln Lys Arg Leu Ala Arg Ile Ala Ala
305                 310                 315                 320

Ile Arg Gln Leu Arg Ser Thr Leu Met His Trp Leu Asp Lys Ile Ile
                325                 330                 335

Glu Phe Gln Asn Asn Gly Asn His Asn Leu Val Pro Glu Pro Met Lys
            340                 345                 350

Ser Phe Ile Glu Asn Leu Lys Pro Asn Leu Asn Gly Val Val Cys Glu
        355                 360                 365

Leu Ser Gly Leu Leu Asn Glu Gln Leu Ser Ser His His Ser Leu Lys
    370                 375                 380

Lys Phe Ala Tyr His Pro Asp Leu Met Ser Val Leu Lys Arg Gln Leu
385                 390                 395                 400

Gln Tyr Val Leu Thr His Gly Glu Thr Val Asp Glu Thr Leu Val Asp
                405                 410                 415

Ser Gln Ile Leu Tyr Val His Cys Lys Gly Leu Arg Ile Phe Asp Ala
            420                 425                 430

Glu Gly Met Pro Asn Pro Tyr Leu Gln Gly Ile Pro Ser Leu Thr Ala
        435                 440                 445

Leu Ala Gly Val Ala His Lys Phe Gln Arg Lys Leu Gln Ser Ile Val
    450                 455                 460

Asp Pro Ser Ile Glu Cys Ile Gly Ser Ala Ile Phe Val His Ser Tyr
465                 470                 475                 480
```

```
Gln Leu His Thr Gly Lys Pro Leu Pro Glu Gln Asn Gln Leu Lys Thr
                485                 490                 495

Asn Gln Gly Ile Thr Ser Ala Lys Arg Pro Gly Ile Val Asp Lys Pro
            500                 505                 510

Lys Cys Asp Met Thr Ile Asp Leu Val Phe Arg Leu Phe Val Pro His
        515                 520                 525

Glu Ser Thr Arg Thr Gln Leu Thr Asp Asn Met Phe Lys Ala Ala Phe
    530                 535                 540

Pro Thr Ser Phe Ala Gly Gly Thr Met His Pro Pro Ser Leu Tyr Glu
545                 550                 555                 560

Thr Val Glu Trp Cys Gln Ala Phe Thr Ser Pro Thr Gln Leu Phe Gly
                565                 570                 575

Glu Leu Ser Leu Leu Pro Ser Arg Gly Cys Trp Leu Tyr Pro Ser Lys
            580                 585                 590

His Gln Val Arg Thr Phe Glu Asp Met Val Glu Leu Leu Asp Ala Asp
        595                 600                 605

Pro Asn Gln Arg Pro Ala Gly Leu Gly Phe Ala Ser Leu Glu Gln Pro
    610                 615                 620

Thr Gln Arg Lys Glu Ala Leu Gly Ser Lys His Cys Tyr Val Glu Pro
625                 630                 635                 640

Ala Ile Gly Leu Leu Glu Cys Val Asn Pro Ile Thr Thr Arg Met Gly
                645                 650                 655

Gly Ala Lys Ala Phe Phe His Asn Ala Phe Trp Val Ile Gly Val Glu
            660                 665                 670

Lys Thr Ser Met Leu Met Lys Lys Ala Lys Phe Glu Tyr Thr Gln Cys
```

675 680 685

Asp Ser Arg Asp Thr
690

<210> 1865
<211> 342
<212> PRT
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1865

Met Arg Leu Pro Arg His Leu Ser Tyr Thr Arg Ser Leu Ser Pro Gly
1 5 10 15

Lys Ala Val Phe Phe Tyr Gln Thr Pro Glu Ser Asp Phe Glu Pro Leu
20 25 30

Gln Ile Glu Gln Asn Lys Leu Ile Gly Gln Lys Ser Gly Phe Thr Asp
35 40 45

Ala Tyr Gln Lys Leu Gly Glu Pro Lys Ser Leu Ala Pro Gln Asp Leu
50 55 60

Ala Phe Gly Asn Pro Gln Thr Ile Asp Val Cys Tyr Val Pro Pro Thr
65 70 75 80

Val Asn Glu Ile Phe Cys Arg Phe Ser Leu Arg Val Glu Ala Asn Ser
85 90 95

Val Glu Pro Tyr Val Cys Asp Asp Arg Lys Val Ser Tyr Trp Leu Lys
100 105 110

Arg Phe Val Glu Thr Tyr Lys Glu His Gly Gly Phe Lys Glu Leu Ala
115 120 125

Ser Arg Tyr Ala Lys Asn Ile Leu Met Gly Asn Trp Leu Trp Arg Asn
130 135 140

```
Lys Gln Ser Pro Gly Phe Asp Val Glu Val Leu Thr Glu His Ser Glu
145                 150                 155                 160

Pro Ile Val Ile Glu Gly Ala Gln Arg Leu Lys Trp Asn Gly Val Trp
                165                 170                 175

Gly Asn Asp Glu Ala Ala Leu Ala Thr Leu Thr Glu Ala Ile Glu Asn
            180                 185                 190

Gly Leu Ala Asn Pro Gln Ala Tyr Cys Tyr Leu Asp Ile Thr Ser Arg
        195                 200                 205

Ile Lys Thr Ala Phe Cys Gln Glu Ile His Pro Ser Gln Lys Phe Val
    210                 215                 220

Asp Asn Val Glu Gln Gly Met Ser Ser Lys Gln Leu Ala Tyr Thr Gln
225                 230                 235                 240

Val Asp Gly Lys Gln Val Ala Ser Leu Asn Ala Gln Lys Val Gly Ala
                245                 250                 255

Ala Ile Gln Thr Ile Asp Asp Trp Tyr Thr Glu Asp Leu Lys Arg Leu
            260                 265                 270

Arg Ile His Glu Tyr Gly Ala Asp Lys Gln Val Leu Val Ala His Arg
        275                 280                 285

Thr Pro Lys Asn Gly Leu Asp Phe Tyr Ser Leu Leu Pro Lys Val Ala
    290                 295                 300

Val Tyr Ile Arg His Met Glu Arg Asp Gly Leu Glu Asp Asp Glu Glu
305                 310                 315                 320

Ser Lys His Ile His Tyr Leu Ala Ser Ile Leu Leu Lys Gly Gly Leu
                325                 330                 335

Phe Gln Arg Ser Lys Gly
            340
```

<210> 1866
<211> 201
<212> PRT
<213> Pseudoalteromonas ruthenica strain S3245

<400> 1866

Met Lys Arg Ser Tyr Phe Thr Val Thr Tyr Leu Pro Ile Asn Cys Asp
1   5   10   15

Tyr Ser Leu Leu Ala Gly Arg Cys Ile Gly Ile Leu His Gly Tyr Leu
            20   25   30

Ser Arg Phe Glu Leu Asp Gly Ile Gly Val Ser Phe Pro Lys Trp Asn
        35   40   45

Glu Glu Thr Val Gly Asn Gln Ile Ala Phe Val Ser Glu Ser Glu Ser
    50   55   60

His Leu Gln Thr Leu Arg Gln Gln Asn Tyr Phe Gln Met Met Ser His
65   70   75   80

Asp Gly Leu Phe Lys Leu Ser Val Thr Arg Thr Val Pro Glu Gln Val
                85   90   95

Asp Glu Ile Gln Phe Val Arg Asn Gln Ser Ile Ser Lys Ala Phe Val
            100   105   110

Gly Glu Arg Arg Arg Arg Met Val Arg Ala Lys Leu Arg Ala Glu Ala
        115   120   125

Arg Gly Glu Glu Tyr Asn Pro Ile Tyr Glu Phe Glu Pro Thr Glu Ile
    130   135   140

Glu His Phe His Ser Ile Pro Ile Thr Ser Lys Ser Asn Asn Asn Glu
145   150   155   160

Phe Val Leu His Ile Gln Arg Arg Glu Cys Ser Gly Thr Ala Gly Gly

```
                165                 170                 175

Phe Asn Lys Tyr Gly Phe Ala Thr Asn Glu His His Leu Gly Thr Val
            180                 185                 190

Pro Ser Leu Ser Gly Leu Leu Ile Ser
        195                 200
```

<210> 1867
<211> 209
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1867

```
Met Tyr Arg Arg Lys Leu Lys His Ser Arg Val Lys Asn Leu Phe Lys
1               5                   10                  15

Phe Val Ser Ala Lys Met Asn Gln Ala Met Thr Val Glu Ser Tyr Leu
            20                  25                  30

Glu Phe Asp Thr Cys Phe His Leu Glu Tyr Ser Ser Ser Ile Ile Ser
        35                  40                  45

Phe Ala Ala Gln Pro Glu Gly Phe Ile Tyr Arg Ile Asp Gly Arg Asp
    50                  55                  60

Cys Ser Tyr Thr Pro Asp Phe Gln Ile Leu Glu Asn Glu Glu Val Lys
65                  70                  75                  80

Trp Ile Glu Val Lys Pro Phe Val Lys Thr Gln Arg Pro Asp Phe Leu
                85                  90                  95

Gln Arg Phe Lys Val Lys Gln Glu Lys Ala Leu Ala Leu Gly Val Pro
            100                 105                 110

Leu Ile Leu Val Thr Glu Lys Gln Ile Arg Val Asn Pro Val Leu Asn
        115                 120                 125
```

```
Asn Leu Lys Ile Leu His Arg Tyr Ser Gly Phe Gln Ser Leu Thr Asp
    130                 135                 140

Leu His Ile Arg Leu Leu Ser Leu Val Lys Thr Val Gly Lys Ile Ser
145                 150                 155                 160

Val Ser Asp Ala Ala Cys Arg Leu Gly Ile Asp Gln Gly Met Met Val
                165                 170                 175

Lys Ser Ala Phe Ser Leu Val Ser Ser Gly Met Leu Thr Ala Asp Leu
            180                 185                 190

Val His Asp Glu Leu Gly Leu His Ser Ile Val Trp Ser Glu His Asn
        195                 200                 205

Gly
```

<210> 1868
<211> 622
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1868

```
Met Ala Lys Asp Ile Ser Thr Gly Leu Phe Gln Asp Glu Met Ala Val
1               5                   10                  15

Ala Ser Ser Ser Glu Pro Val Glu Ala Leu Pro Ser Ser Thr Asp Asp
            20                  25                  30

Phe Phe Glu Arg Asp Leu Ala Ser Tyr Pro Asp Glu Ile Gln Ile Glu
        35                  40                  45

Val Arg Arg Arg Ile Glu Tyr Leu Gln Trp Ile Glu Lys His Leu Val
    50                  55                  60

Gly Gly Trp Thr Gln Lys Asn Leu Asp Pro Leu Ile Glu Lys Ala Ala
65                  70                  75                  80
```

```
Arg Glu Ile Asp Phe Pro Pro Pro Lys Trp Arg Ala Leu Ala Lys Trp
                85                  90                  95

Trp Ser Val Tyr Ser Ser Ser Gly Lys Met Leu Ala Ser Leu Val Pro
            100                 105                 110

Lys Leu His Arg Lys Gly Asn Arg Asn Leu Lys Ile Thr Asn Glu Leu
        115                 120                 125

Ser Phe Phe Asp Arg Ala Val Glu Arg Tyr Leu Val Pro Glu Arg Pro
    130                 135                 140

Ser Ile Ser Ala Val Tyr Gln Tyr Tyr Thr Asp Leu Ile Arg Ile Glu
145                 150                 155                 160

Asn Gln His Leu Val Gly Glu Lys Val Gln Ala Leu Ser Tyr Lys Gly
                165                 170                 175

Phe Tyr Asn Arg Ile Lys Lys Leu Pro Ala Tyr Glu Val Ala Val Ala
            180                 185                 190

Arg His Gly Lys Tyr Leu Ala Asp Met Glu Phe Asn Lys Ile Asp Ala
        195                 200                 205

His Gln Pro Pro Ser Arg Val Leu Glu Lys Val Glu Ile Asp His Ser
    210                 215                 220

Pro Leu Asp Leu Ile Leu Leu Asp Asp Glu Leu Asn Ile Pro Leu Gly
225                 230                 235                 240

Arg Pro Tyr Leu Thr Leu Leu Ile Asp Gln Tyr Ser Lys Ser Ile Met
                245                 250                 255

Gly Phe His Leu Gly Phe Lys Glu Pro Ser Tyr Tyr Ser Val Met Lys
            260                 265                 270

Ala Ile Leu Asn Ala Ile Lys Pro Lys Asp Asp Ile Ala Glu Arg Phe
```

```
        275                 280                 285

Pro Gly Val Val His Asp Trp Tyr Cys Gln Gly Lys Met Glu Ser Leu
    290                 295                 300

Val Val Asp Asn Gly Ala Glu Phe Trp Ser Lys Ser Leu Glu Gln Ser
305                 310                 315                 320

Cys Leu Glu Val Gly Ile His Ile Gln Tyr Asn Pro Val Arg Lys Pro
                325                 330                 335

Trp Leu Lys Pro Leu Val Glu Arg Ile Phe Arg Thr Ile Gly Ser Lys
            340                 345                 350

Leu Leu Val Thr Ile Pro Gly Lys Thr Phe Ser Asn Ile Leu Ala Arg
        355                 360                 365

Glu Glu Tyr Asp Pro Arg Lys Asp Ala Val Met His Phe Ser Val Phe
    370                 375                 380

Asn Glu Leu Phe His Lys Trp Ile Ile Asp Val Tyr His Tyr Glu Ser
385                 390                 395                 400

Asp Ser Arg Lys Arg Ala Ile Pro Tyr Val Lys Trp Gln Glu Gly Val
                405                 410                 415

Val Val Met Pro Pro Ile Ser Tyr Glu Pro Glu Asp Leu Glu Lys Leu
            420                 425                 430

Ser Val Val Leu Gly Ile Lys Glu Leu Arg Lys His Arg Arg Gly Gly
        435                 440                 445

Ile His Leu His Gly Leu Arg Tyr Asp Ser Glu Glu Leu Ala Asp Tyr
    450                 455                 460

Arg Arg Met Tyr Ser Arg Asp Ile Asp Val Leu Thr Lys Thr Asn Pro
465                 470                 475                 480
```

```
Asp Asp Ile Ser Ser Ile Tyr Val Tyr Leu Glu His Lys Gln Gln Tyr
                485                 490                 495

Leu Lys Val Pro Cys Ile Asp Pro Ile Gly Tyr Thr Lys Ser Leu Ser
            500                 505                 510

Leu Thr Gln His His Ile Asn Gln Arg Leu His Arg Asp Phe Ile Asp
        515                 520                 525

Ser Gln Leu Asp Leu Glu Gly Leu Ala Arg Val Arg Met Tyr Ile His
    530                 535                 540

Asp Arg Ile Glu Gln Glu Ala Asp Glu Ile Lys Asn Leu Asn Arg Gly
545                 550                 555                 560

Arg Pro Arg Arg Thr Thr Lys Gly Met Ala Arg Leu Ala Lys His Asn
                565                 570                 575

Gly Val Ala Ser Asp Val Gln Thr Ser Cys Val Pro Glu Thr Leu Pro
            580                 585                 590

Glu Leu Ser Met Pro Asp Lys Gly Lys Glu Ser Lys Gln Leu Pro Asp
        595                 600                 605

Ser Asp Glu Trp Asp Asp Phe Ile Ser Asp Leu Glu Pro Tyr
    610                 615                 620
```

<210> 1869
<211> 338
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1869

```
Met Asp Ser Leu Ser Pro Glu Asp Glu Ala Lys Tyr Gln Ala Phe Val
1               5                   10                  15

Asp Ile Phe Val Glu Gln Pro Ile Ala Thr Met Val Met Ala Asp Phe
            20                  25                  30
```

```
Asp Arg Leu Arg Tyr Asn Arg Gln Phe Gly Gly Asp Gln Gln Cys Met
        35                  40                  45

Leu Leu Thr Gly Asp Thr Gly Ser Gly Lys Ser Phe Leu Ile Lys Glu
    50                  55                  60

Tyr Cys Arg Arg Leu Ala Gln Thr Asn Pro Met Lys Gln Ala Leu Val
65                  70                  75                  80

Leu Ser Ser Arg Ile Pro Ser Lys Pro Thr Leu Glu Ser Thr Ile Ile
                85                  90                  95

Glu Leu Leu Lys Asp Phe Gly His Phe Gly Ala Thr Tyr Arg Lys Gly
            100                 105                 110

Lys Ser Lys Asp Gln Ser Leu Thr Val Ser Leu Ile Lys Cys Leu Lys
        115                 120                 125

Ala Ser Cys Val Glu Leu Ile Ile Ile Asn Glu Phe Gln Glu Leu Val
    130                 135                 140

Glu Phe Lys Thr Gly Arg Ala Leu Asn Glu Ile Ala Thr Arg Leu Lys
145                 150                 155                 160

His Ile Ser Glu Glu Ala Thr Val Pro Ile Val Leu Val Gly Met Pro
                165                 170                 175

Trp Ala Ala Lys Ile Ala Asn Glu Pro Gln Trp Ala Ser Arg Leu Leu
            180                 185                 190

Ile Arg Arg Glu Leu Pro Tyr Phe Lys Leu Ser Glu Glu Pro Glu His
        195                 200                 205

Phe Ile Arg Phe Ile Lys Gly Leu Ala Ala Arg Met Pro Phe Thr Glu
    210                 215                 220
```

```
Leu Pro Lys Leu Asp Asn Lys Gln Thr Ile Leu Ala Leu Phe Ser Ala
225                 230                 235                 240


Ser Asn Gly Gln Thr Arg Arg Leu Lys Gln Leu Leu Asn Glu Ala Val
                245                 250                 255


Lys Leu Ala Leu Val Gln Asn Ala Val Thr Leu Thr Asn Glu His Leu
            260                 265                 270


Ala Asp Val Phe Arg Met Ile Phe Pro Ala Ile Pro Asn Pro Phe Leu
        275                 280                 285


Ala Ser Ile Glu Gln Ile Glu Gly Gln Glu Val Ser Leu Pro Ser His
    290                 295                 300


Tyr Asp Ser Gly Ala Asp Asn Glu Phe Glu Ala Ile Ile Pro Thr Gln
305                 310                 315                 320


Tyr Thr Asp Arg Leu Pro Leu Ser Gln Leu Leu Arg Lys Ser Arg Lys
                325                 330                 335


Thr Lys
```

<210> 1870
<211> 405
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1870

```
Met Phe Leu Ile His Pro Glu Lys His Tyr Gln Asp Glu Ser Leu Glu
1               5                   10                  15


Ser Phe Leu Ile Arg Leu Cys Glu Cys Asn Gly Phe Glu Ser Phe Arg
            20                  25                  30


Leu Leu Ser Gly Ala Leu Trp Glu Trp Leu Val Asp Asn Asp His Gln
        35                  40                  45
```

```
Ala Ala Gly Ala Leu Ser Arg Gln Leu Cys Glu Ile Asn Leu Tyr His
    50                  55                  60

Ala Lys His Ser Ser Gly Phe Arg Val Arg Ala Phe Glu Leu Leu Asp
65                  70                  75                  80

Ser Leu Phe Lys Gly Asn Ala Arg Pro Leu Met Gln His Ala Leu Leu
                85                  90                  95

His Ser Ala Val Thr Phe Ser Pro Asn Leu Thr Ser Val Phe Arg Ala
            100                 105                 110

Gly Ile His Ile Pro Arg Cys Phe Leu Arg Gln Ser Tyr Thr Pro Val
        115                 120                 125

Cys Pro Ala Cys Leu Thr Glu Ala Pro Tyr Ile Arg Gln Tyr Trp His
    130                 135                 140

Leu Lys Pro Tyr Gln Ser Cys His Arg His Gly Val Ala Met Leu Phe
145                 150                 155                 160

His Cys Pro Ser Cys Ser Ala Val Leu Asn Tyr Gln Asp Thr Glu Gln
                165                 170                 175

Ile Glu Thr Cys Ser Cys Gly Phe Asp Leu Arg Asp Ala Gly Thr Asn
            180                 185                 190

Val Ala Ser Ser Glu Gln Ile Ala Ile Ser Gln Leu Val Val Glu Gly
        195                 200                 205

Glu Met Gln Asn Ala Leu Ser Ile Ser His Trp Leu Gly Ala Leu Leu
    210                 215                 220

Trp Phe Tyr Arg Tyr Lys Gln Ser Gln Leu Ser Leu Asn Val Val Lys
225                 230                 235                 240

Glu Pro Glu Phe Gly Arg Ala Val Glu Tyr Phe Ser Gln Trp Pro Asn
```

```
                245                 250                 255

Ala Phe Val Arg Asp Leu His Glu Leu Ala Thr Gln Ala Glu Met Lys
            260                 265                 270

Leu Val Arg Gly Phe Asn His Thr Arg Phe Ser Glu Val Phe Gly Asp
        275                 280                 285

Leu Leu Ser Ser Ser Arg Lys Leu Pro Ser Ser Asp Thr Gln Gln Asn
    290                 295                 300

Phe Ile Leu Lys Ala Val Ile Asp Phe Leu Gln Gln Leu Val Arg Asp
305                 310                 315                 320

Asn Pro Lys Ala Lys Glu Thr Asn Ile Ala Asp Val Lys Leu Thr Val
                325                 330                 335

Val Glu Ala Ala Ala Leu Leu Thr Thr Ser Thr Glu Gln Val Tyr Arg
            340                 345                 350

Leu Tyr Glu Glu Gly Tyr Leu Gln Ser Ser Val Arg Phe Lys Leu His
        355                 360                 365

Ser Lys Leu Ser Pro Asn Asp Ala Val Phe Phe Leu Arg His Val Val
    370                 375                 380

Glu Leu Arg Met Ala Gly Met Ala Ser Asp Tyr Ser Ala Asn Asp Val
385                 390                 395                 400

Tyr Leu Pro Ser Trp
                405
```

<210> 1871
<211> 691
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1871

```
Met Val Arg Ser Met His Leu Ser Glu Leu Leu Leu Val Gln Asp Thr
1               5                   10                  15

Glu Glu Arg Asn Gln Leu Leu Arg Lys Ala Leu Ala Pro Tyr Thr Cys
            20                  25                  30

Leu Val Asp Val Thr Gly Tyr Glu Arg Gln Leu Leu Met Ile Ala Ile
        35                  40                  45

Asn Ile Thr Val Pro Arg Lys Asp Val Asp Asp Val Leu Asp Lys Lys
    50                  55                  60

Leu Ala Lys Ser Leu Leu Thr Asn Thr Lys His Leu Gln Arg Cys Ile
65                  70                  75                  80

Asp Glu Val Gln Trp Phe His Thr His Asn Val Lys Tyr Pro Asp Ser
                85                  90                  95

Arg Val Lys Gly Gln Arg Ile Ile Ser Leu Lys Gln Asp Glu Val Asp
            100                 105                 110

Gly Val Leu Cys Ser Ala Asn Leu Pro Ser Ser Leu Gly Trp Ala His
        115                 120                 125

Asn Ser Ser Gln Val Asn Pro Ala Lys Phe Phe Ser Ile Arg Phe Ile
    130                 135                 140

Trp Gln Gly Arg Ala Met Ser Leu Leu Glu Thr Val Ile Asp Ala Pro
145                 150                 155                 160

Ser Glu Trp Lys Val Ala Phe Arg Ser Leu Gly Ile Ile Lys Lys Gln
                165                 170                 175

Leu Ser Glu Phe Arg Glu Ile Phe Ser Thr Tyr Tyr Thr Ser Ser Gln
            180                 185                 190

Ile Pro Ser Glu Val Ser Asp Tyr Ser Thr Gln Ile Arg Val Pro Tyr
        195                 200                 205
```

```
Gln Gly Tyr Tyr Cys Ala Leu Thr Pro Val Ile Ser His Ser Val Gln
    210                 215                 220

Ser Lys Ile Gln Lys Met Ala Phe Gly Arg Lys Val Lys Ser Ser Asn
225                 230                 235                 240

Val Glu His His His Pro Ala Ser Val Gly Ser Leu Val Ala Ala Leu
                245                 250                 255

Gly Gly Asn Ile Arg Val Leu Asp Tyr Pro Pro Asn Val Arg Gln Lys
            260                 265                 270

Thr Ser Glu Ala Phe Ser Leu Tyr Arg Ala Val Ser Glu Lys Glu Val
        275                 280                 285

Phe Asp His Ser Ile Ile Lys Glu Lys Arg Phe Leu Asp Ala Leu Ser
    290                 295                 300

Arg Ile Ala Gly Glu Asn Pro Thr Pro Thr Leu Arg Gln Arg Arg Gln
305                 310                 315                 320

Leu Arg Val Ser Ala Leu Arg Phe Val Arg Lys Gln Leu Ala Leu Trp
                325                 330                 335

Leu Ala Pro Met Met Glu Trp Arg Asp Ser Ile Gly Gly Glu Ser Arg
            340                 345                 350

His Ser Pro Ile Glu Thr Leu Glu Glu Gln Leu Leu Tyr Leu Pro Ile
        355                 360                 365

Ala His Leu Pro Asp Val Leu Ser Asp Leu Asn Thr Arg Phe His Gln
    370                 375                 380

Ala Leu Gln Tyr His Arg Arg Gly Ala Arg Tyr Ala Tyr His Pro Glu
385                 390                 395                 400
```

```
Val Leu Phe Pro Ile Lys Gln Gln Leu Lys Trp Leu Leu Arg Tyr Met
                405                 410                 415

Ala Asn Gln Gln Asp Ala Leu Ile Thr Pro Glu Pro Asn Cys Val Tyr
            420                 425                 430

Leu His Leu Gln Gln Leu Val Val His Asp Ala Ser Leu Leu Ser Asn
        435                 440                 445

Pro Tyr Val Ser Gly Ile Pro Ala Leu Thr Ala Leu Gly Gly Leu Met
    450                 455                 460

His Asn Tyr Gln Arg Arg Leu Ser Ala Leu Met Glu Cys Glu Cys Leu
465                 470                 475                 480

Ile Gln Arg Gly Ala Trp Phe Ile Ala His Tyr His Gln Gln Lys Ile
                485                 490                 495

Lys Lys Leu Pro Glu Pro Asp Lys Val Arg Tyr Leu Lys Lys Arg Ser
            500                 505                 510

Asp Val Gln Arg Pro Gly Ile Thr Asp Gly Lys Tyr Gly Asp Leu Thr
        515                 520                 525

Met Asn Leu Val Leu Glu Leu Gln Leu Pro Glu Ser Val Ser Ile Pro
    530                 535                 540

Glu Leu Ser Leu Leu Gln Ala Ala Phe Pro Ser Arg Phe Ala Gly Gly
545                 550                 555                 560

Thr Leu His Pro Pro Ser Leu Phe Glu Gln Thr Asp Trp Leu Ser Val
                565                 570                 575

Tyr Ser Asn Gln Ser Glu Leu Phe Ser Val Leu Ala Arg Leu Pro Arg
            580                 585                 590

Ser Gly Cys Trp Val Tyr Pro Asp Asp Lys Gly Val Ser Ser Phe Asp
        595                 600                 605
```

```
Glu Leu Ala Ser Arg Leu Asp Asn Asp Pro Asp Leu Lys Pro Val Gly
    610                 615                 620

Leu Gly Phe Ile Pro Leu Glu Glu Pro His Cys Arg Val Gly Ser Ile
625                 630                 635                 640

Ala Pro Tyr His Cys Tyr Val Glu Pro Cys Ile Gly Val Val Arg Cys
                645                 650                 655

Met Asn Pro Ile Asn Val Arg Leu Ser Gly Ser Gln Gln Phe Tyr Gln
            660                 665                 670

Ser Ala Phe Trp His Phe Asp Ile Ala Asn Asp Ala Met Leu Met Lys
        675                 680                 685

Lys Ala Thr
    690
```

<210> 1872
<211> 344
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1872

```
Met Gln Ile Cys Arg His Leu Asn Tyr Val Arg Ser Leu Ser Pro Gly
1               5                   10                  15

Lys Ala Val Phe Tyr Tyr Gln Thr Pro Glu Ser Asp Phe Val Pro Ile
            20                  25                  30

Gln Val Glu Thr Asn Arg Ile Arg Ala Ala Lys Ser Gly Phe Thr Glu
        35                  40                  45

Ala Tyr Asp Lys Asn Gln Asn Leu Lys Asn Val Ala Pro Gln Asp Leu
    50                  55                  60

Ala Tyr Ser Asn Pro Gln Cys Ile Asp Ala Cys Tyr Val Pro Pro Asn
```

```
65                  70                  75                  80

Ile Ser Glu Ile His Cys Arg Phe Ser Leu Arg Val Glu Ala Asn Ser
                85                  90                  95

Leu Gln Pro Asp Ser Cys Glu Asp Gln Lys Val Arg Arg Tyr Leu Ile
            100                 105                 110

Gln Leu Ala Ser Ile Tyr Ala Gln Val Gly Gly Tyr Gln Glu Leu Ala
        115                 120                 125

Lys Arg Tyr Cys Lys Asn Ile Leu Met Gly Thr Trp Leu Trp Arg Asn
    130                 135                 140

Asn His Thr Leu Gly Thr Arg Ile Asp Val Ile Thr Ser Ser Gly Arg
145                 150                 155                 160

Cys Tyr Ala Ile Asp Asp Ala Arg Tyr Leu Asp Trp Ile Asp Trp Pro
                165                 170                 175

Glu Glu Glu Gln Val Met Leu Asn Asp Leu Ala Ser Glu Met Ala Ala
            180                 185                 190

Ala Leu Cys Glu Pro Lys Gln Phe Trp Phe Ala Asp Ile Lys Ala Thr
        195                 200                 205

Leu Lys Thr Gly Phe Cys Gln Glu Leu His Pro Ser Gln Lys Phe Thr
    210                 215                 220

Asp Ser His Glu Gln Gly Glu Ser Ser Lys Gln Tyr Ala Thr Val Glu
225                 230                 235                 240

Cys Pro Asn Gly Ile Gln Ala Ala Cys Phe His Ala Glu Lys Val Gly
                245                 250                 255

Ala Ala Leu His Leu Ile Asp Asp Trp Trp Asp Glu Val Ala Asp Lys
            260                 265                 270
```

```
Arg Leu Arg Thr His Glu Tyr Gly Ala Asp Arg Asp Tyr Leu Ile Ala
        275                 280                 285

Arg Arg His Pro Met Lys Lys Gln Asp Phe Tyr Ser Leu Leu Thr Leu
    290                 295                 300

Thr Ala Val Phe Ile Arg Gln Leu Arg Asn Val Arg Asp Lys Gly Gly
305                 310                 315                 320

Glu Ile Pro Pro Gln Val His Tyr Leu Met Ala Val Leu Cys Lys Ala
                325                 330                 335

Gly Met Phe Gln Arg Gly Lys Ser
            340
```

<210> 1873
<211> 207
<212> PRT
<213> Photobacterium ganghwense strain JCM 12487

<400> 1873

```
Met Ala Asn Arg Phe Tyr Phe Leu Ile Arg Tyr Met Pro Glu Asp Val
1               5                   10                  15

Asp Glu Gly Leu Leu Ala Gly Arg Cys Ile Ser Ile Leu His Gly Val
            20                  25                  30

Leu Ser Ser Asp Gln Asn Asp Ile Asp Gly Gly Ile Gly Val Val Phe
        35                  40                  45

Pro Gln Trp Ser Cys Thr Ser Leu Gly Arg Ser Ile Ala Phe Val Ser
    50                  55                  60

Asp Asn Gln Arg His Leu Glu Gln Leu Ser Gln Gln His Tyr Phe Ala
65                  70                  75                  80

Val Met Lys Gly Asp Asn Leu Phe Asp Ile Ser His Ile Gln Ala Val
                85                  90                  95
```

```
Pro Ser Gly Leu Ser Glu Ile Arg Phe Lys Arg Asn Gln Gly Ile Ala
            100                 105                 110

Lys Cys Phe Ala Gly Glu Lys Arg Arg Arg Leu Ala Arg Ala Lys Arg
        115                 120                 125

Arg Ala Glu Ala Arg Gly Glu Val Phe Asn Pro Lys His Gly Met Ser
    130                 135                 140

Asp Arg Glu Val Ser Leu Phe His Lys Ala Val Met Thr Ser Lys Ser
145                 150                 155                 160

Thr Gly Gln Lys Tyr Leu Leu His Ile Gln Arg Glu Thr Val Thr Gly
                165                 170                 175

Ser Ser Val Ser Gln Tyr Ser Gln Tyr Gly Leu Ala Thr Asn Ile Glu
            180                 185                 190

Cys Met Gly Thr Val Pro Asp Leu Ser Pro Ile Ile Pro Phe Phe
        195                 200                 205
```

<210> 1874
<211> 209
<212> PRT
<213> Shewanella sp. UCD-KL21

<400> 1874

```
Met Tyr Ile Arg Asn Leu Arg Lys Pro Ser Pro Asn Lys Asn Val Phe
1               5                   10                  15

Lys Phe Ala Ser Ala Lys Val Ser Glu Thr Ile Met Cys Glu Ser Thr
            20                  25                  30

Leu Glu Phe Asp Ala Cys Phe His His Glu Tyr Asn Glu Thr Ile Glu
        35                  40                  45

Thr Phe Gly Ser Gln Pro Lys Gly Phe Tyr Tyr Cys Phe Glu Gly Lys
```

```
    50                  55                  60

Arg Leu Pro Tyr Thr Pro Asp Ala Leu Leu His Tyr Ile Asp Gly Thr
65                  70                  75                  80

Thr Lys Phe His Glu Tyr Lys Pro Tyr Ser Lys Thr Phe Asp Pro Ile
                85                  90                  95

Phe Arg Ala Lys Phe Val Ala Lys Lys Glu Ala Ala Gln Ala Leu Gly
            100                 105                 110

Thr Glu Leu Ile Leu Val Thr Asp Lys Gln Ile Arg Val Asn Pro Ile
        115                 120                 125

Leu Asn Asn Leu Lys Leu Leu His Arg Tyr Ser Gly Ile Tyr Gly Val
    130                 135                 140

Thr Asp Ile Gln Arg Glu Leu Leu Gln Leu Ile Arg His Ser Gly Lys
145                 150                 155                 160

Ile Gln Leu Asp Asp Val Ala Asp Glu Tyr Glu Leu Ser Val Gly Glu
                165                 170                 175

Thr Arg Ser Phe Leu Tyr Ser Leu Ile Asn Lys Gly Leu Leu Glu Ala
            180                 185                 190

Asp Leu Thr Gln Asp Asp Leu Ser Cys Asn Pro Phe Val Trp Cys Asn
        195                 200                 205

Ala
```

<210> 1875
<211> 617
<212> PRT
<213> Shewanella sp. UCD-KL21

<400> 1875

```
Met Ile Glu Phe Lys Asp Glu Phe Thr Glu Ser Thr Ser Val Lys Lys
1               5                  10                  15

Pro Asp Thr Pro Gly Gln Tyr Ile Lys Leu Asp Asp Ala Glu Ile Leu
            20                  25                  30

Lys Arg Asp Leu Asp Thr Phe Pro Asp Phe Leu Lys Glu Lys Ala Phe
        35                  40                  45

Asp Lys Tyr Lys Leu Ile Ser Phe Ile Glu Gln Glu Asn Ser Gly Gly
    50                  55                  60

Trp Thr Gln Lys Lys Leu Asp Pro Ile Leu Asp Lys Leu Phe Glu Gly
65                  70                  75                  80

Asn Arg Asp Lys Arg Pro Asn Trp Arg Thr Val Val Arg Trp Arg Lys
                85                  90                  95

Ser Tyr Ile Asp Ser Asn Gly Asp Leu Ala Ser Leu Val Val Lys Arg
            100                 105                 110

His Lys Met Gly Asn Arg Lys Lys Arg Val Glu Gly Asp Glu Val Phe
        115                 120                 125

Phe Glu Arg Ala Leu Ser Arg Phe Leu Asp Ala Lys Arg Pro Lys Val
    130                 135                 140

Thr Thr Ala Tyr Gln Tyr Tyr Lys Asp Ala Ile Thr Ile Glu Asn Glu
145                 150                 155                 160

Thr Ile Val Asp Gly Glu Ile Pro Ile Ile Ser Tyr Thr Ala Phe Asn
                165                 170                 175

Gln Arg Ile Lys Ser Leu Pro Pro Tyr Pro Ile Ala Val Ala Arg His
            180                 185                 190

Gly Lys Phe Lys Ala Asp Gln Trp Phe Ala Tyr Cys Ser Ser His Ile
        195                 200                 205
```

```
Pro Pro Thr Arg Ile Leu Glu Arg Val Glu Ile Asp His Thr Pro Leu
    210                 215                 220

Asp Leu Ile Leu Leu Asp Asp Glu Leu Gln Leu Pro Leu Gly Arg Pro
225                 230                 235                 240

Tyr Leu Thr Leu Ile Val Asp Val Phe Ser Asn Cys Val Leu Gly Phe
                245                 250                 255

His Leu Ser Tyr Lys Ala Pro Ser Tyr Val Ser Ala Ala Lys Ala Ile
            260                 265                 270

Val His Ala Ile Lys Pro Lys Thr Leu Gly Ile Val Gly Ile Glu Leu
        275                 280                 285

Gln Asn Asp Trp Pro Cys Tyr Gly Lys Phe Glu Thr Leu Val Val Asp
    290                 295                 300

Asn Gly Ala Glu Phe Trp Ser Lys Ser Leu Asp His Ala Cys Lys Glu
305                 310                 315                 320

Ala Gly Ile Asn Ile Gln Tyr Asn Pro Val Arg Lys Pro Trp Leu Lys
                325                 330                 335

Pro Phe Val Glu Arg Phe Phe Gly Met Ile Asn Gln Tyr Phe Leu Thr
            340                 345                 350

Glu Leu Pro Gly Lys Thr Phe Ser Asn Ile Leu Glu Lys Glu Asp Tyr
        355                 360                 365

Lys Pro Glu Lys Asp Ala Ile Met Arg Phe Ser Val Phe Val Glu Glu
    370                 375                 380

Phe His Arg Trp Ile Val Asp Ile Tyr His Gln Asp Ser Asp Ser Arg
385                 390                 395                 400
```

```
Asp Thr Arg Ile Pro Ile Lys Gln Trp Gln His Gly Phe Asp Val Tyr
                405                 410                 415

Pro Pro Leu Gln Met Ser Val Glu Asp Glu Lys Arg Phe Asn Val Leu
            420                 425                 430

Met Gly Ile Thr Asp Glu Arg Thr Leu Thr Arg Asn Gly Phe Lys Phe
        435                 440                 445

Glu Glu Leu Met Tyr Asp Ser Thr Ala Leu Ala Asp Tyr Arg Lys His
    450                 455                 460

Tyr Pro Gln Thr Lys Asp Thr Ile Lys Lys Leu Ile Lys Ile Asp Pro
465                 470                 475                 480

Asp Asp Leu Ser Asn Ile His Val Tyr Leu Glu Glu Leu Glu Gly Tyr
                485                 490                 495

Leu Lys Val Pro Cys Thr Asp Thr Thr Gly Tyr Ala Asn Gly Leu Ser
            500                 505                 510

Leu His Glu His Lys Val Ile Lys Lys Ile Asn Arg Glu Ile Ile Arg
        515                 520                 525

Glu Ser Lys Asp Asn Leu Gly Leu Ala Lys Ala Arg Met Ala Ile His
    530                 535                 540

Ala Arg Val Gln Gln Glu Gln Glu Leu Phe Asn Glu Ser Lys Thr Lys
545                 550                 555                 560

Ala Lys Ile Ser Ala Val Lys Lys Gln Ala Gln Leu Ala Asp Ile Ser
                565                 570                 575

Asn Thr Gly Gln Gly Thr Ile Arg Leu Glu Asn Ser Asp Thr Leu Ser
            580                 585                 590

Asp Ile Thr Asn Lys Pro Glu Ser Asn Ile Ser Asp Ile Leu Asp Asn
        595                 600                 605
```

```
Trp Asp Asp Asn Ile Glu Gly Phe Glu
    610                 615


<210>  1876
<211>  343
<212>  PRT
<213>  Shewanella sp. UCD-KL21

<400>  1876

Met Asn Thr Leu Thr Ala His Gln Met Glu Gln Leu Gly Arg Phe Asn
1               5                   10                  15


Asp Cys Phe Val Met His Pro Gln Ala Lys Val Ile Phe Asn Asp Phe
            20                  25                  30


Asp Asp Leu Arg Leu Asn Arg Asn Phe Gln Ser Asp Gln Gln Cys Met
        35                  40                  45


Leu Leu Thr Gly Asp Thr Gly Val Gly Lys Ser His Leu Ile Asn Asn
    50                  55                  60


Tyr Lys Lys Arg Val Leu Ala Ser Gln Thr Tyr Ser Arg Thr Ser Met
65                  70                  75                  80


Pro Val Leu Val Thr Arg Ile Ser Ser His Lys Gly Leu Asp Ala Thr
                85                  90                  95


Leu Arg Gln Met Leu Thr Asp Leu Glu Ser Phe Gly Ser Gln Gln Arg
            100                 105                 110


Lys Gly Gln Asn Tyr Lys Ile Asp Leu Lys Thr Gln Leu Val Lys Asn
        115                 120                 125


Leu Val Arg Ala Asn Val Glu Leu Leu Ile Phe Asn Glu Phe Gln Glu
    130                 135                 140


Leu Ile Glu Phe Lys Thr Pro Lys Glu Arg Gln Thr Ile Ala Asn Glu
```

```
145                 150                 155                 160

Leu Lys Phe Ile Ser Glu Glu Ala Arg Val Pro Ile Val Leu Val Gly
                165                 170                 175

Met Pro Trp Thr Glu Gln Ile Ala Glu Glu Pro Gln Trp Ser Ser Arg
            180                 185                 190

Leu Ile Arg Arg Arg Lys Leu Glu Tyr Phe Ser Leu Gln Lys Asp Ser
        195                 200                 205

Lys Tyr Tyr Arg Gln Tyr Leu Ile Gly Leu Ala Lys His Met Pro Phe
    210                 215                 220

Asp Glu Pro Pro Lys Ile Glu Asp Lys His Ile Ala Ile Pro Leu Phe
225                 230                 235                 240

Ala Ala Cys Arg Gly Glu Ser Arg Val Leu Asn His Leu Leu Ser Glu
                245                 250                 255

Thr Leu Lys Leu Val Met Val Asn Gly Asp Arg Ser Leu Asp Ile Arg
            260                 265                 270

His Leu Ala Gln Thr Tyr Arg Lys Leu Tyr Glu Ser Gln Glu Ser Glu
        275                 280                 285

Ala Ala Ser Val Phe Phe Asn Pro Phe Leu Glu Pro Leu Asp Lys Val
    290                 295                 300

Leu Ile Ser Glu Val Val Lys Pro Ser Arg Tyr Asn Pro Asn Ala Met
305                 310                 315                 320

Thr Pro Asp Glu Met Leu Ile Lys Arg Glu Phe Ser Ala Pro Ser Thr
                325                 330                 335

Leu Ala Gln Leu Leu Ser Lys
            340
```

<210> 1877
<211> 411
<212> PRT
<213> Shewanella sp. UCD-KL21

<400> 1877

```
Met Ala Phe Leu Phe Ser Pro Lys Ala Arg Ser Phe Ser Asp Glu Ser
1               5                   10                  15


Leu Glu Ser Tyr Leu Leu Arg Val Val Ala Glu Asn Phe Phe Asp Ser
            20                  25                  30


Tyr Gln Gln Leu Ser Leu Ala Ile Arg Glu Glu Leu His Glu Leu Asp
        35                  40                  45


Phe Glu Ala His Gly Ala Phe Pro Val Glu Leu Lys Arg Leu Asn Val
    50                  55                  60


Tyr His Ala Lys His Asn Ser His Phe Arg Met Arg Ala Leu Gly Leu
65                  70                  75                  80


Leu Glu Ser Leu Leu Asp Leu Pro Pro His Glu Leu Gln Lys Leu Ala
                85                  90                  95


Leu Leu Arg Ser Asn Lys Arg Phe Val Gly Gly Met Ser Ala Val His
            100                 105                 110


Arg Asn Gly Val Asp Ile Pro Leu Ser Phe Ile Arg Cys Ala Asp Glu
        115                 120                 125


Asp Gly Ile Glu Ser Leu Pro Ile Cys Pro Gln Cys Leu Lys Glu Glu
    130                 135                 140


Pro Tyr Ile Arg Gln Ala Trp His Ile Lys Pro Ile Glu Val Cys Ala
145                 150                 155                 160


Lys His Glu Cys Glu Leu Ile His His Cys Pro Asp Cys Gln Gln Pro
                165                 170                 175
```

```
Ile Ser Tyr Ile Glu Asn Glu Ser Ile Thr His Cys Ser Cys Gly Phe
            180                 185                 190

Glu Phe Ala Thr Ala Ser Ser Glu Lys Ala Asp Ser Gln Ala Val Val
        195                 200                 205

Leu Ser Arg Ser Leu Phe Asp Gly Asp Ala Leu Ser Asn Asn Pro Leu
    210                 215                 220

Leu Phe Met Gly Thr Ser Val Thr His Arg Phe Ala Ala Leu Leu Trp
225                 230                 235                 240

Tyr Leu Lys Arg His Val Gln Asn Ile Glu Cys Lys Leu Asp Glu Ser
                245                 250                 255

Val Asn Tyr Phe Glu Ala Trp Pro Glu Asn Phe Tyr Gln Glu Leu Asp
            260                 265                 270

Glu Leu Leu Ala Gly Ala Glu Leu Lys Leu Ile Asp Leu Phe Asn Arg
        275                 280                 285

Thr Ser Leu Ser Phe Ile Phe Gly Glu Leu Ile Leu Gln Ser Gln Cys
    290                 295                 300

Leu Leu Pro Glu Asp Lys Thr Pro His Phe Ile Asp Met Gly Leu Met
305                 310                 315                 320

Glu Tyr Leu Gly Lys Leu Val Glu Ser His Pro Lys Ser Lys Lys Pro
                325                 330                 335

Asn Val Ala Asp Met Leu Val Ser Val Thr Glu Thr Ala Val Leu Leu
            340                 345                 350

Ser Thr Ser His Glu Gln Val Tyr Arg Leu Tyr Gln Asp Gly Val Leu
        355                 360                 365
```

```
Thr Ala Gly Phe Lys Gln Lys Ile Arg Thr Arg Ile Asp Pro His Ile
    370                 375                 380

Gly Val Phe Tyr Leu Arg Gln Val Ile Glu Tyr Lys Thr Ser Phe Gly
385                 390                 395                 400

Asn Asp Lys Gln Gly Met Tyr Leu Ser Ala Trp
                405                 410
```

<210> 1878
<211> 699
<212> PRT
<213> Shewanella sp. UCD-KL21

<400> 1878

```
Met Val Asp Lys Leu Lys Phe His Glu Leu Leu Asp Ile Asp Asp Ile
1               5                   10                  15

Ser Glu Arg Asn Ile Ala Leu Arg Arg Ala Phe Thr Gly Tyr Thr Val
            20                  25                  30

Pro Met Asp Val Thr Gly Asn Glu Ala Ser Ala Leu Thr Ile Leu Leu
        35                  40                  45

Asn Leu Thr Tyr Pro Arg Lys Arg Val Asp Asp Leu Leu Asp Lys Arg
    50                  55                  60

Leu Ala Lys Gln Thr Leu Asn Thr Asp Ala His Leu Asp Ala Ser Ile
65                  70                  75                  80

Asp Glu Val Gln Trp Leu His Thr His Asn Leu Lys Tyr Pro Asp Ile
                85                  90                  95

Arg Val Ser Lys Gln Arg Leu Ile Thr Ala Ser Pro Leu Ser His Ser
            100                 105                 110

His Ile Leu Ser Ser Ala Asn Cys Ile Ser Thr Leu Gly Trp Ser His
        115                 120                 125
```

```
Asp Ser Ala Lys Val Asn Leu Ala Lys Leu Phe Ser Cys His Phe Asn
    130                 135                 140

Trp Gln Asp Arg Val Cys Cys Leu Ala Thr Leu Leu Ser Asp Pro Pro
145                 150                 155                 160

Lys Ile Trp Lys Glu Ala Phe Gln Ala Leu Gly Met Leu Val Lys Asp
                165                 170                 175

Phe Met Asn Leu Cys Gly Arg Ile Lys Ala Ser Leu Pro Ser Tyr Glu
            180                 185                 190

Ser Pro Ser Arg Val Asp Lys Tyr Ser Ile Gln Val Arg Leu Pro Tyr
        195                 200                 205

Arg Asp Gly Tyr Leu Ala Ile Thr Pro Val Val Ser His Ala Leu Gln
    210                 215                 220

Ala Glu Ile Gln Gln Ala Ala Met Ala Lys Gln Cys Arg Tyr Thr Asn
225                 230                 235                 240

Phe Glu Phe Thr Arg Pro Ala Ala Val Ser Glu Leu Ser Ala Ser Leu
                245                 250                 255

Gly Gly Asn Val Lys Ala Leu Asn Tyr Pro Pro Arg Ile Gly Asn Ala
            260                 265                 270

Val His Gly Leu Ser Asp Ser Trp Leu Leu Lys Phe Gln Ala Gly Gln
        275                 280                 285

Thr Val Leu Asn Gln Gly Ala Leu Ser Gln Pro Arg Phe Lys Arg Ala
    290                 295                 300

Leu Glu Gly Leu Leu Ser Asn Gly Phe Glu Leu Ala Leu Lys Gln Arg
305                 310                 315                 320

Arg Leu His Lys Val Ala Ser Met Arg Gln Ile Arg Ala Thr Leu Thr
```

```
                325                 330                 335

Glu Trp Leu Ser Pro Leu Leu Glu Trp Arg Leu Glu Val Glu Glu Asn
            340                 345                 350

Lys Asn Asn Val Ser Glu Leu Ala Cys Ile His Gly Ser Phe Glu Tyr
        355                 360                 365

Gln Phe Leu Thr Ala Gln Lys Glu Asn Leu Val Gly Leu Leu Asn Pro
    370                 375                 380

Met Phe Ser Leu Leu Asn Thr Ile Leu Ser Asn Ser Asn Thr Leu Gln
385                 390                 395                 400

Lys Tyr Ala Phe His Gln Arg Leu Met Arg Pro Leu Lys Cys Ser Leu
                405                 410                 415

Lys Trp Leu Leu Asp Asn Leu Ser Lys Glu Ser Asn Ala Ile Asp Ser
            420                 425                 430

Asp Glu Asp Asn Gln Gln Arg Tyr Leu Tyr Leu Lys Gly Ile Arg Val
        435                 440                 445

Phe Asp Ala Gln Ala Leu Ser Asn Pro Tyr Cys Ala Gly Leu Pro Ser
    450                 455                 460

Leu Thr Ala Val Trp Gly Met Val His Asn Tyr Gln Arg Arg Leu Asn
465                 470                 475                 480

Lys Arg Leu Gly Thr Gln Leu Arg Leu Thr Ser Phe Ser Trp Phe Ile
                485                 490                 495

Arg Gln Tyr Ser Ser Val Ala Gly Lys Lys Leu Pro Glu Tyr Gly Met
            500                 505                 510

Gln Gly Gln Lys Glu Asn Gln Phe Arg Arg Ala Gly Ile Val Asp Asn
        515                 520                 525
```

```
Lys His Cys Asp Leu Val Phe Asp Leu Val Val His Ile Asp Gly Tyr
    530                 535                 540

Glu Glu Asp Leu Asp Ala Ile Asp Asn Ser Thr Asp Ala Ile Lys Ala
545                 550                 555                 560

Ser Phe Pro Ala Thr Phe Ala Gly Gly Val Met His Pro Pro Glu Ile
                565                 570                 575

Gly Ser Val Asp Glu Trp Cys Glu Leu Tyr Pro Ser Glu Thr Ser Leu
            580                 585                 590

Tyr Ser Lys Leu Arg Arg Leu Pro Ala Ser Gly Lys Trp Val Met Pro
        595                 600                 605

Thr Arg Tyr Gln Met Asp Ser Leu Asp Gly Leu Leu Gln Leu Leu Lys
    610                 615                 620

Leu Asn Val Ala Leu Cys Pro Val Met Ser Gly Tyr Leu Met Leu Gly
625                 630                 635                 640

Pro Pro Glu Ser Arg Lys Asn Ser Leu Glu Pro Leu His Cys Tyr Ala
                645                 650                 655

Glu Pro Ala Ile Gly Val Val Glu Cys Ala Thr Ala Ile Asp Ile Arg
            660                 665                 670

Leu Gln Gly Met Ser Asn Phe Phe Arg Arg Ala Phe Trp Met Leu Asp
        675                 680                 685

Ile Lys Glu Thr Ser Met Leu Met Lys Arg Ile
    690                 695
```

<210> 1879
<211> 365
<212> PRT
<213> Shewanella sp. UCD-KL21

<400> 1879

```
Met Glu Leu Cys Asn Val Leu Lys Tyr Asp Arg Ser Leu Tyr Pro Gly
1               5                  10                  15

Lys Ala Val Phe Phe Tyr Lys Thr Ala Glu Ser Asp Phe Val Pro Leu
            20                  25                  30

Glu Ala Glu Ile Asn Arg Ile Arg Gly Gln Lys Ala Gly Phe Thr Glu
        35                  40                  45

Ala Phe Thr Pro Gln Phe Lys Ser Lys Asn Leu Ala Pro Gln Asp Leu
    50                  55                  60

Ala His Cys Asn Pro Leu Ile Leu Glu Glu Cys Tyr Val Pro Pro Asn
65                  70                  75                  80

Val Glu Tyr Ile Tyr Cys Arg Phe Ser Leu Arg Val Gln Ala Asn Ser
                85                  90                  95

Leu Lys Pro Ala Gly Cys Ser Glu Pro Thr Val Phe Ala Leu Leu Glu
            100                 105                 110

Glu Phe Ala Ala Ile Phe Lys Ala Cys Gly Gly Tyr Lys Glu Leu Ala
        115                 120                 125

Thr Arg Tyr Cys Lys Asn Val Leu Leu Gly Thr Trp Leu Trp Arg Asn
    130                 135                 140

Gln Asn Thr Gly Asn Ser Gln Ile Asp Ile Lys Thr Ser Ala Gly Asn
145                 150                 155                 160

Cys Tyr Gln Ile Ala Asn Thr Arg Gln Leu Ala Trp Asp Ser Arg Trp
                165                 170                 175

Pro Ala Asp Ala Gln Gln Val Leu Glu Glu Leu Ser Asp Glu Val His
            180                 185                 190
```

```
Gln Ala Leu Thr Asp Pro Thr Val Phe Trp His Ala Asn Ile Thr Ala
        195                 200                 205

Lys Ile Glu Thr Ala Phe Cys Gln Glu Ile Tyr Pro Ser Gln Ser Phe
    210                 215                 220

Gly Glu Lys Ala Ala Gln Gly Glu Ala Ser Lys Gln Phe Ala Lys Val
225                 230                 235                 240

Lys Cys Val Asp Gly Arg Tyr Ala Val Ser Phe Asn Ser Val Lys Ile
                245                 250                 255

Gly Ala Ala Leu Gln Leu Ile Asp Asp Trp Trp Asp Val Asp Asp Ser
            260                 265                 270

Lys Arg Leu Arg Ile His Glu Tyr Gly Ala Asp Lys Glu Leu Gly Val
        275                 280                 285

Ala Arg Arg Ala Pro Glu Ser Lys Gln Ser Phe Tyr Ser Leu Phe Ile
    290                 295                 300

Asn Thr Glu Leu Tyr Leu Ala Glu Leu Asn Gln Gln Leu Ala Glu Asp
305                 310                 315                 320

Glu Tyr Ser Ile Ser Pro Asn Ile Tyr Tyr Leu Phe Ala Val Leu Ile
                325                 330                 335

Lys Gly Gly Met Phe Gln Lys Lys Ala Glu Ala Lys Ser Lys Ser Lys
            340                 345                 350

Ala Glu Thr Ser Thr Ala Lys Ile Thr Pro Ala Lys Ala
        355                 360                 365
```

<210> 1880
<211> 199
<212> PRT
<213> Shewanella sp. UCD-KL21

<400> 1880

```
Met His Arg Tyr Tyr Phe Met Val Arg Phe Leu Pro Glu Gln Ala Asn
1               5                  10                  15

Leu Ala Leu Leu Met Gly Arg Cys Ile Ser Ile Met His Gly Phe Ile
            20                  25                  30

Cys Lys His Asp Ile Gln Gly Leu Gly Val Ser Phe Pro Ala Trp Ser
        35                  40                  45

Asp Ala Ser Ile Gly Asn Met Ile Ala Phe Val His Thr Asp Ile Ala
    50                  55                  60

Ala Leu Asn Glu Leu Lys Leu Gln Gly Tyr Phe Gln Asp Met Gln Glu
65                  70                  75                  80

Cys Gly Val Phe Lys Val Asp Asn Val Glu Ala Val Pro Asp Asp Cys
                85                  90                  95

Val Glu Val Arg Phe Lys Arg Asn Gln Gly Ile Ala Lys Met Phe Val
            100                 105                 110

Gly Glu Ala Arg Arg Arg Leu Lys Arg Leu Glu Lys Arg Ala Leu Ala
        115                 120                 125

Arg Gly Glu Val Phe Asn Pro Asn Lys Asn Asp Glu Pro Arg Glu Leu
    130                 135                 140

Asp Cys Phe His Cys Ile Ala Ile Gly Ser Thr Ser Thr Glu Gln Asp
145                 150                 155                 160

Phe Leu Leu His Val Gln Lys Glu Ile Val Gln Lys Tyr Glu Glu Pro
                165                 170                 175

Glu Phe Asn Gln Tyr Gly Leu Ala Thr Asn Lys Leu Leu Arg Gly Thr
            180                 185                 190

Val Pro Glu Phe Ser Glu Phe
```

195

<210> 1881
<211> 207
<212> PRT
<213> Vibrio cholerae strain OYP7G04

<400> 1881

Met Tyr Val Arg Asn Leu Arg Lys Pro Ser Ala Thr Lys Asn Val Tyr
1 5 10 15

Lys Phe Ala Ser Ser Lys Asn Arg Ser Val Ile Leu Cys Glu Ser Ser
20 25 30

Leu Glu Arg Asp Cys Cys Tyr His Leu Glu Tyr Ser Lys Asp Val Phe
35 40 45

Ser Phe Gln Ser Gln Pro Glu Gly Phe Tyr Tyr Ser Ser Gly Asn Lys
50 55 60

Arg Cys Pro Tyr Thr Pro Asp Phe Leu Val Arg Asn Gln Asp Gly Ser
65 70 75 80

Glu Tyr Tyr Leu Glu Val Lys Pro Leu Ala Lys Thr Phe Ser Glu Asp
85 90 95

Phe Lys Arg Ser Phe Ala Leu Lys Arg Ile Ala Ala Gln His Gln Gly
100 105 110

Lys Pro Leu Val Leu Val Thr Asp Lys Gln Ile Arg Asn Gly Val Tyr
115 120 125

Leu Glu Asn Leu Asn Leu Ile His Arg Tyr Ser Gly Leu Val Asp Phe
130 135 140

Ser Leu Ser Ser Thr Lys Ile Val Glu Glu Leu Ser Thr Ala Gly Arg
145 150 155 160

```
Met Cys Ile Arg Ser Leu Ala Asp Asn Leu Lys Leu Ser Ile Gly Glu
                165                 170                 175


Val Ile Ala Val Val Phe Arg Leu Ile Gly Leu Gly Arg Val Asn Val
            180                 185                 190


Pro Leu Asp Ser Ala Ile Asn Glu Met Ser Val Ile Ser Val Asn
        195                 200                 205


<210>  1882
<211>  635
<212>  PRT
<213>  Vibrio cholerae strain OYP7G04

<400>  1882

Met Pro Phe Asp Asp Glu Phe Glu Ser Ile Asn Asp Asp Thr Gln Ala
1               5                   10                  15


Glu Tyr Asp Ser Thr Ser Glu Ala Lys Leu Val Arg Lys Gln Tyr Leu
            20                  25                  30


Pro Leu Asp Ser Val Thr Ile His Glu Arg Asp Leu Ser Ser Phe Ser
        35                  40                  45


Glu Glu Gln Lys Asn Lys Ala Leu Glu Arg Tyr Lys Leu Ile Ser Ala
    50                  55                  60


Val Ala Lys Glu Ile Ser Gly Gly Trp Thr Pro Lys Asn Ile Asn Pro
65                  70                  75                  80


Leu Ile Asp Lys Tyr Gly Leu Asn Leu Ser Ile Lys Arg Pro Ser Tyr
                85                  90                  95


Lys Ser Val Ile Arg Trp Tyr Lys Ser Phe Cys Gly Ser Asp Gly Asn
            100                 105                 110


Ile Val Cys Leu Val Asp His Asn His Ser Lys Gly Asn Arg Thr Lys
        115                 120                 125
```

```
Arg Ile Ile Asp Asp Glu Ser Phe Phe Val Glu Ala Thr Glu Arg Phe
    130                 135                 140

Leu Asp Ala Lys Arg Pro Asn Tyr Ser Gln Ala Tyr Gln Phe Tyr Cys
145                 150                 155                 160

Asp Arg Ile Glu Ile Glu Asn Ser Asn Ile Ile Ser Gly Gln Ile Ser
                165                 170                 175

Lys Val Ser Tyr Gln Ala Phe Lys Glu Arg Leu Lys Lys Leu Pro Pro
            180                 185                 190

Tyr Glu Val Ala Leu Lys Arg Phe Gly Gln Asn Tyr Ala Asn Lys Leu
        195                 200                 205

Phe Asn Tyr Tyr Gln Ser Ser Val Pro Thr Thr Arg Ile Leu Glu Arg
    210                 215                 220

Val Glu Leu Asp His Thr Pro Leu Asp Leu Ile Leu Leu Asp Asp Asp
225                 230                 235                 240

Leu Leu Ile Pro Leu Gly Arg Ala Tyr Leu Thr Leu Leu Val Asp Val
                245                 250                 255

Phe Ser Gly Cys Ile Val Gly Phe His Leu Gly Phe Asn Pro Pro Ser
            260                 265                 270

Tyr Val Ser Val Ala Lys Ala Ile Ile His Ser Val Lys Ser Lys Asp
        275                 280                 285

Tyr Val His Asp Leu Asn Ile Glu Leu Thr Asn Asp Trp Leu Cys His
    290                 295                 300

Gly Lys Met Glu Thr Leu Val Val Asp Asn Gly Ala Glu Phe Trp Ser
305                 310                 315                 320

Lys Ser Leu Asp Gln Ala Cys Met Glu Ala Gly Ile His Tyr Glu Tyr
```

```
                325                 330                 335

Cys Lys Val Gly Gln Pro Trp Glu Lys Pro Arg Val Glu Arg Lys Phe
            340                 345                 350

Leu Glu Ile Ile Gln Gly Ile Val Gly Trp Val Pro Gly Lys Thr Phe
        355                 360                 365

Ser Asn Ile Leu Glu Lys Asp Arg Tyr Asp Pro Gln Lys Asp Ala Val
    370                 375                 380

Met Arg Phe Ser Ser Phe Val Glu Glu Leu His Arg Trp Ile Ile Asp
385                 390                 395                 400

Val His Asn Ala Ser Pro Asp Ser Arg Asn Thr Lys Ile Pro Asn Tyr
                405                 410                 415

His Trp Lys Lys Ser Glu Glu Ala Leu Pro Pro Ala Ala Leu Ser Asp
            420                 425                 430

Arg Asp Glu Lys Gln Phe Arg Ile Ile Met Gly Val Ile His Glu Gly
        435                 440                 445

Val Val Thr Thr Lys Gly Ile Lys Tyr Lys His Leu Met Tyr Asp Asn
    450                 455                 460

Val Ala Leu Glu Gln Tyr Arg Lys Gln Tyr Pro Gln Thr Lys Lys Ser
465                 470                 475                 480

Arg Lys Lys Thr Ile Lys Ile Asp Pro Asp Asp Leu Ser Ser Ile Phe
                485                 490                 495

Val Tyr Leu Glu Glu Ile Gly Gly Tyr Ile Glu Val Pro Cys Lys Tyr
            500                 505                 510

Asp Pro Leu Gly Tyr Thr Lys Asn Leu Ser Leu Ser Glu His Val Arg
        515                 520                 525
```

```
Ile Thr Lys Ile His Arg Asp Phe Ile Lys Gly Gln Val Asp Ala Leu
    530                 535                 540

Ser Leu Ala Lys Ala Arg Gln Ala Leu His Glu Arg Ile Lys Thr Glu
545                 550                 555                 560

Gln Glu His Leu Ser Leu Met Ser Val Glu Ser Arg Ala Lys Lys Ala
                565                 570                 575

Lys His Gly Lys Lys Met Ala Ala Leu Ser Gly Ile Ser Asn Glu Gln
            580                 585                 590

Pro Met Ser Ile Gln Asn Ala Leu Glu Asn Lys Asn Lys Pro Leu Asp
        595                 600                 605

Asp Asn Phe Asp Glu Pro Thr Pro Val Asp Asn Leu Lys Ser Leu Trp
    610                 615                 620

Asn Lys Arg Lys Ala Met Lys Arg Ser Lys Glu
625                 630                 635
```

<210> 1883
<211> 328
<212> PRT
<213> Vibrio cholerae strain OYP7G04

<400> 1883

```
Met Asn Leu Ser Ala Lys Gln Glu Ile Ala Val Asp Glu Leu Leu Thr
1               5                   10                  15

Gln Tyr His Asn Ser Phe Val Ile Tyr Pro Asp Val Gln Gln Ile Phe
            20                  25                  30

Asp Gly Leu Asp Trp Ile Val Arg Arg Ser Gln Phe Gly Asn Phe Thr
        35                  40                  45

Pro Ser Met Leu Ile Thr Gly Gly Thr Gly Ala Gly Lys Thr Ser Leu
    50                  55                  60
```

```
Ile Asn His Tyr Ala Lys Tyr His Phe Asn Asp Asn Glu Val Leu Ile
65                  70                  75                  80

Thr Arg Val Arg Pro Ser Phe Ile Glu Thr Leu Ile Trp Ala Ile Asp
                85                  90                  95

Lys Leu Gly Ile Pro Tyr Asn Thr Arg Ser Lys Arg Ser Glu Ile Gly
            100                 105                 110

Leu Gln Asp Tyr Phe Ile Asn Ser Val Lys Lys Ser Asn Leu Lys Leu
        115                 120                 125

Leu Val Ile Glu Glu Ala Gln Glu Leu Phe Glu Cys Ala Ser Pro Lys
    130                 135                 140

Glu Arg Gln Lys Ile Arg Asp Arg Leu Lys Met Ile Ser Asp Glu Cys
145                 150                 155                 160

Arg Leu Pro Ile Val Phe Ile Gly Ile Pro Thr Ala Lys Leu Ile Leu
                165                 170                 175

Glu Asp Ser Gln Trp Asp Arg Arg Ile Met Val Lys Arg Glu Leu Pro
            180                 185                 190

Tyr Ile Arg Ile Thr Ser Glu Ser Ser Leu Asp Val Tyr Ile Asp Leu
        195                 200                 205

Leu Glu Glu Leu Glu Lys Gln Leu Pro Ile Ser Val Gln Pro Glu Leu
    210                 215                 220

Ser Glu Met Asp Ile Ala Met Arg Leu Leu Ser Ala Thr Lys Gly Met
225                 230                 235                 240

Leu Gly Ala Ile Lys Glu Leu Val Gly Tyr Ala Leu Glu Leu Ala Leu
                245                 250                 255
```

```
Leu Ser Gly Lys Ser Ala Ile Thr Asn Asp Glu Phe Ala Leu Gly Phe
            260                 265                 270

Glu Arg Ile Asn Gly Pro Asp Val Thr Asn Pro Phe Thr Thr Glu Leu
        275                 280                 285

Glu Lys Leu Leu Val Pro Gln Val Ile Glu Tyr Glu Gly Phe Ile Ile
    290                 295                 300

Asp Pro Glu Asn Gly Glu Ile Lys Phe Thr Lys Gln Ile Phe Lys Asp
305                 310                 315                 320

Ile Pro Leu Ala Ala Leu Leu Gly
                325
```

<210> 1884
<211> 403
<212> PRT
<213> Vibrio cholerae strain OYP7G04

<400> 1884

```
Met Asn Thr Asp Ile Gln Leu Tyr Pro Asp Glu Ser Leu Glu Ser Phe
1               5                   10                  15

Leu Leu Arg Leu Ser Gln Glu Gln Gly Tyr Glu Arg Phe Ser His Phe
            20                  25                  30

Ala Glu Asp Ile Trp Phe Asp Thr Leu Asp Gln His Glu Ala Ile Pro
        35                  40                  45

Gly Ala Phe Pro Leu Glu Leu Asn Arg Ile Asn Ile Tyr His Ala Gln
    50                  55                  60

Thr Thr Ser Gln Met Arg Val Arg Val Leu Ile His Leu Glu Asn Gln
65                  70                  75                  80

Leu Lys Leu Asn Asn Phe Gly Ala Leu Arg Leu Ala Leu Ser His Ser
                85                  90                  95
```

```
Lys Ala Gln Phe Ser Pro Glu Tyr Lys Ala Val His Arg Leu Gly Ala
            100                 105                 110

Asp Tyr Pro Phe Val Phe Leu Ala Lys Arg Phe Thr Pro Ile Cys Pro
        115                 120                 125

Leu Cys Ile Ser Glu Ala Pro Tyr Ile Arg Gln Gln Trp Gln Phe Leu
    130                 135                 140

Ser Gln Gln Val Cys Glu Arg His Gly Cys Lys Leu Val His His Cys
145                 150                 155                 160

Pro Glu Cys Gln Ser Arg Leu Glu Tyr Gln Thr Thr Glu Ser Ile Ser
                165                 170                 175

Gln Cys Glu Cys Gly Phe Glu Leu Arg Asn Ser Pro Val Ala Asp Ala
            180                 185                 190

Pro Val Ala Ala Leu Leu Val Ala Arg Trp Leu Ser Gly Asn Asp Ser
        195                 200                 205

Lys Pro Leu Gly Leu Leu Lys Ala Glu Met Thr Pro Ser Glu Arg Tyr
    210                 215                 220

Gly Phe Leu Leu Trp Tyr Val Asn Arg Tyr Gly Asp Ile Glu Asn Ile
225                 230                 235                 240

Ser Phe Glu Ser Phe Val Glu Tyr Cys Ser Cys Trp Pro Arg Val Leu
                245                 250                 255

Gln Glu Glu Leu Asp Glu Leu Val Asn Lys Ala Asp Leu Ile Arg Ile
            260                 265                 270

Lys Asp Trp Lys Lys Thr Phe Phe Asn Glu Val Phe Gly Ala Leu Leu
        275                 280                 285

Lys Asp Cys Arg Gln Leu Pro Ser Arg Gln Leu Glu Arg Asn Ser Val
```

```
    290                 295                 300

Leu Thr Gln Val Leu Ala Tyr Phe Thr Lys Leu Met Ala Thr Leu Pro
305                 310                 315                 320

Ser Ser Ser Lys Gly Asn Val Gly Asp Val Leu Leu Ser Pro Leu Glu
                325                 330                 335

Val Ser Thr Leu Leu Ser Cys Thr Thr Asp Glu Val Tyr Arg Leu Tyr
            340                 345                 350

Glu Phe Gly Glu Ile Lys Ala Ala Ile Arg Pro Arg Met His Thr Lys
        355                 360                 365

Ile Ala Ser His Glu Ser Ala Phe Thr Leu Arg Ser Val Ile Glu Thr
    370                 375                 380

Lys Leu Thr Arg Met Cys Ser Glu Asn Asp Gly Leu Ser Val Tyr Leu
385                 390                 395                 400

Pro Glu Trp
```

<210> 1885
<211> 695
<212> PRT
<213> Vibrio cholerae strain OYP7G04

<400> 1885

```
Met Thr Lys Leu Ser Asp Leu Leu Ala Ile Glu Asp Glu Ala Ile Lys
1               5                   10                  15

Gln Thr Ala Leu Lys Lys Met Phe Met Pro Tyr Thr Glu Asp Val Cys
            20                  25                  30

Val Asp Gly Tyr Glu Gln Glu Thr Leu Thr Ile Leu Leu Asn Leu Ser
        35                  40                  45
```

```
Ser Ser His Gln Ala Asp Arg Cys Ser Asp Trp Leu Asp Val Ala Arg
    50                  55                  60

Ala Gln Arg Tyr Leu Lys Asp Arg Glu Asn Leu Asp Ala Ser Leu Ala
65                  70                  75                  80

Glu Ile Gln Trp Phe His Thr His Asn Leu Lys Phe Pro Asp Cys Arg
                85                  90                  95

Val Lys Asp Gln Arg Ile Ile Ala Arg Pro Leu Ser Thr Ala Glu Glu
            100                 105                 110

Phe Ile Ser Ser Ala Val Leu Asp Gln Arg Leu Gly Trp Ala His Asn
        115                 120                 125

Ser Ala Val Tyr Arg His Thr Leu Trp Leu Leu Asn Pro Phe Lys Trp
    130                 135                 140

Gln Ser Gln Pro Val Cys Ile Leu Ser Leu Ile Gln Gln Lys Asn Pro
145                 150                 155                 160

Val Trp Leu Asp Leu Leu Thr Glu Phe Gly Leu Asp Val Lys Ser Leu
                165                 170                 175

Ala Arg Leu Gln Arg Ala Ile Glu Glu Gln Leu Pro Glu Asn Ser Phe
            180                 185                 190

Pro Asp Ser Val Ser Thr Tyr Ser Lys Gln Leu Arg Phe Pro Leu Gly
        195                 200                 205

Asp Asp Tyr Val Ser Ile Thr Pro Val Val Ser His Ala Leu Gln Cys
    210                 215                 220

Glu Leu Glu Ile Arg Ala Arg Ser Pro Glu Asn Lys Phe Ser Phe Val
225                 230                 235                 240

Ser Ser Ser Leu Pro Asn Ser Ala Ser Ile Gly Asn Leu Cys Gly Ser
                245                 250                 255
```

```
Leu Gly Gly Tyr Met Arg Val Leu Asn Tyr Pro Leu Gly Val Lys Gln
            260                 265                 270

Ala Lys Gly Gly Thr Leu Thr Glu Asn Arg Gln Lys Ser Gly His Tyr
        275                 280                 285

Phe Asp Asp Tyr Gln Val Thr Asn Ala Lys Ile Cys Gln Val Leu Asn
    290                 295                 300

Arg Leu Ile Gly Ser Glu Pro Ser Lys Thr Gln Arg Gln Arg Glu Arg
305                 310                 315                 320

Ala Arg Lys Val Arg Ser Lys Ile Leu Arg Lys Gln Ile Ala Leu Trp
                325                 330                 335

Met Leu Pro Leu Ile Glu Leu Arg Asp Ile Ala Glu Ser Glu Pro Asn
            340                 345                 350

Gln Gln Gln Leu Glu His Asp Asp Thr Leu Ala Gln Ala Phe Leu Ser
        355                 360                 365

Leu Pro Glu Trp Glu Leu Gly Ser Leu Ala Gly Glu Phe Asn Arg Arg
    370                 375                 380

Leu His Leu Ala Phe Gln Asn Asn Ile Tyr Ser Ala Lys Phe Ala Tyr
385                 390                 395                 400

His Pro Lys Leu Met Gln Val Ala Lys Ala Gln Val Thr Trp Val Leu
                405                 410                 415

Glu Gln Leu Ser Lys Pro Ile Asn Asn Gln Asp Thr Leu Thr Gly Glu
            420                 425                 430

Gln Tyr Ile Tyr Leu Ser Ser Met Arg Val Gln Asp Ala Val Ala Met
        435                 440                 445
```

```
Ser Asn Pro Cys Leu Cys Gly Val Pro Ser Leu Thr Ala Ile Trp Gly
    450                 455                 460

Phe Met His Asp Tyr Gln Arg Gln Phe Asn Gln Leu Val Asn Asn Asp
465                 470                 475                 480

Ser Pro Val Glu Phe Ser Ser Phe Ala Phe Tyr Val Arg Asn Glu Asn
                485                 490                 495

Ile Gln Ser Thr Ala Lys Leu Thr Glu Pro Asn Ser Val Ala Lys Ala
            500                 505                 510

Arg Thr Val Ser Asn Ala Lys Arg Pro Thr Ile Arg Ser Glu Arg Leu
        515                 520                 525

Ser Asp Leu Glu Ile Asp Leu Val Ile Arg Val His Ser Glu Ser Arg
    530                 535                 540

Ile Ser Asp Phe Arg Ser Ala Leu Lys Thr Ala Leu Pro Val Ala Phe
545                 550                 555                 560

Ala Gly Gly Ala Leu Tyr Gln Pro Gln Leu Ser Met Gln Ile Glu Trp
                565                 570                 575

Leu Arg Thr Phe Thr Gly Arg Ser Glu Leu Phe His Val Leu Lys Gly
            580                 585                 590

Leu Pro Ala Tyr Gly Arg Trp Leu Tyr Pro Ser Glu Lys Gln Pro Thr
        595                 600                 605

Asn Phe Asp Glu Leu Glu Arg Leu Leu Thr Gln Asp Asp Asp Asn Leu
    610                 615                 620

Pro Val Ser Leu Gly Tyr His Leu Leu Glu His Pro Thr Lys Arg Gly
625                 630                 635                 640

Asn Ala Ile Thr Gly Cys His Ala Tyr Ala Glu Asn Ala Ile Gly Leu
                645                 650                 655
```

```
Ala Lys Arg Ile Asn Pro Ile Glu Val Arg Phe Ser Gly Arg Asp His
            660                 665                 670


Phe Leu Asn His Ala Phe Trp Ser Ile Glu Cys Ser Ser Glu Thr Ile
        675                 680                 685


Leu Ile Lys Asn Tyr Arg Asp
    690                 695


<210>  1886
<211>  343
<212>  PRT
<213>  Vibrio cholerae strain OYP7G04

<400>  1886

Met Glu Leu Cys Thr Gln Leu Asn Tyr Val Arg Ser Leu Ser Ala Gly
1               5                   10                  15


Lys Ala Tyr Phe Tyr Tyr Leu Ser Glu Ser Gly Glu Met Cys Pro Phe
            20                  25                  30


Asn Val Asp Arg Thr Arg Leu Arg Ala Pro Lys Gly Ser Tyr Ser Glu
        35                  40                  45


Ala Tyr Lys Gly Asn Lys Phe Val Asp Lys Asn Val Ala Pro Gln Asp
    50                  55                  60


Leu Ala Tyr Ser Asn Pro Gln Phe Ile Glu Glu Cys Tyr Val Lys Pro
65                  70                  75                  80


Gly Val Asp Glu Ile Tyr Cys Ala Phe Ser Leu Arg Ile Arg Ala Asn
                85                  90                  95


Ser Leu Thr Pro Asp Ile Cys Ser Asp Asp Glu Val Arg Ser Lys Leu
            100                 105                 110


Ser Met Phe Ala Lys Ile Tyr Lys Glu Leu Asn Gly Tyr Lys Glu Leu
```

```
        115                 120                 125

Ala Asn Arg Tyr Ala Lys Asn Ile Leu Leu Gly Thr Trp Leu Trp Arg
    130                 135                 140

Asn Arg Glu Cys Arg Asn Ile Thr Ile Glu Val Thr Thr Ser Glu Leu
145                 150                 155                 160

Asp Thr Phe Val Val Glu His Ala Gln Lys Leu Ser Trp Tyr Gly His
                165                 170                 175

Trp Asp Gly Asp Ser Thr Glu Cys Leu Glu Arg Leu Thr Ala Tyr Leu
            180                 185                 190

Glu Arg Ala Leu Ser Asp Pro Thr Glu Tyr Phe Tyr Met Asp Val Lys
        195                 200                 205

Ala Lys Met Arg Val Gly Trp Gly Asp Glu Val Tyr Pro Ser Gln Glu
    210                 215                 220

Phe Leu Asp Ser Arg Glu Asp Gly Ile Pro Thr Lys Gln Leu Ala Thr
225                 230                 235                 240

Val Glu Leu Leu Ser Gly Lys Glu Thr Val Ala Phe His Gly Gln Lys
                245                 250                 255

Val Gly Ala Ala Leu Gln Ser Ile Asp Asp Trp Trp His Glu Glu Ala
            260                 265                 270

Asp Lys Pro Leu Arg Val Asn Glu Tyr Gly Ala Asp Arg Glu Tyr Val
        275                 280                 285

Ile Ala Arg Arg His Val Ala Tyr Gly Asn Asp Phe Tyr Gln Leu Leu
    290                 295                 300

Arg Asn Thr Glu Asn Trp Ile Glu Ser Met Thr Ala Ser Glu Ser Ile
305                 310                 315                 320
```

```
Pro Asn Asp Val His Phe Ile Met Ser Val Leu Ile Lys Gly Gly Leu
                325                 330                 335


Phe Asn Cys Ala Lys Ala Asn
            340
```

<210> 1887
<211> 212
<212> PRT
<213> Vibrio cholerae strain OYP7G04

<400> 1887

```
Met Ser Gln Arg Tyr Tyr Phe Leu Ile Arg Tyr Thr Asn Ala Asn Ala
1               5                   10                  15


Asp Tyr Gly Leu Leu Ala Gly Arg Cys Ile Ser Gln Met His Leu Phe
            20                  25                  30


Met Val Asn His His Gln Ala Met Asn Arg Val Gly Val Ser Phe Pro
        35                  40                  45


Asp Trp Asn Glu Ser Ser Val Gly Gln Thr Ile Ala Phe Val Ser Glu
    50                  55                  60


Asp Lys Glu Met Met Ile Gly Leu Ser Phe Gln Pro Tyr Phe Ser Leu
65                  70                  75                  80


Met Val Asn Glu Gly Leu Phe Glu Ile Ser Ser Val Tyr Glu Val Pro
                85                  90                  95


Asp Thr Ser Glu Glu Val Arg Phe Val Arg Asn Gln Thr Ile Gly Lys
            100                 105                 110


Asn Phe Leu Gly Ser Lys Lys Arg Arg Ile Lys Arg Ser Met Ala Arg
        115                 120                 125


Ala Glu Leu Phe Gly Ile Gln Gln Ser Leu Pro Val Thr Asn Glu Asp
    130                 135                 140
```

```
Arg Ala Ile Asp Ser Phe His Gln Ile Pro Ile Ser Ser Gly Ser Ser
145                 150                 155                 160


Arg Gln Asp Tyr Ile Leu Phe Ile Gln Lys Glu Leu Ala Asp Glu Arg
                165                 170                 175


Ala Glu Ser Gly Phe Asn Ser Tyr Gly Phe Ala Thr Asn Gln Glu Lys
            180                 185                 190


Arg Ala Thr Val Pro Asp Leu Arg Phe Asn Pro Phe Asp Glu Asp Ser
        195                 200                 205


Phe Leu Val Gln
    210


<210>  1888
<211>  207
<212>  PRT
<213>  Vibrio cholerae strain M1517

<400>  1888

Met Phe Asp Gln Thr Lys Lys Ser Ser His Val His Asn Ile Cys Lys
1               5                   10                  15


Phe Met Ser Leu Lys Asn Asp Ala Val Val Arg Thr Leu Ser Ile Leu
            20                  25                  30


Glu Phe Asp Phe Cys Phe His Leu Glu Tyr Asn Pro Asn Ile Lys Ser
        35                  40                  45


Phe Thr Ser Gln Pro Phe Gly Phe His Tyr Leu Phe Asn Asn Arg Lys
    50                  55                  60


Cys Arg Tyr Thr Pro Asp Phe Leu Ala Ile Gly His Asn Glu Gln Ser
65                  70                  75                  80


Thr Phe Phe Glu Val Lys His Ser Ser Gln Ile Pro Lys Pro Asp Phe
```

```
                85                  90                  95

Arg Glu Arg Phe Glu Glu Lys Gln Arg Val Ala Leu Ser Glu Phe Asn
            100                 105                 110

Arg Arg Leu Val Leu Val Thr Glu Lys Gln Ile Arg Met Gly Pro Thr
        115                 120                 125

Leu Asp Asn Phe Lys Leu Leu His Arg Tyr Ser Gly Leu Arg Thr Val
    130                 135                 140

Thr Glu Phe Gln Lys Arg Val Leu Ala Phe Ile Gln Arg Lys Gln Met
145                 150                 155                 160

Val Lys Leu Gln Glu Val Ser Leu Tyr Phe Gly Leu Ser Glu Gln Asp
                165                 170                 175

Thr Leu Ile Ser Thr Leu Pro Trp Ile Ser Ser Gly His Val Lys Thr
            180                 185                 190

Asp Leu Asn Thr Ile Gly Phe Gly Leu Glu Thr Cys Val Trp Cys
        195                 200                 205
```

<210> 1889
<211> 621
<212> PRT
<213> Vibrio cholerae strain M1517

<400> 1889

```
Met Pro Pro Asp Ser Asn Ser Ile Phe Gly Phe Phe Asp Glu Phe Glu
1               5                   10                  15

Ala Ser Glu Glu Glu Ser Gln Leu Leu Pro Lys Glu Leu Ile Leu Glu
            20                  25                  30

Pro Val Glu Ile Ser Ser Thr Ile Asp Ser Leu Pro Ala Lys Ile Gln
        35                  40                  45
```

```
Glu Glu Val Leu Arg Arg Ile Lys Val Ile Thr Phe Val Glu Lys Arg
    50                  55                  60

Leu Lys Gly Gly Trp Thr Glu Lys Asn Leu Asn Pro Ile Leu Ser Leu
65                  70                  75                  80

Val Glu Ser Glu Leu Gln Leu Thr Pro Pro Ser Trp Arg Thr Val Ala
                85                  90                  95

Thr Trp Lys Lys Ser Tyr Ala Glu Ala Gly Arg Glu Ala Ser Ala Leu
            100                 105                 110

Ile Pro Lys His Thr Phe Lys Gly Asn Arg Gln Lys Glu Met Asp Ser
        115                 120                 125

Gln Ser Leu Ile Asp Glu Ala Ile Gln Asn Val Tyr Leu Thr Arg Glu
    130                 135                 140

Arg Leu Ser Val Ala Glu Ala Tyr Arg Tyr Tyr Lys Ser Arg Val Ile
145                 150                 155                 160

Gln Met Asn Arg Gly Ile Val Glu Gly Lys Ile Lys Pro Ile Ala Glu
                165                 170                 175

Arg Ser Phe Tyr Asn Arg Ile Asn Glu Leu Pro Pro Tyr Glu Val Ala
            180                 185                 190

Ile Ala Arg Phe Gly Lys Arg Tyr Ala Asp Arg Glu Tyr Arg Ser Val
        195                 200                 205

Gly Gln Gln Val Val Ala Thr Lys Pro Met Glu Phe Val Glu Ile Asp
    210                 215                 220

His Thr Pro Val Pro Val Ile Leu Ile Asp Asp Glu Leu Asp Ile Pro
225                 230                 235                 240

Leu Gly Arg Pro Tyr Leu Thr Met Leu Tyr Asp Arg Phe Ser Lys Cys
                245                 250                 255
```

```
Ile Val Gly Cys Ser Ile Asn Phe Arg Glu Pro Ser Phe Asp Ser Val
            260                 265                 270

Arg Lys Ala Leu Leu Asn Ser Leu Leu Asp Lys Ser Trp Leu Lys Ala
        275                 280                 285

Lys Tyr Pro Ser Ile Glu Asn Glu Trp Pro Cys His Gly Lys Ile Asp
    290                 295                 300

Cys Leu Val Val Asp Asn Gly Ala Glu Phe Trp Ser Gln Ser Leu Glu
305                 310                 315                 320

Asp Ser Leu Arg Pro Leu Val Ser Asp Ile Gln Tyr Ser Gln Ala Ala
                325                 330                 335

Lys Pro Trp Arg Lys Ser Gly Ile Glu Lys Leu Phe Asp Gln Met Asn
            340                 345                 350

Lys Gly Leu Val Asn Ala Leu Pro Gly Lys Thr Phe Thr Asn Pro Thr
        355                 360                 365

Gln Leu Gln Asp Tyr Asn Pro Lys Lys Asp Ala Val Val Arg Val Ser
    370                 375                 380

Val Phe Leu Glu Leu Leu His Lys Trp Ile Val Asp Tyr Tyr His Met
385                 390                 395                 400

Ala Pro Asp Ser Arg Glu Arg Glu Ile Pro Tyr His Lys Trp His Gln
                405                 410                 415

Ser Lys Trp Thr Pro Ser Tyr Tyr Asp Gly Ala Glu Lys Glu Gln Leu
            420                 425                 430

Arg Val Glu Leu Gly Leu Leu Arg His Arg Thr Ile Gly Val Ala Gly
        435                 440                 445
```

```
Ile Arg Leu His Asn Leu Arg Tyr Gln Ser Ala Glu Leu Ile Glu Tyr
    450                 455                 460

Arg Lys Tyr Cys Thr Pro Asn Asn Gly Lys Gln Leu Phe Val Lys Thr
465                 470                 475                 480

Lys Thr Asp Pro Ser Asp Ile Ser Tyr Ile His Val Tyr Leu Glu Ser
                485                 490                 495

Glu Lys Lys Tyr Ile Lys Val Pro Ala Val Asp Asn Ser Gly Tyr Thr
            500                 505                 510

Asn Gly Leu Ser Leu Phe Glu His Gln Arg Ile Gln Lys Val Arg Arg
        515                 520                 525

Leu Asn Thr Lys Asp Leu Ala Asp Asp Glu Ala Leu Ala Asp Thr Phe
    530                 535                 540

Leu Tyr Met Lys Lys Arg Ile His Glu Glu Thr Asp Arg Phe Arg Arg
545                 550                 555                 560

Val Lys Ser Ser Lys Pro Asn Leu Pro Lys Thr Gly Asn Thr Ser Arg
                565                 570                 575

Leu Ala Lys Phe Asn Asp Val Gly Ser Glu Gly Pro Asn Ser Ile Asn
            580                 585                 590

Val Thr Pro Val Arg Leu Lys Ser Glu Val Val Ser Asp Ala Ser Glu
        595                 600                 605

Tyr Leu Asp Asp Asp Asp Phe Glu Asp Ile Glu Gly Tyr
    610                 615                 620
```

<210> 1890
<211> 365
<212> PRT
<213> Vibrio cholerae strain M1517

<400> 1890

```
Met Thr Met Ile Leu Lys Ile Leu Lys Gly Ile Ser Leu Asn Leu Thr
1               5                  10                  15

Pro Lys Gln Leu Glu Gln Leu Lys Ser Phe Glu Thr Cys Phe Ile Glu
            20                  25                  30

Tyr Pro Ala Ile Thr Glu Ile Tyr Ser Ile Phe Asp Gln Leu Arg Phe
        35                  40                  45

Asn His Ser Leu Gly Gly Glu Pro Glu Ser Phe Leu Leu Thr Gly Glu
    50                  55                  60

Ala Gly Ser Gly Lys Thr Ala Leu Ile Asn Asn Tyr Leu Ser Arg Phe
65                  70                  75                  80

Gln Ser Gly Ser Thr Trp Gly Lys Gln Pro Val Leu Ser Thr Arg Val
                85                  90                  95

Pro Ser Arg Ile Asn Glu Gln Asn Thr Leu Thr Gln Phe Leu Val Asp
            100                 105                 110

Leu Asp Cys Lys Ser Gly Gly Arg Gly Ile Arg Arg Arg Asn Glu Ile
        115                 120                 125

Ala Leu Gly Glu Ala Val Val Lys Gln Leu Lys Arg Lys Ser Val Glu
    130                 135                 140

Leu Ile Ile Val Asn Glu Ile Gln Glu Leu Val Glu Phe Ser Thr Ala
145                 150                 155                 160

Glu Gln Arg Gln Val Ile Ala Asn Thr Phe Lys Tyr Met Ser Glu Glu
                165                 170                 175

Ala Arg Val Ser Phe Val Leu Val Gly Met Pro Tyr Ala Asp Val Ile
            180                 185                 190

Ala Thr Glu Pro Gln Trp Asn Ser Arg Leu Ser Trp Arg Arg Lys Ile
```

```
        195                 200                 205

Asp Tyr Phe Lys Leu Leu Lys Ala Asn Ser His Ser Ser Lys Thr Ala
    210                 215                 220

Ser Tyr Gly Phe Asp Leu Glu Gln Lys Lys His Phe Ala Arg Phe Val
225                 230                 235                 240

Ala Gly Leu Ser Ser Arg Met Gly Phe Asp Glu Pro Pro Val Leu Thr
                245                 250                 255

Lys Asn Glu Leu Leu Tyr Pro Leu Phe Ala Met Cys Arg Gly Glu Cys
            260                 265                 270

Arg Ala Leu Lys His Phe Leu Lys Asp Ala Leu Leu Thr Ser Phe Asn
        275                 280                 285

Asp Asn Ala Asp Thr Ile Asp Lys Ala Ile Leu Ser Arg Thr Phe Ala
    290                 295                 300

Phe Lys Phe Pro Tyr Leu Asp Asn Pro Phe Asp Arg Pro Leu Glu Gln
305                 310                 315                 320

Leu Ser Leu His Gln Ile Asp Ser Gly Ser Ala Tyr His Leu Asn Ala
                325                 330                 335

Ile Thr Thr Glu Asp Lys Ile Val Ala Pro Arg Phe Thr Asp Ala Ile
            340                 345                 350

Pro Leu Ser Met Leu Leu Ser Lys Asn Gly Leu Lys Ala
        355                 360                 365


<210>  1891
<211>  403
<212>  PRT
<213>  Vibrio cholerae strain M1517

<400>  1891
```

```
Met Lys Thr Asp Ile Gln His Tyr Ser Asp Glu Ser Leu Glu Ser Phe
1               5                   10                  15

Leu Leu Arg Leu Ser Gln Glu Gln Gly Tyr Glu Arg Phe Ser His Phe
            20                  25                  30

Ala Glu Asp Ile Trp Phe Asp Thr Met Glu Gln His Glu Ala Ile Ala
        35                  40                  45

Gly Ala Phe Pro Leu Glu Leu Asn Arg Ile Asn Ile Tyr His Ala Gln
    50                  55                  60

Thr Thr Ser Gln Met Arg Val Arg Val Leu Ile His Leu Glu Asn Gln
65                  70                  75                  80

Leu Lys Leu Asn Asn Phe Gly Val Leu Arg Leu Ala Leu Ser His Ser
                85                  90                  95

Lys Ala Gln Phe Ser Pro Glu Tyr Lys Ala Val His Arg Leu Gly Ser
            100                 105                 110

Asp Tyr Pro Phe Val Phe Leu Gly Lys Arg Phe Thr Pro Ile Cys Pro
        115                 120                 125

Leu Cys Ile Ser Glu Ala Pro Tyr Ile Arg Gln Gln Trp Gln Phe Leu
    130                 135                 140

Ser Gln Gln Ala Cys Glu Arg His Gly Cys Lys Leu Val His His Cys
145                 150                 155                 160

Pro Glu Cys Gln Ser Arg Leu Glu Tyr Gln Thr Thr Glu Ser Ile Ser
                165                 170                 175

Gln Cys Glu Cys Gly Phe Glu Leu Arg Asn Ser Pro Val Glu Asp Ala
            180                 185                 190

Pro Val Ala Ala Leu Leu Val Ala Arg Trp Leu Ser Gly Asn Asp Ser
        195                 200                 205
```

```
Lys Pro Leu Gly Leu Leu Lys Ala Glu Met Thr Leu Ser Glu Arg Tyr
    210                 215                 220

Gly Phe Leu Leu Trp Tyr Val Asn Arg Tyr Gly Asp Ile Glu Asn Ile
225                 230                 235                 240

Ser Phe Glu Ser Phe Val Glu Tyr Cys Ser Cys Trp Pro Arg Val Leu
                245                 250                 255

Lys Glu Glu Leu Asp Glu Leu Val Asn Lys Ala Asp Leu Ile Arg Ile
            260                 265                 270

Lys Asp Trp Lys Lys Thr Phe Phe Asn Glu Val Phe Gly Ala Leu Leu
        275                 280                 285

Lys Asp Cys Arg Gln Leu Pro Ser Arg Gln Leu Glu Cys Asn Ser Val
    290                 295                 300

Leu Thr Gln Val Leu Ala Tyr Phe Thr Lys Leu Met Ala Ala Ile Pro
305                 310                 315                 320

Ser Ser Ser Lys Gly Asn Val Gly Asp Val Leu Leu Ser Pro Leu Glu
                325                 330                 335

Ala Ser Thr Leu Leu Ser Cys Thr Thr Asp Glu Val Tyr Arg Leu Tyr
            340                 345                 350

Glu Phe Gly Glu Ile Lys Ala Ala Ile Arg Pro Arg Met His Thr Lys
        355                 360                 365

Ile Ala Ser His Glu Ser Ala Phe Thr Leu Arg Ser Val Ile Glu Thr
    370                 375                 380

Lys Leu Thr Arg Met Cys Ser Glu Asn Asp Gly Leu Ser Val Tyr Leu
385                 390                 395                 400
```

Pro Glu Trp

<210> 1892
<211> 695
<212> PRT
<213> Vibrio cholerae strain M1517

<400> 1892

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Met Thr Lys Leu Ser Asp Leu Leu Ala Ile Glu Asp Glu Ala Ile Lys
1               5                  10                  15


Gln Thr Ala Leu Lys Lys Met Phe Met Pro Tyr Thr Glu Asp Val Cys
            20                  25                  30


Val Asp Gly Tyr Glu Gln Glu Thr Leu Thr Ile Leu Leu Asn Leu Ser
        35                  40                  45


Ser Ser His Gln Ala Asp Arg Cys Ser Asp Trp Leu Asp Val Ala Arg
    50                  55                  60


Ala Gln Arg Tyr Leu Lys Asp Arg Glu Asn Leu Asp Ala Ser Leu Ala
65                  70                  75                  80


Glu Ile Gln Trp Phe His Thr His Asn Leu Lys Phe Pro Asp Cys Arg
                85                  90                  95


Val Lys Asp Gln Arg Ile Ile Ala Arg Pro Leu Ser Thr Ala Glu Glu
            100                 105                 110


Phe Ile Ser Ser Ala Val Leu Asp Gln Arg Leu Gly Trp Ala His Asn
        115                 120                 125


Ser Ala Val Tyr Arg His Thr Leu Trp Leu Leu Asn Pro Phe Lys Trp
    130                 135                 140


Gln Ser Gln Pro Val Cys Ile Leu Leu Leu Ile Gln Gln Lys Asn Pro
145                 150                 155                 160
```

```
Val Trp Leu Asp Leu Leu Thr Glu Phe Gly Leu Asp Val Lys Ser Leu
                165                 170                 175

Ala Arg Leu Gln Arg Ala Ile Glu Glu Gln Leu Pro Glu Asn Ser Phe
            180                 185                 190

Pro Asp Ser Val Ser Thr Tyr Ser Lys Gln Leu Arg Phe Pro Trp Gly
        195                 200                 205

Asp Asp Tyr Val Ser Ile Thr Pro Val Val Ser His Ala Leu Gln Cys
    210                 215                 220

Glu Leu Glu Ile Arg Ala Arg Ser Pro Glu Asn Lys Phe Ser Phe Val
225                 230                 235                 240

Ser Ser Ser Leu Pro Asn Ser Ala Ser Ile Gly Asn Leu Cys Gly Ser
                245                 250                 255

Leu Gly Gly Tyr Met Arg Val Leu Asn Tyr Pro Leu Gly Val Lys Gln
            260                 265                 270

Ala Lys Gly Gly Thr Leu Thr Glu Asn Arg Gln Lys Ser Gly His Tyr
        275                 280                 285

Phe Asp Asp Tyr Gln Val Thr Asn Ala Lys Ile Cys Gln Val Leu Asn
    290                 295                 300

Arg Leu Ile Gly Ser Glu Pro Ser Lys Thr Gln Arg Gln Arg Glu Arg
305                 310                 315                 320

Ala Arg Lys Val Arg Ser Lys Ile Leu Arg Lys Gln Ile Ala Leu Trp
                325                 330                 335

Met Leu Pro Leu Ile Glu Leu Arg Asp Ile Ala Glu Ser Glu Pro Asn
            340                 345                 350

Gln Gln Gln Leu Glu His Asp Asp Thr Leu Ala Gln Ala Phe Leu Ser
```

```
        355                 360                 365

Leu Pro Glu Trp Glu Leu Gly Ser Leu Ala Gly Glu Phe Asn Arg Arg
    370                 375                 380

Leu His Leu Ala Phe Gln Asn Asn Ile Tyr Ser Ala Lys Phe Ala Tyr
385                 390                 395                 400

His Pro Lys Leu Met Gln Val Ala Lys Ala Gln Val Thr Trp Val Leu
                405                 410                 415

Glu Gln Leu Ser Lys Pro Ile Asn Asn Gln Asp Thr Val Thr Gly Glu
            420                 425                 430

Gln Tyr Ile Tyr Leu Ser Ser Met Arg Val Gln Asp Ala Val Ala Met
        435                 440                 445

Ser Asn Pro Cys Leu Cys Gly Val Pro Ser Leu Thr Ala Ile Trp Gly
    450                 455                 460

Phe Met His Asp Tyr Gln Arg Gln Phe Asn Gln Leu Val Asn Asn Asp
465                 470                 475                 480

Ser Pro Val Glu Phe Ser Ser Phe Ala Phe Tyr Val Arg Asn Glu Asn
                485                 490                 495

Ile Gln Ser Thr Ala Lys Leu Thr Glu Pro Asn Ser Ile Ala Lys Ala
            500                 505                 510

Arg Thr Val Ser Asn Ala Lys Arg Pro Thr Ile Arg Ser Lys Arg Leu
        515                 520                 525

Ala Asp Leu Glu Ile Asp Leu Val Ile Arg Val His Ser Glu Ser Arg
    530                 535                 540

Ile Ser Asp Phe Arg Ser Ala Leu Lys Thr Ala Leu Pro Val Ala Phe
545                 550                 555                 560
```

```
Ala Gly Gly Ala Leu Tyr Gln Pro Gln Leu Ser Thr Gln Ile Glu Trp
                565                 570                 575


Leu Arg Thr Phe Thr Gly Arg Ser Glu Leu Phe His Val Leu Lys Gly
            580                 585                 590


Leu Pro Ala Tyr Gly Arg Trp Leu Tyr Pro Ser Glu Lys Gln Pro Thr
        595                 600                 605


Asn Phe Asp Glu Leu Glu Arg Leu Leu Thr Gln Asp Asp Asp Asn Leu
    610                 615                 620


Leu Val Ser Leu Gly Tyr His Leu Leu Glu His Pro Thr Lys Arg Asp
625                 630                 635                 640


Asn Ala Ile Thr Gly Cys His Ala Tyr Ala Glu Asn Ala Ile Gly Leu
                645                 650                 655


Ala Lys Arg Ile Asn Pro Ile Glu Val Arg Phe Ser Gly Arg Asp His
            660                 665                 670


Phe Leu Asn His Ala Phe Trp Ser Ile Glu Cys Ser Ser Glu Thr Ile
        675                 680                 685


Leu Ile Lys Asn Tyr Arg Asp
    690                 695


<210>  1893
<211>  343
<212>  PRT
<213>  Vibrio cholerae strain M1517

<400>  1893

Met Glu Leu Cys Thr Gln Leu Asn Tyr Val Arg Ser Leu Ser Ala Gly
1               5                   10                  15


Lys Ala Tyr Phe Tyr Tyr Leu Ser Glu Ser Gly Glu Met Cys Pro Leu
            20                  25                  30
```

```
Asp Val Asp Arg Thr Arg Leu Arg Ala Pro Lys Gly Ser Tyr Ser Glu
        35                  40                  45

Ala Tyr Lys Gly Asn Lys Phe Val Asp Lys Asn Val Ala Pro Gln Asp
    50                  55                  60

Leu Ala Tyr Ser Asn Pro Gln Phe Ile Glu Glu Cys Tyr Val Lys Pro
65                  70                  75                  80

Gly Val Asp Glu Ile Tyr Cys Ala Phe Ser Leu Arg Ile Arg Ala Asn
                85                  90                  95

Ser Leu Thr Pro Asp Met Cys Ser Asp Asp Glu Val Arg Ser Lys Leu
            100                 105                 110

Ser Met Leu Ala Lys Ile Tyr Lys Asp Leu Asn Gly Tyr Lys Glu Leu
        115                 120                 125

Ala His Arg Tyr Ala Lys Asn Ile Leu Leu Gly Thr Trp Leu Trp Arg
    130                 135                 140

Asn Arg Glu Cys Arg Asn Ile Thr Ile Glu Val Thr Thr Ser Glu Leu
145                 150                 155                 160

Asp Thr Phe Val Val Glu His Ala Gln Lys Leu Ser Trp Tyr Gly His
                165                 170                 175

Trp Asp Gly Asp Ser Thr Glu Cys Leu Glu Arg Leu Thr Ala Tyr Leu
            180                 185                 190

Glu Arg Ala Leu Ser Asp Pro Thr Glu Tyr Phe Tyr Met Asp Val Lys
        195                 200                 205

Ala Lys Met Arg Val Gly Trp Gly Asp Glu Val Tyr Pro Ser Gln Glu
    210                 215                 220
```

```
Phe Leu Asp Ser Arg Glu Asp Gly Ile Pro Thr Lys Gln Leu Ala Thr
225                 230                 235                 240


Val Glu Leu Leu Ser Gly Lys Glu Thr Val Ala Phe His Gly Gln Lys
                245                 250                 255


Val Gly Ala Ala Leu Gln Ser Ile Asp Asp Trp Trp Asn Glu Asn Ala
            260                 265                 270


Asp Lys Pro Leu Arg Val Asn Glu Tyr Gly Ala Asp Arg Glu Tyr Val
        275                 280                 285


Ile Ala Arg Arg His Val Thr His Gly Asn Asp Phe Tyr Gln Leu Val
    290                 295                 300


Arg Asn Thr Glu Asn Trp Ile Glu Thr Met Thr Ala Ser Arg Thr Ile
305                 310                 315                 320


Pro Asn Asp Val His Phe Ile Met Ser Val Leu Ile Lys Gly Gly Leu
                325                 330                 335


Phe Asn Cys Ala Lys Ala Asn
            340


<210>  1894
<211>  209
<212>  PRT
<213>  Vibrio cholerae strain M1517

<400>  1894

Met Ser Gln Arg Tyr Tyr Phe Leu Ile Arg Tyr Thr Asn Ala Asn Ala
1               5                   10                  15


Asp Tyr Gly Leu Leu Ala Gly Arg Cys Ile Ser Gln Met His Leu Phe
            20                  25                  30


Met Val Asn His His Gln Ala Met Asn Arg Val Gly Val Ser Phe Pro
        35                  40                  45
```

```
Asp Trp Asn Glu Ser Ser Val Gly Gln Thr Ile Ala Phe Val Ser Glu
    50                  55                  60

Asp Lys Glu Met Met Ile Gly Leu Ser Phe Gln Pro Tyr Phe Ser Leu
65                  70                  75                  80

Met Val Asn Glu Gly Leu Phe Glu Ile Ser Ser Val Tyr Glu Val Pro
                85                  90                  95

Asp Thr Ser Ala Glu Val Arg Phe Val Arg Asn Gln Thr Ile Gly Lys
            100                 105                 110

Asn Phe Leu Gly Ser Lys Lys Arg Arg Ile Lys Arg Ser Met Ala Arg
        115                 120                 125

Ala Glu Leu Phe Gly Val Glu Gln Ser Leu Pro Val Thr Asn Glu Asp
    130                 135                 140

Arg Val Ile Asp Ser Phe His Arg Ile Pro Ile Ser Ser Gly Ser Ser
145                 150                 155                 160

Arg Gln Asp Phe Ile Leu Phe Ile Gln Lys Glu Leu Ala Asp Glu Arg
                165                 170                 175

Ala Lys Ser Gly Phe Asn Ser Tyr Gly Phe Ala Thr Asn Gln Glu Lys
            180                 185                 190

Arg Ala Thr Val Pro Asp Leu Arg Phe Asn Leu Phe Glu Glu Asp Ser
        195                 200                 205

Phe
```

<210> 1895
<211> 58
<212> PRT
<213> Vibrio cholerae strain 4874

<400> 1895

Ala Thr Gly Thr Cys Thr Gly Cys Thr Cys Thr Ala Cys Cys Thr Thr
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Cys Thr Cys Cys Thr Thr Cys Thr Ala Cys Thr Ala Cys Cys Ala Cys
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Cys Cys Thr Gly Ala Thr Thr Gly Cys Ala Cys Thr Thr Gly Ala Ala
35 40 45

Ala Gly Thr Gly Cys Ala Thr Thr Thr Gly
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<210> 1896
<211> 3229
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1896
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ttttcgttcc actgagcgtc agaccccgta gaaaagatca aaggatcttc ttgagatcct 180

ttttttctgc gcgtaatctg ctgcttgcaa acaaaaaaac caccgctacc agcggtggtt 240

tgtttgccgg atcaagagct accaactctt tttccgaagg taactggctt cagcagagcg 300

cagataccaa atactgttct tctagtgtag ccgtagttag gccaccactt caagaactct 360

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tgtacgttcg caatcttcga aaaccttcag caaacaaaaa cgtttataag tttgttagtg 1140

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agttctgcta tgtggcgcgg tattatcccg tattgacgcc gggcaagagc aactcggtcg 2640

ccgcatacac tattctcaga atgacttggt tgagtactca ccagtcacag aaaagcatct 2700

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taagccctcc cgtatcgtag ttatctacac gacggggagt caggcaacta tggatgaacg 3180

aaatagacag atcgctgaga taggtgcctc actgattaag cattggtaa 3229

<210> 1897
<211> 3229
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1897
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ttttcgttcc actgagcgtc agaccccgta gaaaagatca aaggatcttc ttgagatcct 180

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<212> DNA
<213> Vibrio diazotrophicus strain 60.6F

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<210> 1910
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<400> 1911
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<211> 2091
<212> DNA
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<210> 1913
<211> 1038
<212> DNA
<213> Vibrio diazotrophicus strain 60.6F

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<211> 612
<212> DNA
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<210> 1915
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<212> DNA
<213> Vibrio diazotrophicus strain 60.6F

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<210> 1916
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<210> 1917
<211> 207
<212> PRT
<213> Vibrio diazotrophicus strain 60.6F

<400> 1917

Met Tyr Val Arg Asn Leu Arg Lys Pro Ser Ala Asn Lys Asn Val Tyr
1 5 10 15

Lys Phe Val Ser Val Lys Asn Gly Cys Asn Ile Met Cys Glu Ser Ser
20 25 30

Leu Glu Tyr Asp Cys Cys Tyr Tyr Leu Glu Tyr Ser Asp Asp Val Val
35 40 45

Arg Tyr Gln Ser Gln Pro Lys Gly Tyr Arg Phe Pro Tyr Gln Gly Lys
50 55 60

Glu His Pro Tyr Thr Pro Asp Phe Leu Val His Lys Lys Asp Gly Thr
65 70 75 80

```
Ser Tyr Leu Leu Glu Val Lys Pro Leu Ser Lys Thr Phe Ser Ser Glu
                85                  90                  95


Phe Gln Asp Val Phe Arg Gln Lys Gln Ile Met Ala Ser Glu Leu Gly
            100                 105                 110


Ala Pro Leu Leu Leu Val Thr Asp Arg Gln Ile Arg Asn Asp Val His
        115                 120                 125


Leu Asn Asn Leu Lys Leu Val His Arg Tyr Ser Gly Cys Ile Gly Asn
    130                 135                 140


Ser Ser His Leu Glu Ser Val Trp Ser Ala Val Asn Gln Ser Ser Ser
145                 150                 155                 160


Ile Cys Ile Lys Ala Leu Ser Ala Ile Leu Asn Leu Thr Ile Gly Glu
                165                 170                 175


Val Phe Ala Ser Val Leu Arg Leu Ile Gly Leu Gly Lys Ala Lys Thr
            180                 185                 190


Lys Leu Asp Val Leu Leu Asp Glu Asn Ser Leu Ile Ser Val Ala
        195                 200                 205


<210>  1918
<211>  635
<212>  PRT
<213>  Vibrio diazotrophicus strain 60.6F

<400>  1918

Met Ser Phe Gly Pro Phe Glu Asp Glu Phe Gly Ser Ile Thr Asn Asp
1               5                   10                  15


Val Gln Gln Gln Tyr Glu Ala Ser Pro Glu Ala Lys Leu Ser Arg Leu
            20                  25                  30


Lys Tyr Ser Pro Leu Glu Thr Thr Lys Val Ile Glu Arg Asp Leu Ser
        35                  40                  45
```

```
Ser Phe Pro Glu Glu Gln Lys Leu Lys Ala Leu Glu Arg Tyr Lys Leu
    50                  55                  60

Ile Ser Leu Ile Ala Lys Glu Ile Asn Gly Gly Trp Thr Pro Lys Asn
65                  70                  75                  80

Leu Ile Pro Leu Ile Asp Lys His Ile Glu Thr Leu Asn Ile Pro Lys
                85                  90                  95

Pro Ser Asp Arg Thr Val Lys Arg Trp Tyr Lys Ala Phe Cys Glu Ser
            100                 105                 110

Asp Gly Asp Ile Lys Ser Leu Val Asp Ser His His Leu Lys Gly Asn
        115                 120                 125

Arg Gln Pro Arg Ile Glu Asp Asp Glu Pro Phe Phe Ile Glu Ala Val
    130                 135                 140

Glu Arg Phe Leu Asp Ala Val Arg Pro Ser Tyr Ser Lys Ala Tyr Gln
145                 150                 155                 160

Val Tyr Cys Asp Arg Ile Glu Ile Glu Asn Ser Thr Ile Val Ser Gly
                165                 170                 175

Lys Ile Ala Lys Val Ser Tyr Glu Ala Phe Lys Lys Arg Leu Lys Lys
            180                 185                 190

Leu Pro Pro Tyr Thr Val Ala Leu Lys Arg His Gly Lys Tyr Tyr Ala
        195                 200                 205

Asp Lys Leu Phe Asn Tyr Tyr Glu Ala Val Lys Met Pro Thr Arg Ile
    210                 215                 220

Leu Glu Arg Val Glu Ile Asp His Thr Pro Leu Asp Leu Ile Leu Leu
225                 230                 235                 240

Asp Asp Glu Leu Leu Val Pro Leu Gly Arg Ala Tyr Leu Thr Leu Leu
```

```
                245                 250                 255

Val Asp Val Phe Ser Gly Cys Ile Ile Gly Phe His Leu Gly Phe Lys
            260                 265                 270

Ala Pro Ser Tyr Thr Ala Val Ser Lys Ala Ile Ile His Ser Val Lys
        275                 280                 285

Ser Lys Glu Tyr Val Asn Glu Leu Pro Ile Gly Leu Ser Asn Gln Trp
    290                 295                 300

Ile Cys His Gly Lys Ile Glu Asn Leu Val Val Asp Asn Gly Ala Glu
305                 310                 315                 320

Phe Trp Ser Lys Ser Leu Asp Gln Ala Cys Ile Glu Ala Gly Ile Asn
                325                 330                 335

Ile Ile Tyr Asn Lys Val Arg Lys Pro Trp Leu Lys Pro Phe Val Glu
            340                 345                 350

Arg Lys Phe Gly Glu Leu Ile Gln Gly Ile Val Gly Trp Val Pro Gly
        355                 360                 365

Arg Thr Phe Ser Asn Val Leu Glu Lys Glu Asp Tyr Asp Pro Gln Lys
    370                 375                 380

Asp Ala Val Met Arg Phe Ser Val Phe Val Glu Glu Leu His Arg Trp
385                 390                 395                 400

Ile Ile Asp Val His Asn Ala Ser Ala Asp Ser Arg His Thr Arg Ile
                405                 410                 415

Pro Asn Tyr His Trp Gln Lys Ser Glu Glu Val Leu Pro Pro Pro Ala
            420                 425                 430

Leu Thr Glu Arg Asp Glu Ile Gln Phe Arg Val Ile Met Gly Met Val
        435                 440                 445
```

```
His Lys Gly Ala Leu Thr Ser Lys Gly Ile Lys Phe Lys His Leu Met
    450                 455                 460

Tyr Asp Asn Val Ala Leu Glu His Tyr Arg Lys Gln Tyr Pro Gln Ser
465                 470                 475                 480

Lys Asp Ser Arg Ile Lys Thr Val Lys Ile Asp Pro Asp Asp Leu Ser
                485                 490                 495

Arg Ile Phe Val Phe Leu Glu Glu Lys Lys Gly Tyr Ile Glu Val Pro
            500                 505                 510

Cys Lys Tyr Asp Pro Leu Gly Tyr Thr Lys Lys Leu Ser Leu Cys Glu
        515                 520                 525

His Leu Arg Thr Val Lys Val His Arg Asp Phe Ile Lys Gly Gln Val
    530                 535                 540

Asp Ser Leu Ser Leu Ala Lys Ala Arg Gln Ala Leu His Glu Arg Ile
545                 550                 555                 560

Lys Gln Glu His Glu Asn Leu Arg Gln Met Ser Leu Pro His Arg Ala
                565                 570                 575

Lys Lys Ala Lys Asn Gly Lys Lys Met Ala Glu Leu Ala Gly Val Asn
            580                 585                 590

Ser Asp Ser Pro Lys Ser Ile Thr Thr Asp Tyr Pro Ile Glu Asp Thr
        595                 600                 605

Ile Gln Leu His Glu Ser Thr Pro Val Asp Asp Leu Gln Ser Leu Trp
    610                 615                 620

Asn Lys Arg Arg Ala Leu Arg Lys Ser Gly Lys
625                 630                 635
```

<210> 1919

<211> 328
<212> PRT
<213> Vibrio diazotrophicus strain 60.6F

<400> 1919

```
Met Thr Ser Leu Gln Pro Thr Asn Asn Asp Val Asp Val Leu Leu Ala
1               5                  10                  15


Glu Phe His Gln Ser Phe Val Val Tyr Pro Asp Val Glu Lys Val Phe
            20                  25                  30


Glu Gly Leu Asp Trp Ile Val Arg Arg Ser Gln Phe Gly Lys Phe Ala
        35                  40                  45


Pro Ser Met Leu Ile Thr Gly Gly Thr Gly Ala Gly Lys Thr Ser Val
    50                  55                  60


Val Glu Ile Tyr Leu Asn Asn His Phe Ser Ser Ser Glu Val Leu Ile
65                  70                  75                  80


Thr Arg Val Arg Pro Ser Phe Val Glu Thr Leu Ile Trp Ala Ile Glu
                85                  90                  95


Lys Leu Asn Val Pro Tyr Asn Ser Arg Ser Lys Arg Ser Glu Ile Gly
            100                 105                 110


Leu Gln Asp Tyr Phe Ile Asn Ser Val Lys Lys Ser Lys Leu Lys Leu
        115                 120                 125


Leu Val Ile Glu Glu Ala Gln Glu Leu Phe Glu Cys Ala Ser Pro Lys
    130                 135                 140


Glu Arg Gln Lys Ile Arg Asp Arg Leu Lys Met Ile Ser Asp Glu Cys
145                 150                 155                 160


Arg Leu Pro Ile Val Phe Ile Gly Ile Pro Thr Ala Lys Leu Ile Leu
                165                 170                 175
```

```
Glu Asp Ser Gln Trp Asp Arg Arg Ile Met Val Lys Arg Asp Leu Pro
            180                 185                 190

Tyr Ile Arg Ile Thr Asn Glu Glu Ser Leu Asp Val Tyr Ile Ala Leu
        195                 200                 205

Leu Glu Gly Leu Glu Lys Thr Leu Pro Ile Ser Val Ala Pro Glu Leu
    210                 215                 220

Thr Asp Met Asp Met Ala Met Arg Leu Leu Ala Ala Ser Arg Gly Met
225                 230                 235                 240

Leu Gly Leu Ile Lys Glu Leu Val Gly Tyr Ala Phe Glu Leu Ala Leu
                245                 250                 255

Leu Glu Gly Lys Arg Gln Ile Thr Gln Asn Glu Phe Val Gln Ala Phe
            260                 265                 270

Lys Ser Ile Phe Gly Pro Asp Ile Ser Asn Pro Phe Glu Ile Glu Leu
        275                 280                 285

Asp Lys Leu Leu Ile Pro Gln Ile Ile Glu Tyr Glu Gly Tyr Leu Leu
    290                 295                 300

Asp Ser Asp Ser Gly Asp Ile Lys Phe Thr His Gln Ile Phe Glu Asp
305                 310                 315                 320

Ile Pro Leu Thr Glu Leu Leu Arg
                325
```

<210> 1920
<211> 403
<212> PRT
<213> Vibrio diazotrophicus strain 60.6F

<400> 1920

```
Met Asp Thr Asp Ile Glu Val Tyr Ser Asp Glu Ser Leu Glu Ser Phe
1               5                   10                  15
```

```
Leu Leu Arg Leu Ser Lys Phe Gln Gly Tyr Glu Arg Phe Ala His Phe
            20                  25                  30

Ala Glu Asp Ile Trp Gln Thr Thr Leu Leu Gln His Glu Ala Ile Pro
        35                  40                  45

Gly Ala Phe Pro Phe Glu Leu Ser Arg Ile Asn Ile Tyr Lys Ala Gln
    50                  55                  60

Thr Thr Ser Gln Met Arg Val Arg Val Leu Ile Asp Leu Glu Lys Arg
65                  70                  75                  80

Leu Lys Phe Asn Asp Phe Gly Val Leu Arg Leu Ser Leu Ala His Ser
                85                  90                  95

Lys Ala Ser Phe Ser Pro Asp Tyr Lys Ala Val Asn Arg Tyr Gly Ala
            100                 105                 110

Asp Tyr Pro Gln Ala Phe Leu Arg Lys Asn Phe Thr Pro Val Cys Pro
        115                 120                 125

Lys Cys Leu Asp Glu Ala Ala Tyr Ile Arg Gln Leu Trp His Phe Ile
    130                 135                 140

Pro Tyr Gln Val Cys His Lys His His Ser Gln Leu Ala Gln Arg Cys
145                 150                 155                 160

Pro Glu Cys Gly Lys Leu Leu Asn Tyr Gln Ser Ser Glu Leu Ile Glu
                165                 170                 175

Asn Cys Glu Cys Gly Phe Ser Leu Leu Asn Gly Glu Ser Glu Lys Glu
            180                 185                 190

Ser Cys Ser Thr Leu Phe Val Ala Gln Trp Leu Ala Gly Glu Lys Pro
        195                 200                 205

Val Glu Ser Gly Leu Met Ser Gln Glu Leu Thr Gln Ser Ser Arg Phe
```

```
    210                 215                 220

Gly Phe Leu Leu Trp Tyr Ile Asn Arg Tyr Gly Glu Leu Asp Asp Ile
225                 230                 235                 240

Ser Phe Asp Gly Phe Val Glu Cys Cys Lys Ser Trp Pro Asn Lys Leu
                245                 250                 255

Asn Thr Asp Leu Asp Ser Ile Val Gln Lys Ala Asp Ile Val Arg Ile
            260                 265                 270

Gln Pro Trp Asn Lys Ile Tyr Phe Ser Glu Val Phe Gly Asp Leu Leu
        275                 280                 285

Lys Glu Cys Arg Ser Leu Pro Ser Arg Asp Leu Ser Lys Asn Pro Val
    290                 295                 300

Leu Lys Asn Val Val Leu Tyr Phe Arg Ala Leu Ile Thr Asn Asn Pro
305                 310                 315                 320

Lys Val Lys Ser Ala Asn Ile Gly Asp Val Leu Leu Ser Pro Leu Glu
                325                 330                 335

Ala Ser Thr Leu Leu Ser Cys Thr Thr Asp Glu Ile Tyr Arg Leu Tyr
            340                 345                 350

Gln Phe Gly Gln Leu Lys Ala Gln His Thr Pro Lys Leu Gln Ser Lys
        355                 360                 365

Ile Glu Asn His His Ser Val Phe Thr Leu Arg Ser Ile Ile Glu Leu
    370                 375                 380

Lys Leu Ser Ser Met Cys Ser Glu Thr Asp Gly Leu Asn His Tyr Leu
385                 390                 395                 400

Pro Glu Trp
```

<210> 1921
<211> 696
<212> PRT
<213> Vibrio diazotrophicus strain 60.6F

<400> 1921

```
Met Thr Thr Leu Gln Asp Leu Ile Asp Ile Glu Asp Ser Lys Leu Arg
1               5                  10                  15


Phe Ile Glu Ile Lys Lys Ala Phe Met Pro Tyr Thr Arg Pro Val Glu
            20                  25                  30


Val Asp Gly Ser Glu Lys Gln Ala Leu Ile Val Leu Leu Asn Leu Ser
        35                  40                  45


Leu Ser Lys Pro Glu Val Lys Asp Trp Leu Asp Phe Pro Arg Ala Leu
    50                  55                  60


Asp Tyr Phe Ala Asp Ser Asp Asn Leu Ser Ala Ala Glu Gln Glu Ile
65                  70                  75                  80


Gln Trp Phe His Thr His Asn Leu Lys Phe Pro Asp Cys Arg Val Ser
                85                  90                  95


Glu Gln Arg Ile Ile Ala Thr Pro Leu Tyr Thr Glu Thr Pro Thr Leu
            100                 105                 110


Thr Ser Gln Ser Leu Asn Arg Ala Tyr Gly Trp Ala His Asn Ser Ala
        115                 120                 125


Val Tyr Lys His Thr Ile Trp Leu Leu Asn Glu Phe Arg Trp Arg Gly
    130                 135                 140


Arg Val Glu Asn Leu Leu Asn Leu Ile Cys Gly Gly Asp Asp Phe Trp
145                 150                 155                 160


Leu Glu Leu Leu Ala Asp Met Gly Leu Lys Pro Lys Ala Gln Ile Gln
                165                 170                 175
```

```
Leu Lys Asp Leu Ile Glu His Gln Leu Pro Leu Thr His Phe Pro Asp
            180                 185                 190

Glu Val Asn Arg Tyr Ser Lys Gln Leu Arg Phe Pro Trp Arg Gly Asp
        195                 200                 205

Tyr Leu Ser Val Thr Pro Val Val Ser His Ala Ile Gln Gln Gln Leu
    210                 215                 220

Ser Val Leu Ser Arg Gln Gly Glu Cys Ser Leu Arg Phe Lys Thr Met
225                 230                 235                 240

Thr Tyr Pro Asn Ser Ala Ser Ile Gly Asn Leu Cys Gly Ser Leu Gly
                245                 250                 255

Gly Tyr Ile Asn Val Leu Asn Tyr Pro Ile Asp Val Ile Ala Asn Arg
            260                 265                 270

His Gln Thr Leu Gly Ala Ser Arg Ser Arg Thr Lys Arg Tyr Phe Asp
        275                 280                 285

Asp Phe Gln Leu Thr Ser Lys Ser Thr Cys Ser Val Leu Ala His Leu
    290                 295                 300

Thr Gly Phe Glu Gln Pro Gln Met Arg Lys Ala Gln Lys His Val Arg
305                 310                 315                 320

Gln Tyr Gln Leu Lys Ile Ile Arg Lys Gln Ile Ala Leu Trp Leu Leu
                325                 330                 335

Pro Leu Ile Glu Leu Arg Asp Asn Ser Val Thr Asp Pro Ile Gly Phe
            340                 345                 350

Tyr Asp Glu Pro Asp Asp Glu Leu Ala Lys Arg Phe Leu Thr Ile Asn
        355                 360                 365
```

```
Glu Leu Asp Phe Ile Glu Leu Thr Thr Ser Leu Asn Gln Arg Leu Asn
    370                 375                 380

Ile Ala Leu Gln Asn Asn Arg Phe Ala Ser Arg Phe Ala Tyr His Pro
385                 390                 395                 400

Lys Leu Met Arg Val Leu Lys Thr Glu Leu Ile Trp Val Leu Thr Gln
                405                 410                 415

Leu Ser Gln Pro Glu Pro Glu Pro Pro Thr Val Ser Asp Ser Lys Val
            420                 425                 430

Gln Tyr Leu Tyr Leu Ser Ser Met Arg Val Phe Asp Ala Ala Ala Met
        435                 440                 445

Ser Cys Pro Tyr Leu Ser Gly Ala Pro Ser Leu Thr Ala Val Trp Gly
    450                 455                 460

Phe Val His Arg Tyr Gln Arg Glu Leu Gln Asp Leu Leu Ser Asp Gly
465                 470                 475                 480

Glu Gly Gln Phe Glu Phe Lys Asp Phe Ala Phe Phe Ile Arg Asp Glu
                485                 490                 495

Ser Val Gln Thr Ser Ala Lys Leu Thr Glu Pro Ser Val Ile Ala Lys
            500                 505                 510

Ala Arg Ser Ile Ser Gln Val Lys Arg Thr Thr Ile Ile Arg Glu Asp
        515                 520                 525

Cys Ser Asp Leu Ile Phe Asp Ile Val Ile Ala Ile Glu Ser Asp Gln
    530                 535                 540

Arg Ile Ser Asp Tyr Gln Ser Gln Phe Lys Ala Ala Leu Pro Thr Asn
545                 550                 555                 560

Phe Ala Gly Gly Ala Leu Phe Gln Pro Glu Ile Asn Ser Gly Ile Asn
                565                 570                 575
```

```
Trp Leu Arg Thr Phe Val Ser Lys Ser Glu Leu Phe Gln Ala Val Lys
            580                 585                 590

Gly Leu Pro Gly Tyr Gly Thr Trp Leu Ser Pro Asp Ser Phe Gln Pro
        595                 600                 605

Gln Asn Leu Ala Glu Leu Gln Glu Cys Leu Thr Ile Asp Ser Ser Leu
    610                 615                 620

Ile Pro Val Ser Asn Gly Phe His Phe Leu Gly Ser Pro Gln Glu Arg
625                 630                 635                 640

Lys Gly Ala Leu Thr Lys Leu His Cys Tyr Ala Glu Asn Asn Ile Ala
                645                 650                 655

Leu Ala Lys Arg Thr Asn Pro Ile Glu Val Arg Phe Ala Gly Ser Asp
            660                 665                 670

His Phe Phe Glu Gln Val Phe Trp Ser Leu Glu Val Thr Glu Gln Thr
        675                 680                 685

Ile Leu Ile Lys Asn Lys Arg Ile
    690                 695
```

<210> 1922
<211> 345
<212> PRT
<213> Vibrio diazotrophicus strain 60.6F

<400> 1922

```
Met Glu Leu Cys Ser Gln Leu Asn Tyr Val Arg Ser Leu Ser Pro Gly
1               5                   10                  15

Arg Ala Tyr Phe Tyr Tyr Leu Asp Glu Asp Asn Lys Met Arg Pro Leu
            20                  25                  30

Gln Ile Asp Arg Thr His Leu Arg Ala Pro Lys Ser Gly Tyr Ser Glu
```

```
        35                  40                  45

Ala Phe Ser Gly Asn Phe Lys Ser Lys Asn Ile Ala Pro Gln Asp Leu
    50                  55                  60

Ser Tyr Ser Asn Pro Gln Phe Ile Glu Glu Cys Tyr Val Pro Pro Gly
65                  70                  75                  80

Val Asn Asp Ile Tyr Cys Ala Phe Ser Leu Arg Val Arg Ala Asn Ser
                85                  90                  95

Leu Ser Pro Glu Val Cys Val Asp Asn Glu Val Arg Asp Ile Leu Cys
            100                 105                 110

Asn Phe Ala Ala Leu Tyr Lys Glu Leu Gly Gly Tyr Arg Glu Leu Ala
        115                 120                 125

Arg Arg Tyr Ala Lys Asn Ile Leu Met Gly Thr Trp Val Trp Arg Asn
    130                 135                 140

Arg Glu Cys Arg Asn Ile Arg Val Glu Val Lys Thr Glu Asp Lys Glu
145                 150                 155                 160

Trp Val Ile Thr Asp Ala Arg Phe Leu Asp Trp Tyr Gly Ser Trp Glu
                165                 170                 175

Lys Asp Ser Gln Leu Ala Leu Asp Glu Phe Thr Asp Tyr Leu Ser Gln
            180                 185                 190

Ala Leu Ser Asp Arg Thr Cys Tyr Phe Asn Met Asp Ile Lys Ala Lys
        195                 200                 205

Leu Thr Val Gly Trp Gly Asp Glu Val Tyr Pro Ser Gln Glu Phe Leu
    210                 215                 220

Asp Val Lys Glu Ala Gly Lys Pro Ser Lys Leu Leu Ala Lys Val Thr
225                 230                 235                 240
```

```
Val Asn Gly Glu Glu Ser Ala Ala Phe His Ser Gln Lys Val Gly Ala
                245                 250                 255


Ala Ile Gln Arg Ile Asp Asp Trp Trp Asp Glu Asn Ala Asp Lys Pro
            260                 265                 270


Leu Arg Val Asn Glu Tyr Gly Ala Asp Lys Glu Tyr Ala Ile Ala Arg
        275                 280                 285


Arg His Ser Ser Arg His Arg Asp Phe Tyr Ser Leu Ile Ala His Thr
    290                 295                 300


Glu Ser Tyr Val Glu Leu Met Leu Glu Thr Asn Leu Ile Ser Asp Asp
305                 310                 315                 320


Val His Phe Ile Met Ala Val Leu Thr Lys Gly Gly Val Phe Ser Gly
                325                 330                 335


Ala Ser Lys Lys Ser Lys Lys Asp Glu
            340                 345


<210>  1923
<211>  203
<212>  PRT
<213>  Vibrio diazotrophicus strain 60.6F

<400>  1923

Met Glu Ser Arg Tyr Tyr Phe Ser Ile Arg Tyr Ile Pro Glu His Val
1               5                   10                  15


Asp Asn Glu Leu Leu Ala Gly Arg Cys Ile Ser Asn Met His Gly Phe
            20                  25                  30


Leu Ser His Glu Arg Asn Thr Gln Phe Lys Asn Ser Val Gly Ile Cys
        35                  40                  45


Phe Pro Leu Trp Asn Glu Gln Thr Val Gly Asn Val Ile Thr Phe Val
    50                  55                  60
```

```
Ser Thr Asn Glu Ser Ile Leu Thr Gly Leu Ser Tyr Gln Pro Tyr Phe
65                  70                  75                  80

Ser Thr Met Met Asn Glu Asn Leu Phe Glu Ile Ser Gly Ile Arg Ile
                85                  90                  95

Val Pro Asp Asp Ala Lys Asp Val Arg Phe Val Phe Asn Lys Thr Ile
            100                 105                 110

Gln Lys Ile Phe Asn Gly Ser Lys Lys Arg Arg Ile Lys Arg Ala Met
        115                 120                 125

Lys Arg Ala Glu Glu Phe Gly His Thr Phe Thr Pro Ile Ser Val Glu
    130                 135                 140

Val Arg Glu Phe Glu Leu Phe His Glu Ile Pro Ile Asn Ser Lys Ser
145                 150                 155                 160

Ser Gly Arg Asp Phe Val Leu His Ile Gln Arg Gln Asn Pro Val Glu
                165                 170                 175

Ala Glu Ile Gly Gln Gly Phe Asn Gly Tyr Gly Phe Ala Ser Asn Gln
            180                 185                 190

Leu Trp Arg Arg Thr Val Pro Leu Ile Leu Phe
        195                 200
```

<210> 1924
<211> 624
<212> DNA
<213> Vibrio sp. 16

<400> 1924
atgttcgatc aaaccaagaa gtcatctcac gtgcacaaca tctgtaagtt catgagcttg 60

aagaatgatg cagttgttcg cactctgtcc attttagagt ttgatttctg ttttcacctc 120

gaatacaacg cagacatcaa aacctttacg tcccaacctt ttggtttcca ctatcaattc 180

aataatcgaa agtgccgata tacgcccgat tttttggcga cagatcacga tgaacattca 240

actttcttcg aagtaaaaca ctctagccag attctcaaac ctgatttcag ggaacgattt 300

aaagagaaac aaagagttgc gttcaatgag tttaacagac gcttggtttt agttactgag 360

aagcaaatta gaatgggacc aactttagat aacttcaagc tactacatcg ttactccgga 420

ttgcggaccg tgactgagtt tcaaaagtta gtgttggcgt ttattcaacg taaacaaatg 480

gtgaagttac aagaggtgtc tttgtatttc ggtttatcgg agcaggacac acttatctct 540

actctacctt ggatctcttc ggggcaagtt aaaacaaacc tcaataatat tggctttggc 600

ctcgaaactt acgtttggtg ttaa 624

<210> 1925
<211> 1866
<212> DNA
<213> Vibrio sp. 16

<400> 1925
atgccgtcgg actccaataa catatttggg ttctttgatg agtttgaagc ttcagaggga 60

gagtcgcagc agcttccaat agagttaatt caagaaccta ttgaaatctt ttccactatt 120

gatactcaat caccaaaggt acagcaagaa gttatccgcc gtatcaaaat catcgatttc 180

gtagagaggc gcctaaaggg gggatggacc gagaaaaact tgaatcctat cttaagtctc 240

attgaaccag aattaaagct tactcccccg agttggcgaa ctttagcaac ttggaaaaaa 300

tcttactttg aagcgggtaa agacccatgt gcacttattc cgaagcatac gtttaagggc 360

aaccgccaaa aagaaatgga ttcgcaatcc ttgattgatg aggcagttca gaacgtatac 420

ctgacacgtg aacgacttag cgtggcagaa gcataccgat actataagag tcgagtgatt 480

caaataaatc gcgggattgt cgaggggaaa atcaaaccaa tttcagatcg ttctttttat 540

aatcgaatac acgacttacc tccatatgag gtcgcgatcg caaggtttgg caaacgatat 600

gcggatcggg agtttcggtc agttggtcaa caggtagccg cgactaaacc aatggagttt 660

gtcgaaattg accatactcc agttccagtg attttgatcg atgatgagtt agagattcct 720

ttaggtcggc cctatctgac gatgctatat gaccgcttca gtaaatgtat cgtaggatgc 780

agtatcaact ttagagagcc tagttttgac tctgtcagaa aggcgctatt gaattcgcta 840

ctagataaga gttgggtaaa gcaaaggtat ccttctattg ataatgaatg gccttgccac 900

ggcaagattg actgtttagt tgtcgataat ggtgctgagt tttggagtaa aagcttggaa 960

gattcgttac ggcctctggt atcagacatc caatacagtc aagccgctaa accttggcga 1020

aagtcaggga tcgaaaagct gtttgatcag atgaacaaag ggttagtgaa cgcactgcct 1080

ggaaaaacgt tcaccaatcc tactcagcta caagattaca acccaaagaa ggatgcggtg 1140

gttagagttt ccgtgtttct tgagctactt cataaatgga ttgtcgatta ttaccatatg 1200

gcacctgatt caagagaacg tgacattcca taccacaagt ggaaccaatc ggaatggact 1260

ccctcttact acagtggtgt tgagaaggag cagttgagag ttgagctagg tttgcttaga 1320

cacagaacca ttggagtagc agggatcagg cttcataatc tccactatca gtcctcagaa 1380

cttattgaat accgtaaata ttgggcgtcc aacaatggca aaaagctgtt tgttaagacc 1440

aaaacagacc cttctgatat cagctctatt catgtttatc tagaatcgga aaagaggtac 1500

ataaaagttc cagcggtaga caacaccgga tatacaaagg ggctgtcgct ttttgaacac 1560

gagcgaatac aaaaagtacg ccggctcaat actaagcagc ttactgatga tgaggcgctt 1620

gcggatacat tcctgtatat gaagaaacgt attcaggaag aaaccgatag attccgcggt 1680

gcaaaaagca ataaggctag cttgcctaaa acgggcaata cttcgaaatt agcaaagttt 1740

aatgatgtcg gatctgaggg accaagctca atcaacgtga ttcctgttac gcacaaatct 1800

gaggttgttt ccgatgcctc agagtactta gatgacgatg attttgaaga tattgaaggg 1860

tattaa 1866

<210> 1926
<211> 1116
<212> DNA
<213> Vibrio sp. 16

<400> 1926
atgacgatga ttttgaagat attgaagggt attaatttga atttaacgcc aaagcagctt 60

gagcagctaa agtcctttga aaccagcttt atcgagtatc ccgcgataac tgaaatctac 120

tctatctttg atcaacttcg tttcaatcac tctttaggtg gtgaaccaga gtctttcttg 180

ttaactggtg aggctggaag tggaaagacg gctttgatca acaactactt atcacgcttt 240

caatcgggtt caacttggga aaaacagcca gtgttaagca ctagagtgcc aagtcgtatc 300

aatgaacaga atacgctgac ccaatttttg gttgatttag attgtaaatc cggaggaaga 360

ggtattcggc gccgtaatga aattgcgctt ggcgaagcgg ttgtaaagca acttaaacgt 420

aaatctgttg agctgattat tgttaatgaa attcaagagc tggttgagtt ttcaaccgca 480

gaacagagac aagttattgc caacacattc aaatatataa gtgaagaagc aagagtctcg 540

tttgtgctag tgggtatgcc ttatgctgat gtgatagcga cagaaccaca gtggaactcg 600

cggctaagct ggaggagaaa gatagattat ttcaaattgt tgaaagcgaa gagtcattcg 660

aatagaacgg tatcttatgg gtttgactta gaacaaaaaa aacattttgc cagatttgtc 720

gcgggtttga gtgcgagaat gggctttgat gaaccgccag tgcttacaaa aaatgaagtg 780

ttatatcctt tgttcgttat gtgtagaggg gagtgccgag cgttgaagca cttcttgaaa 840

gatgcactac ttatgagttt caatgagaac gtcgatacga taaacaaagc gatattgacg 900

cgcacgtttt cgtttaagtt tccctatttg gacaacccat ttgactctcc tgtagagcag 960

cttcgtcttc atcaaattga cgctggctct acttacaacc taaatgccat tacagcagaa 1020

gataagattc tcgcgcctcg ttttacagat gcaattccgt tgagcatgtt attgagcaaa 1080

atacgcttaa agcttagagt ggctttcgtg atttag 1116

<210> 1927
<211> 1212
<212> DNA
<213> Vibrio sp. 16

<400> 1927
gtgaataccg accttcaact ataccctgac gagtcgctag agagcttctt gttacgctta 60

tcgcaagaac aaggctacga gcgattttct cattttgctg aagacatctg gtttgacacg 120

atggatcagc atgaagcgat ttctggtgct ttccctttag agctcaatcg agtcaacatc 180

taccacgctc aaacaacaag ccaaatgcga gcgcgggttc ttattcacct tgagaaccaa 240

ttcaagctca ataactttgg tgtactgcgt ctcgcgctat cacattcgaa agctcaattc 300

tctccgcaat acaaagcggt acatagattc gggtctgact acccgtatgc ttttcttcgc 360

aaacgcttca cgccaatttg ccctctgtgt attagcgaag ctccctacat tcgccagcag 420

tggcaatata tctctcacca agcttgtgaa catcatggct gtaaactggt tcatcactgc 480

cctgagtgta tatcgagact agaatatcaa ggtaccgaga gcattagcca gtgtgaatgt 540

ggttatgaac tccgaaactc gccagtagag gacgcgtcag aggctgaggt attggtagct 600

cgatggttat caggaagcga ttcaaaaccc ttgggattat tgaaagcagg aatgacttta 660

tctgaacgct acggtttttt aatttggtat gtaagtcgct atagtgacgt cgatgatatt 720

agctttgaag cctttattga ctattgcttc gcatggccaa catcactcaa agaggactta 780

gatgcattgg tgctaaaagc tgatgtagtt cgagtgagag attggcgaaa ggctttcttt 840

tcagaggcgt ttggcagctt gcttaaagac tgtcgtcatt tgccgagccg cgagttgagt 900

aaaaacttag tgttgaatga agtgttgagg tatctctcag ggcttgtttc ggataaccca 960

gcctcatcta agggaaatgt tggtgatgtg ctgctaagcc cgttagaagc ctctacattg 1020

ctttcttgca caacagatga agtatatcgg ctctatgagt ttggtgaaat caaagctgct 1080

attcggccgc gtatgcatac taaaatagcc agccatgaat cggctttcac gctaagaagc 1140

gtggtagaaa ctaagctaac tcgaatgagc tcagaaatgg atgggctatg cgtatatttg 1200

ccggagtggt aa 1212

<210> 1928
<211> 2088
<212> DNA
<213> Vibrio sp. 16

<400> 1928
atgacgaaac ttattgagtt gctctcaatt gaagatgcga ataaaaagca ggcaatgttg 60

aaaaaatggt tcatgcctta caccgcagac attgaagtcg acgggcttga ggagacggca 120

ttaacggtac tagttaacct aagctctcat cataaaggcg ataaatgcaa tgactggtta 180

gacaaagtcc gtgcgaagca gcatttgagc gattcagaaa acatagactc atcaataggg 240

gaattgaaat ggtttcactc gcacaatttg aaatatccag actgccgcgt agcagagcag 300

aggctgattg ctaaaccttt gcaaaccgat gaagtgttta tttcgggaag aagtcttgaa 360

ccgagtttag gctgggcgca caactcagca tattaccgac acgtattgtg gttattgaat 420

ccttttcgtt ggcaatccaa atcaaccaat gttctcacgc tagtgcgaga aggacaccac 480

atttggttag cgttattgca agactttggg ttagaggtca aaactctcgt cgctttgcaa 540

aaggcgatta acgcacaagt tccagattca acctttccaa catcagtcag ttcgtatagc 600

aagcagttac gatttccatg ggagaacgac tatgtatcca ttaccccggt tgtgaaccac 660

tcaatacagc gagagctcga ggttcgagct cgggataagg agagcaaact gagttttgtt 720

acctcatcac tgcccaattc cgcaagtatt ggaagccttt gcggaagcct tggtgggaac 780

atgaaaataa tgaactatcc acttggggta aagtcgacac taaatgggac gttagcgaca 840

aaccgcaata aaaccggtcg ctactttgat gattatcaag ttacaaatca tcaagtctgc 900

ttggtgctca gcaggttgac tggcagtgaa ccactcaaaa ctaacaagca aagagataaa 960

gcacgcaatg tccaaagtaa gatcttgaga aagcagatag cgctatggat gttgccatta 1020

attgaattgc gcgatcgagc taatttaaat ccaagtgagc agtttttaaa tagcctagat 1080

tctttagcga gtgcattttt gacgttaccc gagtcagagc ttaaatcact cgcaacccaa 1140

ttcaatcacc gacttcacta tgtgctgcag gaaaataaat ttactcataa gtttgcttat 1200

caccccaaac tattacaagt cattaagtgt cagatagttt gggtactgaa tcaattgagt 1260

aagccgagca ctagtgatga aactactcaa agcgaacaat acatctatct gacttccatg 1320

cgagttcagg atgcggtggc gatgagtagt ccatacttga gtggagcacc gtcacttacc 1380

gcccttgggg gctttatgca ccgttatcag agagagttta gtcagttaat cggtagcgac 1440

tcatcattgg aattctcaag cttttctttt ttcgttcgaa gtgaggatat acagtccaca 1500

gccaaactga ctgagccaaa ttcagtagca actaaaagaa cagtttctaa tgctaaacgt 1560

cctacgattc gttctgagag gttagccgat ttagaaatag atatggtgat tcgagtcaag 1620

ggtcacgagc gtttagcaga ccacttcagc gagttaaaag cgtcgttacc aatggctttt 1680

gcgggaggat acttattcca gcctccgatt tcatctgagg ttaactggct aaacattttt 1740

ggcagccagt cagaagtgtt ccacgcgatt aaaggagcac caacatacgg gcgttggtta 1800

tacccaagcg agttgcagcc cagtagcttt gacgagcttg aattgcagat ttcaagcgat 1860

gccgacattc atccagtttc tctcggctat catttgctgg aaaaaccgac atttcgtgag 1920

aactcgataa cagagtgtca tgcttatgca gagaacgcga taggggttgc aaaacgcgtt 1980

aatccgattg aagttcgatt tagtggtcga ggtcactatt ttgagcatgc gttttggtcg 2040

ctagaataca gctacgcaac tattcttatg aaaaactata ggaattag 2088

<210> 1929
<211> 1038
<212> DNA
<213> Vibrio sp. 16

<400> 1929
atggatttgt gtagccagct gaattatgtt cgttcacttt ccccaggtaa ggcgtatttt 60

tactacttat caaaagatgg tgagatgtgt cctgttggta ttgatagaac aaggttgcga 120

gcaccaaaag caggctattc cgaagcttac aaaggcaaca atttttttgc aaaaaatgtt 180

gctccccaag acttggctta cgctaatcct caatacattg aagagtgtta tgttactcca 240

ggggttgatg atatttattg tgcattttct cttcgtatcc gtgctaattc tttgttccct 300

gaagtatgta ataacgatga tgtacgcaat gcgttagtgt ccttgagttc ggtatataag 360

gagcttaatg gttaccaaga gctggcgcac cgttatgcca aaaatattct atcaggagca 420

tggttgtgga gaaataaaga gtgtcgagca ttatcaattg aagtcacgac tagcgaagaa 480

gagagaataa ttgttaatga tgcactgaga ctatcttggt atggacactg ggatgaagag 540

tcaacactaa gccttgagct tttgatggct tatctaagcc gagcgctatc agaccgttct 600

gaatctttct acatggatat tcgagcgaag ttatctgttg gttggggaga tgaggtttac 660

ccgagccaag agtttttaga taccaaagag gatggtattc caaccaagca attggcaacc 720

gtgaaactga gtaatggcaa agaaacggtg gcgtttcatg gtcagaaagt gggtgctgcg 780

ctgcaatcta tagatgactg gtggcatgaa gacccagata aagttttaag agtgaacgaa 840

tatggtgctg atcgagagta tgtgatcgca agaaggcatg tggcattaga aaatgacttt 900

tatcacctaa tcaaaaatac cgagagttgg gtgaaggaaa tgaacaaaac aaaagtgatt 960

ccaaatgatg ttcatttcat tatgtctgtc ttggttaaag gcggtctctt taatggggca 1020

agcggtaagg ccaagtga 1038

<210> 1930
<211> 603
<212> DNA
<213> Vibrio sp. 16

<400> 1930
atgaacaaac gctatttctt ctatatacgc tatcttccgg agcaggttga ctgtggactt 60

cttgctgggc gctgtattag ccaaatgcac aagtttatgg tcaataataa acaggctatg 120

aatcaaatag gagtgagttt tccgtgttgg tgtgcggatt cagttggtaa tagcatcgcc 180

tttatttctg aagataaaga ccttttgata gggctaacat ttcaacctta tttttctgtc 240

atgaaggaag aagaactgtt tgagttgtct gatgtacatc aagttccaga aggcgcaact 300

gaattaagat tcgtccggaa tcagacgata ggcaaaagct ttataggctc taaaaagcga 360

agaatgaaac gcagcattgc tagagcagaa ctaacggatt cacaatcatt acccgttgca 420

gatgaagatc gcgaggttga acatttccat cgaattccaa tttctagtgg ttcatctagg 480

caggacttca tcttacatgt tcaaaaagaa catgttggcg agagcgtccc tacaaacttt 540

aatagttatg ggttcgccac caaccaagat aaacgaggaa ccgtacctga tattcacatt 600

taa 603

<210> 1931
<211> 28
<212> DNA
<213> Vibrio sp. 16

<400> 1931
gtgacctgcc gcataggcag ctaagaat 28

<210> 1932
<211> 510
<212> DNA
<213> Vibrio sp. 16

<220>
<221> misc_feature
<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1932
tgatgcttgc aagataagtc ttcataacgc gaaccaacta tcaacgtgtt aaaatactat 60

ttgcagcata agttcgcata atattgcgcc aaaactctgc aaattttagc aactacccaa 120

atccaacgtt gtaaaattac cacctcctgt gagccctctg aaatggatgg tgatcacatt 180

ggatggggag tatgtatgaa acacactttt ggacacaaaa gcgttagagt tggcgctcta 240

tggcatacgc nnnnnnnnnn ttgatgtctg cgttgtattc gaggtgaaaa cagaaatcaa 300

actctaaaat ggacagagtg cgaacaactg catcattctt caagctcatg aacttacaga 360

tgttgtgcac gtgagatgac ttcttggttt gatcgaacat agcacaatca cttttgttgt 420

aaacctacaa caaaaaaata gactatgaaa acttatggtg caaatatgaa gaaagcctgc 480

aatttatgcg aacatatatt gcaggattca 510

<210> 1933
<211> 207
<212> PRT
<213> Vibrio sp. 16

<400> 1933

Met Phe Asp Gln Thr Lys Lys Ser Ser His Val His Asn Ile Cys Lys
1 5 10 15

Phe Met Ser Leu Lys Asn Asp Ala Val Val Arg Thr Leu Ser Ile Leu
20 25 30

Glu Phe Asp Phe Cys Phe His Leu Glu Tyr Asn Ala Asp Ile Lys Thr
35 40 45

Phe Thr Ser Gln Pro Phe Gly Phe His Tyr Gln Phe Asn Asn Arg Lys
50 55 60

Cys Arg Tyr Thr Pro Asp Phe Leu Ala Thr Asp His Asp Glu His Ser
65 70 75 80

Thr Phe Phe Glu Val Lys His Ser Ser Gln Ile Leu Lys Pro Asp Phe
85 90 95

```
Arg Glu Arg Phe Lys Glu Lys Gln Arg Val Ala Phe Asn Glu Phe Asn
            100                 105                 110

Arg Arg Leu Val Leu Val Thr Glu Lys Gln Ile Arg Met Gly Pro Thr
        115                 120                 125

Leu Asp Asn Phe Lys Leu Leu His Arg Tyr Ser Gly Leu Arg Thr Val
    130                 135                 140

Thr Glu Phe Gln Lys Leu Val Leu Ala Phe Ile Gln Arg Lys Gln Met
145                 150                 155                 160

Val Lys Leu Gln Glu Val Ser Leu Tyr Phe Gly Leu Ser Glu Gln Asp
                165                 170                 175

Thr Leu Ile Ser Thr Leu Pro Trp Ile Ser Ser Gly Gln Val Lys Thr
            180                 185                 190

Asn Leu Asn Asn Ile Gly Phe Gly Leu Glu Thr Tyr Val Trp Cys
        195                 200                 205
```

<210> 1934
<211> 621
<212> PRT
<213> Vibrio sp. 16

<400> 1934

```
Met Pro Ser Asp Ser Asn Asn Ile Phe Gly Phe Phe Asp Glu Phe Glu
1               5                   10                  15

Ala Ser Glu Gly Glu Ser Gln Gln Leu Pro Ile Glu Leu Ile Gln Glu
            20                  25                  30

Pro Ile Glu Ile Phe Ser Thr Ile Asp Thr Gln Ser Pro Lys Val Gln
        35                  40                  45

Gln Glu Val Ile Arg Arg Ile Lys Ile Ile Asp Phe Val Glu Arg Arg
```

```
    50                  55                  60

Leu Lys Gly Gly Trp Thr Glu Lys Asn Leu Asn Pro Ile Leu Ser Leu
65                  70                  75                  80

Ile Glu Pro Glu Leu Lys Leu Thr Pro Pro Ser Trp Arg Thr Leu Ala
                85                  90                  95

Thr Trp Lys Lys Ser Tyr Phe Glu Ala Gly Lys Asp Pro Cys Ala Leu
            100                 105                 110

Ile Pro Lys His Thr Phe Lys Gly Asn Arg Gln Lys Glu Met Asp Ser
        115                 120                 125

Gln Ser Leu Ile Asp Glu Ala Val Gln Asn Val Tyr Leu Thr Arg Glu
    130                 135                 140

Arg Leu Ser Val Ala Glu Ala Tyr Arg Tyr Tyr Lys Ser Arg Val Ile
145                 150                 155                 160

Gln Ile Asn Arg Gly Ile Val Glu Gly Lys Ile Lys Pro Ile Ser Asp
                165                 170                 175

Arg Ser Phe Tyr Asn Arg Ile His Asp Leu Pro Pro Tyr Glu Val Ala
            180                 185                 190

Ile Ala Arg Phe Gly Lys Arg Tyr Ala Asp Arg Glu Phe Arg Ser Val
        195                 200                 205

Gly Gln Gln Val Ala Ala Thr Lys Pro Met Glu Phe Val Glu Ile Asp
    210                 215                 220

His Thr Pro Val Pro Val Ile Leu Ile Asp Asp Glu Leu Glu Ile Pro
225                 230                 235                 240

Leu Gly Arg Pro Tyr Leu Thr Met Leu Tyr Asp Arg Phe Ser Lys Cys
                245                 250                 255
```

```
Ile Val Gly Cys Ser Ile Asn Phe Arg Glu Pro Ser Phe Asp Ser Val
            260                 265                 270

Arg Lys Ala Leu Leu Asn Ser Leu Leu Asp Lys Ser Trp Val Lys Gln
        275                 280                 285

Arg Tyr Pro Ser Ile Asp Asn Glu Trp Pro Cys His Gly Lys Ile Asp
    290                 295                 300

Cys Leu Val Val Asp Asn Gly Ala Glu Phe Trp Ser Lys Ser Leu Glu
305                 310                 315                 320

Asp Ser Leu Arg Pro Leu Val Ser Asp Ile Gln Tyr Ser Gln Ala Ala
                325                 330                 335

Lys Pro Trp Arg Lys Ser Gly Ile Glu Lys Leu Phe Asp Gln Met Asn
            340                 345                 350

Lys Gly Leu Val Asn Ala Leu Pro Gly Lys Thr Phe Thr Asn Pro Thr
        355                 360                 365

Gln Leu Gln Asp Tyr Asn Pro Lys Lys Asp Ala Val Val Arg Val Ser
    370                 375                 380

Val Phe Leu Glu Leu Leu His Lys Trp Ile Val Asp Tyr Tyr His Met
385                 390                 395                 400

Ala Pro Asp Ser Arg Glu Arg Asp Ile Pro Tyr His Lys Trp Asn Gln
                405                 410                 415

Ser Glu Trp Thr Pro Ser Tyr Tyr Ser Gly Val Glu Lys Glu Gln Leu
            420                 425                 430

Arg Val Glu Leu Gly Leu Leu Arg His Arg Thr Ile Gly Val Ala Gly
        435                 440                 445

Ile Arg Leu His Asn Leu His Tyr Gln Ser Ser Glu Leu Ile Glu Tyr
```

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    450                 455                 460

Arg Lys Tyr Trp Ala Ser Asn Asn Gly Lys Lys Leu Phe Val Lys Thr
465                 470                 475                 480

Lys Thr Asp Pro Ser Asp Ile Ser Ser Ile His Val Tyr Leu Glu Ser
                485                 490                 495

Glu Lys Arg Tyr Ile Lys Val Pro Ala Val Asp Asn Thr Gly Tyr Thr
            500                 505                 510

Lys Gly Leu Ser Leu Phe Glu His Glu Arg Ile Gln Lys Val Arg Arg
        515                 520                 525

Leu Asn Thr Lys Gln Leu Thr Asp Asp Glu Ala Leu Ala Asp Thr Phe
    530                 535                 540

Leu Tyr Met Lys Lys Arg Ile Gln Glu Glu Thr Asp Arg Phe Arg Gly
545                 550                 555                 560

Ala Lys Ser Asn Lys Ala Ser Leu Pro Lys Thr Gly Asn Thr Ser Lys
                565                 570                 575

Leu Ala Lys Phe Asn Asp Val Gly Ser Glu Gly Pro Ser Ser Ile Asn
            580                 585                 590

Val Ile Pro Val Thr His Lys Ser Glu Val Val Ser Asp Ala Ser Glu
        595                 600                 605

Tyr Leu Asp Asp Asp Asp Phe Glu Asp Ile Glu Gly Tyr
    610                 615                 620


<210>  1935
<211>  371
<212>  PRT
<213>  Vibrio sp. 16

<400>  1935
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Met Thr Met Ile Leu Lys Ile Leu Lys Gly Ile Asn Leu Asn Leu Thr
1               5                  10                  15

Pro Lys Gln Leu Glu Gln Leu Lys Ser Phe Glu Thr Ser Phe Ile Glu
            20                  25                  30

Tyr Pro Ala Ile Thr Glu Ile Tyr Ser Ile Phe Asp Gln Leu Arg Phe
        35                  40                  45

Asn His Ser Leu Gly Gly Glu Pro Glu Ser Phe Leu Leu Thr Gly Glu
    50                  55                  60

Ala Gly Ser Gly Lys Thr Ala Leu Ile Asn Asn Tyr Leu Ser Arg Phe
65                  70                  75                  80

Gln Ser Gly Ser Thr Trp Glu Lys Gln Pro Val Leu Ser Thr Arg Val
                85                  90                  95

Pro Ser Arg Ile Asn Glu Gln Asn Thr Leu Thr Gln Phe Leu Val Asp
            100                 105                 110

Leu Asp Cys Lys Ser Gly Gly Arg Gly Ile Arg Arg Arg Asn Glu Ile
        115                 120                 125

Ala Leu Gly Glu Ala Val Val Lys Gln Leu Lys Arg Lys Ser Val Glu
    130                 135                 140

Leu Ile Ile Val Asn Glu Ile Gln Glu Leu Val Glu Phe Ser Thr Ala
145                 150                 155                 160

Glu Gln Arg Gln Val Ile Ala Asn Thr Phe Lys Tyr Ile Ser Glu Glu
                165                 170                 175

Ala Arg Val Ser Phe Val Leu Val Gly Met Pro Tyr Ala Asp Val Ile
            180                 185                 190

Ala Thr Glu Pro Gln Trp Asn Ser Arg Leu Ser Trp Arg Arg Lys Ile
        195                 200                 205
```

```
Asp Tyr Phe Lys Leu Leu Lys Ala Lys Ser His Ser Asn Arg Thr Val
    210                 215                 220

Ser Tyr Gly Phe Asp Leu Glu Gln Lys Lys His Phe Ala Arg Phe Val
225                 230                 235                 240

Ala Gly Leu Ser Ala Arg Met Gly Phe Asp Glu Pro Pro Val Leu Thr
                245                 250                 255

Lys Asn Glu Val Leu Tyr Pro Leu Phe Val Met Cys Arg Gly Glu Cys
            260                 265                 270

Arg Ala Leu Lys His Phe Leu Lys Asp Ala Leu Leu Met Ser Phe Asn
        275                 280                 285

Glu Asn Val Asp Thr Ile Asn Lys Ala Ile Leu Thr Arg Thr Phe Ser
    290                 295                 300

Phe Lys Phe Pro Tyr Leu Asp Asn Pro Phe Asp Ser Pro Val Glu Gln
305                 310                 315                 320

Leu Arg Leu His Gln Ile Asp Ala Gly Ser Thr Tyr Asn Leu Asn Ala
                325                 330                 335

Ile Thr Ala Glu Asp Lys Ile Leu Ala Pro Arg Phe Thr Asp Ala Ile
            340                 345                 350

Pro Leu Ser Met Leu Leu Ser Lys Ile Arg Leu Lys Leu Arg Val Ala
        355                 360                 365

Phe Val Ile
    370
```

<210> 1936
<211> 403
<212> PRT
<213> Vibrio sp. 16

<400> 1936

```
Met Asn Thr Asp Leu Gln Leu Tyr Pro Asp Glu Ser Leu Glu Ser Phe
1               5                  10                  15


Leu Leu Arg Leu Ser Gln Glu Gln Gly Tyr Glu Arg Phe Ser His Phe
            20                  25                  30


Ala Glu Asp Ile Trp Phe Asp Thr Met Asp Gln His Glu Ala Ile Ser
        35                  40                  45


Gly Ala Phe Pro Leu Glu Leu Asn Arg Val Asn Ile Tyr His Ala Gln
    50                  55                  60


Thr Thr Ser Gln Met Arg Ala Arg Val Leu Ile His Leu Glu Asn Gln
65                  70                  75                  80


Phe Lys Leu Asn Asn Phe Gly Val Leu Arg Leu Ala Leu Ser His Ser
                85                  90                  95


Lys Ala Gln Phe Ser Pro Gln Tyr Lys Ala Val His Arg Phe Gly Ser
            100                 105                 110


Asp Tyr Pro Tyr Ala Phe Leu Arg Lys Arg Phe Thr Pro Ile Cys Pro
        115                 120                 125


Leu Cys Ile Ser Glu Ala Pro Tyr Ile Arg Gln Gln Trp Gln Tyr Ile
    130                 135                 140


Ser His Gln Ala Cys Glu His His Gly Cys Lys Leu Val His His Cys
145                 150                 155                 160


Pro Glu Cys Ile Ser Arg Leu Glu Tyr Gln Gly Thr Glu Ser Ile Ser
                165                 170                 175


Gln Cys Glu Cys Gly Tyr Glu Leu Arg Asn Ser Pro Val Glu Asp Ala
            180                 185                 190
```

```
Ser Glu Ala Glu Val Leu Val Ala Arg Trp Leu Ser Gly Ser Asp Ser
        195                 200                 205

Lys Pro Leu Gly Leu Leu Lys Ala Gly Met Thr Leu Ser Glu Arg Tyr
    210                 215                 220

Gly Phe Leu Ile Trp Tyr Val Ser Arg Tyr Ser Asp Val Asp Asp Ile
225                 230                 235                 240

Ser Phe Glu Ala Phe Ile Asp Tyr Cys Phe Ala Trp Pro Thr Ser Leu
                245                 250                 255

Lys Glu Asp Leu Asp Ala Leu Val Leu Lys Ala Asp Val Val Arg Val
            260                 265                 270

Arg Asp Trp Arg Lys Ala Phe Phe Ser Glu Ala Phe Gly Ser Leu Leu
        275                 280                 285

Lys Asp Cys Arg His Leu Pro Ser Arg Glu Leu Ser Lys Asn Leu Val
    290                 295                 300

Leu Asn Glu Val Leu Arg Tyr Leu Ser Gly Leu Val Ser Asp Asn Pro
305                 310                 315                 320

Ala Ser Ser Lys Gly Asn Val Gly Asp Val Leu Leu Ser Pro Leu Glu
                325                 330                 335

Ala Ser Thr Leu Leu Ser Cys Thr Thr Asp Glu Val Tyr Arg Leu Tyr
            340                 345                 350

Glu Phe Gly Glu Ile Lys Ala Ala Ile Arg Pro Arg Met His Thr Lys
        355                 360                 365

Ile Ala Ser His Glu Ser Ala Phe Thr Leu Arg Ser Val Val Glu Thr
    370                 375                 380

Lys Leu Thr Arg Met Ser Ser Glu Met Asp Gly Leu Cys Val Tyr Leu
```

385 390 395 400

Pro Glu Trp

<210> 1937
<211> 695
<212> PRT
<213> Vibrio sp. 16

<400> 1937

Met Thr Lys Leu Ile Glu Leu Leu Ser Ile Glu Asp Ala Asn Lys Lys
1 5 10 15

Gln Ala Met Leu Lys Lys Trp Phe Met Pro Tyr Thr Ala Asp Ile Glu
20 25 30

Val Asp Gly Leu Glu Glu Thr Ala Leu Thr Val Leu Val Asn Leu Ser
35 40 45

Ser His His Lys Gly Asp Lys Cys Asn Asp Trp Leu Asp Lys Val Arg
50 55 60

Ala Lys Gln His Leu Ser Asp Ser Glu Asn Ile Asp Ser Ser Ile Gly
65 70 75 80

Glu Leu Lys Trp Phe His Ser His Asn Leu Lys Tyr Pro Asp Cys Arg
85 90 95

Val Ala Glu Gln Arg Leu Ile Ala Lys Pro Leu Gln Thr Asp Glu Val
100 105 110

Phe Ile Ser Gly Arg Ser Leu Glu Pro Ser Leu Gly Trp Ala His Asn
115 120 125

Ser Ala Tyr Tyr Arg His Val Leu Trp Leu Leu Asn Pro Phe Arg Trp
130 135 140

```
Gln Ser Lys Ser Thr Asn Val Leu Thr Leu Val Arg Glu Gly His His
145                 150                 155                 160


Ile Trp Leu Ala Leu Leu Gln Asp Phe Gly Leu Glu Val Lys Thr Leu
                165                 170                 175


Val Ala Leu Gln Lys Ala Ile Asn Ala Gln Val Pro Asp Ser Thr Phe
            180                 185                 190


Pro Thr Ser Val Ser Ser Tyr Ser Lys Gln Leu Arg Phe Pro Trp Glu
        195                 200                 205


Asn Asp Tyr Val Ser Ile Thr Pro Val Val Asn His Ser Ile Gln Arg
    210                 215                 220


Glu Leu Glu Val Arg Ala Arg Asp Lys Glu Ser Lys Leu Ser Phe Val
225                 230                 235                 240


Thr Ser Ser Leu Pro Asn Ser Ala Ser Ile Gly Ser Leu Cys Gly Ser
                245                 250                 255


Leu Gly Gly Asn Met Lys Ile Met Asn Tyr Pro Leu Gly Val Lys Ser
            260                 265                 270


Thr Leu Asn Gly Thr Leu Ala Thr Asn Arg Asn Lys Thr Gly Arg Tyr
        275                 280                 285


Phe Asp Asp Tyr Gln Val Thr Asn His Gln Val Cys Leu Val Leu Ser
    290                 295                 300


Arg Leu Thr Gly Ser Glu Pro Leu Lys Thr Asn Lys Gln Arg Asp Lys
305                 310                 315                 320


Ala Arg Asn Val Gln Ser Lys Ile Leu Arg Lys Gln Ile Ala Leu Trp
                325                 330                 335


Met Leu Pro Leu Ile Glu Leu Arg Asp Arg Ala Asn Leu Asn Pro Ser
            340                 345                 350
```

```
Glu Gln Phe Leu Asn Ser Leu Asp Ser Leu Ala Ser Ala Phe Leu Thr
        355                 360                 365

Leu Pro Glu Ser Glu Leu Lys Ser Leu Ala Thr Gln Phe Asn His Arg
    370                 375                 380

Leu His Tyr Val Leu Gln Glu Asn Lys Phe Thr His Lys Phe Ala Tyr
385                 390                 395                 400

His Pro Lys Leu Leu Gln Val Ile Lys Cys Gln Ile Val Trp Val Leu
                405                 410                 415

Asn Gln Leu Ser Lys Pro Ser Thr Ser Asp Glu Thr Thr Gln Ser Glu
            420                 425                 430

Gln Tyr Ile Tyr Leu Thr Ser Met Arg Val Gln Asp Ala Val Ala Met
        435                 440                 445

Ser Ser Pro Tyr Leu Ser Gly Ala Pro Ser Leu Thr Ala Leu Trp Gly
    450                 455                 460

Phe Met His Arg Tyr Gln Arg Glu Phe Ser Gln Leu Ile Gly Ser Asp
465                 470                 475                 480

Ser Ser Leu Glu Phe Ser Ser Phe Ser Phe Phe Val Arg Ser Glu Asp
                485                 490                 495

Ile Gln Ser Thr Ala Lys Leu Thr Glu Pro Asn Ser Val Ala Thr Lys
            500                 505                 510

Arg Thr Val Ser Asn Ala Lys Arg Pro Thr Ile Arg Ser Glu Arg Leu
        515                 520                 525

Ala Asp Leu Glu Ile Asp Met Val Ile Arg Val Lys Gly His Glu Arg
    530                 535                 540
```

```
Leu Ala Asp His Phe Ser Glu Leu Lys Ala Ser Leu Pro Met Ala Phe
545                 550                 555                 560


Ala Gly Gly Tyr Leu Phe Gln Pro Pro Ile Ser Ser Glu Val Asn Trp
                565                 570                 575


Leu Asn Ile Phe Gly Ser Gln Ser Glu Val Phe His Ala Ile Lys Gly
            580                 585                 590


Ala Pro Thr Tyr Gly Arg Trp Leu Tyr Pro Ser Glu Leu Gln Pro Ser
        595                 600                 605


Ser Phe Asp Glu Leu Glu Leu Gln Ile Ser Ser Asp Ala Asp Ile His
    610                 615                 620


Pro Val Ser Leu Gly Tyr His Leu Leu Glu Lys Pro Thr Phe Arg Glu
625                 630                 635                 640


Asn Ser Ile Thr Glu Cys His Ala Tyr Ala Glu Asn Ala Ile Gly Val
                645                 650                 655


Ala Lys Arg Val Asn Pro Ile Glu Val Arg Phe Ser Gly Arg Gly His
            660                 665                 670


Tyr Phe Glu His Ala Phe Trp Ser Leu Glu Tyr Ser Tyr Ala Thr Ile
        675                 680                 685


Leu Met Lys Asn Tyr Arg Asn
    690                 695


<210>  1938
<211>  345
<212>  PRT
<213>  Vibrio sp. 16

<400>  1938

Met Asp Leu Cys Ser Gln Leu Asn Tyr Val Arg Ser Leu Ser Pro Gly
1               5                   10                  15
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Lys Ala Tyr Phe Tyr Tyr Leu Ser Lys Asp Gly Glu Met Cys Pro Val
            20                  25                  30

Gly Ile Asp Arg Thr Arg Leu Arg Ala Pro Lys Ala Gly Tyr Ser Glu
        35                  40                  45

Ala Tyr Lys Gly Asn Asn Phe Phe Ala Lys Asn Val Ala Pro Gln Asp
    50                  55                  60

Leu Ala Tyr Ala Asn Pro Gln Tyr Ile Glu Glu Cys Tyr Val Thr Pro
65                  70                  75                  80

Gly Val Asp Asp Ile Tyr Cys Ala Phe Ser Leu Arg Ile Arg Ala Asn
                85                  90                  95

Ser Leu Phe Pro Glu Val Cys Asn Asn Asp Asp Val Arg Asn Ala Leu
            100                 105                 110

Val Ser Leu Ser Ser Val Tyr Lys Glu Leu Asn Gly Tyr Gln Glu Leu
        115                 120                 125

Ala His Arg Tyr Ala Lys Asn Ile Leu Ser Gly Ala Trp Leu Trp Arg
    130                 135                 140

Asn Lys Glu Cys Arg Ala Leu Ser Ile Glu Val Thr Thr Ser Glu Glu
145                 150                 155                 160

Glu Arg Ile Ile Val Asn Asp Ala Leu Arg Leu Ser Trp Tyr Gly His
                165                 170                 175

Trp Asp Glu Glu Ser Thr Leu Ser Leu Glu Leu Leu Met Ala Tyr Leu
            180                 185                 190

Ser Arg Ala Leu Ser Asp Arg Ser Glu Ser Phe Tyr Met Asp Ile Arg
        195                 200                 205

Ala Lys Leu Ser Val Gly Trp Gly Asp Glu Val Tyr Pro Ser Gln Glu
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    210                 215                 220

Phe Leu Asp Thr Lys Glu Asp Gly Ile Pro Thr Lys Gln Leu Ala Thr
225                 230                 235                 240

Val Lys Leu Ser Asn Gly Lys Glu Thr Val Ala Phe His Gly Gln Lys
                245                 250                 255

Val Gly Ala Ala Leu Gln Ser Ile Asp Asp Trp Trp His Glu Asp Pro
            260                 265                 270

Asp Lys Val Leu Arg Val Asn Glu Tyr Gly Ala Asp Arg Glu Tyr Val
        275                 280                 285

Ile Ala Arg Arg His Val Ala Leu Glu Asn Asp Phe Tyr His Leu Ile
    290                 295                 300

Lys Asn Thr Glu Ser Trp Val Lys Glu Met Asn Lys Thr Lys Val Ile
305                 310                 315                 320

Pro Asn Asp Val His Phe Ile Met Ser Val Leu Val Lys Gly Gly Leu
                325                 330                 335

Phe Asn Gly Ala Ser Gly Lys Ala Lys
            340                 345


<210>  1939
<211>  200
<212>  PRT
<213>  Vibrio sp. 16

<400>  1939

Met Asn Lys Arg Tyr Phe Phe Tyr Ile Arg Tyr Leu Pro Glu Gln Val
1               5                   10                  15

Asp Cys Gly Leu Leu Ala Gly Arg Cys Ile Ser Gln Met His Lys Phe
            20                  25                  30
```

```
Met Val Asn Asn Lys Gln Ala Met Asn Gln Ile Gly Val Ser Phe Pro
        35                  40                  45

Cys Trp Cys Ala Asp Ser Val Gly Asn Ser Ile Ala Phe Ile Ser Glu
    50                  55                  60

Asp Lys Asp Leu Leu Ile Gly Leu Thr Phe Gln Pro Tyr Phe Ser Val
65                  70                  75                  80

Met Lys Glu Glu Glu Leu Phe Glu Leu Ser Asp Val His Gln Val Pro
                85                  90                  95

Glu Gly Ala Thr Glu Leu Arg Phe Val Arg Asn Gln Thr Ile Gly Lys
            100                 105                 110

Ser Phe Ile Gly Ser Lys Lys Arg Arg Met Lys Arg Ser Ile Ala Arg
        115                 120                 125

Ala Glu Leu Thr Asp Ser Gln Ser Leu Pro Val Ala Asp Glu Asp Arg
    130                 135                 140

Glu Val Glu His Phe His Arg Ile Pro Ile Ser Ser Gly Ser Ser Arg
145                 150                 155                 160

Gln Asp Phe Ile Leu His Val Gln Lys Glu His Val Gly Glu Ser Val
                165                 170                 175

Pro Thr Asn Phe Asn Ser Tyr Gly Phe Ala Thr Asn Gln Asp Lys Arg
            180                 185                 190

Gly Thr Val Pro Asp Ile His Ile
        195                 200
```

<210> 1940
<211> 621
<212> DNA
<213> Vibrio sp. F12

<400> 1940

atgaaaaaac ggattcttag aaactcgtca gtaaaaaaca tctcacgctt tgtcagtctc 60

aaaacgaact ctatccatac agtcgaatcc gacttggagt ttgacgcatg tttccacttc 120

gaattttcgc cacagattat aactttcgaa gcgcagccta tcggttttga atattttatc 180

gaaggtaagg tgcataggta tacgcccgac tttttagtca catacaaaga ttcataccaa 240

tcattttatg agataaagcc caagcacatt gcagaaaaag atgagtttaa agaaaagttt 300

agagctcaga aagaacaagc attgggcgac ggtaaagacc tgcacgtatt gacagatgat 360

gatattcaaa tatacccatt gctcgataac ttaaggatca ttcatcgtta tgcttgcgat 420

gagcgtctta actctattca aagaaatata ttgaatctat ttaagaaata tggagagctc 480

aggatagagc aggttgttca atattcttca gttcattctt ctcagttatt accctcactt 540

tatgatttga ttgctaggca gttgttaagt attgatatgc accagcctat tggttggcaa 600

agccctattt ggagctctta g 621

<210> 1941
<211> 1872
<212> DNA
<213> Vibrio sp. F12

<400> 1941
atgccaagtg aaggttctaa gcgatttggc gagctatttc ctagtaccaa cttcgataat 60

gaatcgaaac caaaggaaac gctatcactc cccttatgga aagatgttga tctgacgttt 120

aaggatgtct tttctgttga tgaagaccga agaaatgagg ccatacatag atataacatt 180

ctagaattcc ttatagatca atatggtacc gatttttcaa aaaagcaaat agatgagtca 240

cttactgctt taatagataa atttggttca agtacaccat cagcaatcag catttatagg 300

tactggagag attttaaaaa atcaaatttt cagcttaact ccctaattcc taaagtctct 360

gctggcaata caaaaagaaa tactcccgat gaacttgaac ctttaattca aggtgcaata 420

agaaattact tttctgaaga atgcccgaca gcaacatcgg catacgtaac tcttgaggtt 480

gaaattgatc ggcataacga aatcaatgga actcaatttg aaccgttctc aatacaggca 540

tttaggaaga gactaaggaa gcactctgag tacgaaaaaa tattacttag aaagggaaaa 600

agtgtagctg attctacttt cagaaaagtg ggggaaaggc cagcaacaac acgagtattg 660

gaacgtgtag aagcggacca tactaggctt gatttattta ttattgatga aaaaaacggt 720

ataccgttag ggcgaccctg gctcacagtt ttgtacgata ctcatacaaa gagcattgtg 780

ggtttctatc tagggttcga gccgccgagt tacttatcag tatcactggc acttgtgaat 840

gcaattcttc caaaagaaca cgtcaaagaa ctatacccat cagtagaagg gtgttggcct 900

tgttatggct tacctgagca tttgattgtc gataatggta ctgagtttaa cagtagtgac 960

ttcaaaatag cgtgcaaaga cctgaaaata aaagttaaga aaaacccgac taaaaagcct 1020

tggcttaaag ggtcagtaga gcgatatttt cgaactatca ataatcgatt tctctctaga 1080

atgccgggta agagttttac taatatattt gagagaaaag attacgatcc actcaaaaat 1140

gcagttattg ataattcgct tctgcaagaa atggttcata tctggatagt ggatgtttac 1200

caaaatggaa aaaacgggct agaaaacaat atcccaaatc taagttgggt cgatgctgtt 1260

aattcttcaa ttcccccacg tcctttcaaa gggtctagag atgaattgaa gtttaaccta 1320

ggaaaaaacc gtgaggtatc tctcgataag aatggggtta ggttaggcac aacaatacgc 1380

tactccagtg ttcgtctagc aagatatttt ggacacaaaa cttgtaaaga catgaaaagt 1440

gtacgtgtga ggatcaagta tgatcctagt tgtcttggta gggtttatgt acttgatgaa 1500

acgaaagaag agtttttgc tgtagacgca attgatgctg attacgccta ttctgtttct 1560

gagtggttac acaagacttg ttgtaactat gcaaggcgac atattcgcaa gaactacaac 1620

cacagagatg ttgttaaagc ttggcgtaaa attctcgata ttattgatga agcatttgaa 1680

aaaacaggtc aaaataagaa acaaaactct ctagggacta caactacatc tcgggtgcag 1740

cgtataaaag agcattctaa aagagcaact tccgaagcaa aaacacaaca agttgattat 1800

gtaaaatcag aacttgatga tgaattagat tgggatatcg aggttaatac taatggttgg 1860

tcgataaagt ga 1872

<210> 1942
<211> 981
<212> DNA
<213> Vibrio sp. F12

<400> 1942

atggatagta ataaaacaga aagcacagct gagatggtca aacaaatctt cattcagagc 60

ccgctaataa ccgacattct tgatgatatt tcagattgcc gagaatttag tgacggtatt 120

catgaaccag actgtatgat cgttgttgga gatactgggt cgggaaaaac aacgctgata 180

aataagtatt taaacgaaaa ccctcgttca gagacaagcg aaggttcttt tataccgatt 240

ttatcgactt ctctcccacc caatgcgacc ccgattacgg cttctgagca gttgctatct 300

gacctagggg atccactcgc tttttctaga gggagtgatc ctgtcaaggt cgcccaagaa 360

atgagtgact taatgaagtc atgcggagtt gaattaatta tcatagatga gtttcaacac 420

atgatagatc ggaagaataa gcaaatttta catagtgcag ctgactggtt gaagatgctc 480

attgtacgtt caaaggtacc agtggtgctt tttggcatgc cttactcagt ggtaattttg 540

gaggcaaata gtcaattagc aggacgcttc gagttacagc acactcttga gcctttccgg 600

ttgaatagca aaaataaccg tagtatctat aaaacgtttt taacaatgct tgatgacgca 660

ttacctttg gtgagtgttc tggtcttgct gaacctgaca tgatgaagcg tatctacgca 720

ttttcccaag gtaatctacg tcggatcaga aaactcatta atagagcgag taggcttgca 780

ttacgtgatc attcaaataa agttgcatta aaacactttg ccaaagcagc acccaaagtc 840

agccaggtcg catgtgaaaa tctaaatcct tttgaagtta ctattaagga attgaagatc 900

aatcatcccc ctcaagatat tgggtgggaa aattatctgt ttcaacaaga aaaagacgta 960

tcggcaaaag gtttattttg a 981

<210> 1943
<211> 1185
<212> DNA
<213> Vibrio sp. F12

<400> 1943
atgcttttac aaagacccaa accacacagt aacgaaagct tggagagctt ctttatccga 60

gttgcaaata aaaatggcta tgaagatgtg aaccgttttc ttatggccac gaaacgttac 120

cttcaagata tcgacttctc agggttccag accttcccta ctaacatctg caagatgaat 180

cctgcgtcag ccaaaagcag ttccagtgcc cgtacagcct cactcctgaa actcgctcaa 240

ttaacgttta acgaacctac cgagttactt ggattagcag ttaacagaac aaacttaaaa 300

tattctccat caactagtgc cgtgatccgt ggctcagaag tttttcctcg cagtttactc 360

cggacaaagt ccataccctg ctgcccatta tgcttacaag aaaatggtta cgcttcttac 420

ctttggcatt ttgagggtta cgatcactgc catatccata atgtaccttt actcaacagc 480

tgtcgctgtg gtgctgagta cgactatcga gtgtctggtt taagtggaat gtgcggcagt 540

tgtgaagcac ctatcgccat aaagagtcga gaaaaaagtc ataacgccac actctctgtt 600

gcgaattggc tagcgggcaa tgaatcaaaa gatctgccag atctccctcc aagctaccgt 660

tggggcttag tacattggtg gattcatatc agcaatgatc cgttcgagca cctttcgttc 720

gtccaatttt tctcgaactg gccaagttcg tttcactcca taattgatag tgagatcgag 780

ttcaatctag agcacgccat tgttggaaaa agtgaattac ggataaaaga tctcctaggg 840

cggatattgt ttagttctgt tcggttacca gaacgcaacc tgcagcacaa tatcgttcta 900

ggagagcttc tacggcatac agagatgcat ttatgggata acaacggtct gatcgctaac 960

cttcgaatga acgctctaga gactactgta ttcctcaatt gcagtaagga tgagttagcc 1020

tcaatggtag aacagcgcat cttaaagcca aatcgtaaaa ctaagccaaa catacctctg 1080

gtggttaacg actacttatt ttatttcggc gacatcttct gcctttggtt agccgaattt 1140

caaactgatg aatttaaccg ctctttctat gtgtcgaggt ggtaa 1185

<210> 1944
<211> 1923
<212> DNA
<213> Vibrio sp. F12

<400> 1944
atggagagtc tgaaagagtt actacaatca agaccagatg atttgaacgt agagttaaag 60

cgaacattcc gccctcttac tccacatatc aatatcgatg gaaaggagct tgatgctctc 120

actgtattag tgaacttaac cgacaaaaca gccgttcaaa aagatctact tgatagggtt 180

aaatgcaagc aaaagcttag agacgaaaaa tggtgggctc gctgtctaaa aacggttgaa 240

tacaggcaaa gccacaacct aaaatttcca gacatacgct ctgaaggtgt tattcgcgcg 300

actcctctgg ggcagctacc cgatttttta ctttcatctt ctaaattaga accacacaac 360

tgggcgtaca gccatgattc cagcgatgtt aacaaaagcg ctttattaac caatgaattt 420

cgttggaatg gtgtaatttc atgccttggt gatttgctta aagatgtaga acacccgttg 480

tggcaaaaac tcaatacgct tggctgctac cagaaaacac gtaaggctat cgctaaacaa 540

ttggctcaga tttctcaaac aacgattaac gtcagtctcg ctccaaatta cttaactcaa 600

ctatctttgc ctgataacga cagttcttat atttcactct cgccagtggc ttctcaatcg 660

atgcaaagtc actgttatca agcgctaaaa aatgagtatc gctatacagc gttaacccgt 720

tacagtcgca gtactaacat gggagtatta cctatgacat gtggtggtgc tttgaagatg 780

ttgaaaactg tccctaactt ttcccttaca catcattatc agataaacat tggaaaatct 840

tggttgacct caagtcatat tcaatcgtta aaacagtacc aaacgcatac tcaatattta 900

atgccaaaaa acaagcgagt ggcttaccgc agaacagtca aaaacgagat acaagagatg 960

gttaaggctt ggttggcaac acaagacaac accatggatg ttaatactct tgttcaacat 1020

ttaaacgatg atctatcccg cttcaaatca gctaagtgtt tcgcatacga gccgagcatt 1080

actaaactcc tgcttgggct catcaagcgt gaactaaccg aacctacaac cgtttcaact 1140

aatatttgcc gcagtgaaaa aaaggattca ttctttgtga ttccaaatat aagagtttgt 1200

ggagcaagcg cgttgagttc acctatcacg gtcggtcttc catcactcac tgctttcttg 1260

gggtttactc acgcgtttga acgtaactta aatgagtctt ttcctacgct cgcaattgat 1320

tcgtttgcca tctgtgtcca tcaactacac gttgaaaaac gcggtttaac aaaagaatat 1380

atacaaaaag caaaccacac catatcgcca cccgctacat acgatgactg gcagtctgat 1440

ttggtcttta gtttggtgat taggtttaat cgtagcttga acgttgatga caatactatt 1500

gttcgagctc tgccgaaacg gtttgccaga ggttccgcta aaatagctat tgcagatttc 1560

aaatacatcc ggtcattttc aacgttagaa aagacgattc aatcctttcc tcagaaaacc 1620

ggcaaatggc tatcgatgca tactgaacct atcgaaaaca tgagtgatat tttatcggaa 1680

gttaaagaga accgaaaatt aaccccaagc tgtgttgggt atcattttct tgaagagccg 1740

accgacaaac ctaactctct tcgaggttat aaacatgctt tttctgagtg catcattggt 1800

ctgattgagc caatcacttt tgatcaaaac accgacataa atactatttt gtggcatcac 1860

aagtgctatc aaaactacct ttctgtgcag ccaaggagta cctatcatgg aactaccgac 1920

taa 1923

<210> 1945
<211> 1062
<212> DNA
<213> Vibrio sp. F12

<400> 1945
atggaactac cgactaacct agcctatgaa cgctctattg atccttctga tgtgtgcttt 60

ctagttgtgt ggccagatgg gcgaaagacc cccttaacct acacttctcg tactgtacta 120

ggacaaatgg aaaccgcagc cttagcttat gagccgtcgg ggcggaccaa agagagtgca 180

accgctgaaa aactggctca aggtaaccca catcaagtcg atttttgtca tgctcctttc 240

ggtgcgagcc acattgaatg ctacttttcg gtctcttttt cttctgagct acgcaaacct 300

tacaagtgta attcgtctac ggttaaacac acactaatgc agctaatcaa agcgtatgaa 360

gaaaatattg gttggaatga attggtttct cgatatctag tcaatatatg taatggatca 420

tggctgtgga aaaatactaa aaaagcctat tgctgggata tagagttaac cccttggccc 480

tgggcgggag gtgctgtcaa atttcaaaac ataagggcta actaccttga aagaagtgac 540

tttgagaacc ataaagattg ggaagctatt gctcaaatga ccaaaaatgc tttttctcac 600

tctaatggtt tggccatatt tgaagtaaaa gccaccttgc ggctaccaac caataaacag 660

attttcccga gccaagcatt caccgaaaat gaaagtaaca acactaataa atctaagaaa 720

caaagcaagg gacgaatttt tcaaagcaca acggttgacg gtgaacggag cccaatattg 780

ggtatttata aaactggtgc cgccattgcg accatagacg actggtaccc cgatgcaact 840

gaggcactac gtgtcggccg gtttggggtt cataaagaag atgtcacttg ctaccgtcac 900

ccttctacac aaaaagattt ctttttttata cttcagcaca cagagtctta tattgaagca 960

ctcacgtctt cagataaacc aaatcaagag accataaacg acctgcattt tttggtcgca 1020

aatatcatca agggtggaat gttccagcat aagggaaatt aa 1062

<210> 1946
<211> 600

<212> DNA
<213> Vibrio sp. F12

<400> 1946
atgaagtggt actacaaaac ggtcactttt ctgccagcgc gttgtaacaa tgaatcatta 60

gccgctaagt gccttcggat tcttcatggc tttaactatg agtatgaaac aagaaatatt 120

ggcgtttcat ttcctctttg gagtgactat accatcggaa ataaaatttc ttttgtgagc 180

acaaataaaa tcgaactcga tttgctactc aaacagcact acttcaccca aatgaaagag 240

ctgcactatt ttgatatatc aaatacaaag gttgtccctg acggctgcga gtatgtttca 300

tttaagcgtt gccagtcaat agacaaagca acacctgcag gacaagctag aaaagcgaaa 360

agattaaaaa aacgtgcgga agaaagaggt gaagtgtttg acttatcctc gttcaaacaa 420

cacgaagttg ttgcactcca tcactaccac tcacttgagg aagacagtaa aagtcgtgga 480

ggtagttttc gactcaatat aagaacattc aaagaagctc gcttagacgg agatgcacta 540

tttagcagct atggtcttgc gaatactgga aacaaatctc aacccgtccc cctaatttga 600

<210> 1947
<211> 28
<212> DNA
<213> Vibrio sp. F12

<400> 1947
gtgaactgcc gaataggtag ctgataat 28

<210> 1948
<211> 510
<212> DNA
<213> Vibrio sp. F12

<220>
<221> misc_feature
<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1948
tgttgaaaca accataaagt gataacaacg aatcaattaa aatcataggc ttaatcgaaa 60

aacaaccata tcttgatatc gcataaaaca accataagtt gatattttgg tgaaaaggat 120

attccaacct tcatagttta gtaagaaact ttcttacaga acttacactt atgcctgatt 180

tgtactgcat agcatgtttt caccggcatt gggggcgaac tcgaaagcta aaaaactata 240

gaattcatca nnnnnnnnnn aaaattcgaa gtggaaacat gcgtcaaact ccaagtcgga 300

ttcgactgta tggatagagt tcgttttgag actgacaaag cgtgagatgt tttttactga 360

cgagtttcta agaatccgtt ttttcataat aaacaaccat acctgtagta aactttctca 420

agtgttgtac actttataag caatttcaag gtatggttgt ttttatttca gcgtatggtt 480

tcgtaaaatc aacgtatggt ttttttttaca 510

<210> 1949
<211> 206
<212> PRT
<213> Vibrio sp. F12

<400> 1949

Met Lys Lys Arg Ile Leu Arg Asn Ser Ser Val Lys Asn Ile Ser Arg
1 5 10 15

Phe Val Ser Leu Lys Thr Asn Ser Ile His Thr Val Glu Ser Asp Leu
20 25 30

Glu Phe Asp Ala Cys Phe His Phe Glu Phe Ser Pro Gln Ile Ile Thr
35 40 45

Phe Glu Ala Gln Pro Ile Gly Phe Glu Tyr Phe Ile Glu Gly Lys Val
50 55 60

His Arg Tyr Thr Pro Asp Phe Leu Val Thr Tyr Lys Asp Ser Tyr Gln
65 70 75 80

Ser Phe Tyr Glu Ile Lys Pro Lys His Ile Ala Glu Lys Asp Glu Phe
85 90 95

Lys Glu Lys Phe Arg Ala Gln Lys Glu Gln Ala Leu Gly Asp Gly Lys
100 105 110

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Asp Leu His Val Leu Thr Asp Asp Asp Ile Gln Ile Tyr Pro Leu Leu
        115                 120                 125


Asp Asn Leu Arg Ile Ile His Arg Tyr Ala Cys Asp Glu Arg Leu Asn
    130                 135                 140


Ser Ile Gln Arg Asn Ile Leu Asn Leu Phe Lys Lys Tyr Gly Glu Leu
145                 150                 155                 160


Arg Ile Glu Gln Val Val Gln Tyr Ser Ser Val His Ser Ser Gln Leu
                165                 170                 175


Leu Pro Ser Leu Tyr Asp Leu Ile Ala Arg Gln Leu Leu Ser Ile Asp
            180                 185                 190


Met His Gln Pro Ile Gly Trp Gln Ser Pro Ile Trp Ser Ser
        195                 200                 205


<210>  1950
<211>  623
<212>  PRT
<213>  Vibrio sp. F12

<400>  1950

Met Pro Ser Glu Gly Ser Lys Arg Phe Gly Glu Leu Phe Pro Ser Thr
1               5                   10                  15


Asn Phe Asp Asn Glu Ser Lys Pro Lys Glu Thr Leu Ser Leu Pro Leu
            20                  25                  30


Trp Lys Asp Val Asp Leu Thr Phe Lys Asp Val Phe Ser Val Asp Glu
        35                  40                  45


Asp Arg Arg Asn Glu Ala Ile His Arg Tyr Asn Ile Leu Glu Phe Leu
    50                  55                  60


Ile Asp Gln Tyr Gly Thr Asp Phe Ser Lys Lys Gln Ile Asp Glu Ser
65                  70                  75                  80
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Leu Thr Ala Leu Ile Asp Lys Phe Gly Ser Ser Thr Pro Ser Ala Ile
               85                  90                  95

Ser Ile Tyr Arg Tyr Trp Arg Asp Phe Lys Lys Ser Asn Phe Gln Leu
            100                 105                 110

Asn Ser Leu Ile Pro Lys Val Ser Ala Gly Asn Thr Lys Arg Asn Thr
        115                 120                 125

Pro Asp Glu Leu Glu Pro Leu Ile Gln Gly Ala Ile Arg Asn Tyr Phe
    130                 135                 140

Ser Glu Glu Cys Pro Thr Ala Thr Ser Ala Tyr Val Thr Leu Glu Val
145                 150                 155                 160

Glu Ile Asp Arg His Asn Glu Ile Asn Gly Thr Gln Phe Glu Pro Phe
               165                 170                 175

Ser Ile Gln Ala Phe Arg Lys Arg Leu Arg Lys His Ser Glu Tyr Glu
            180                 185                 190

Lys Ile Leu Leu Arg Lys Gly Lys Ser Val Ala Asp Ser Thr Phe Arg
        195                 200                 205

Lys Val Gly Glu Arg Pro Ala Thr Thr Arg Val Leu Glu Arg Val Glu
    210                 215                 220

Ala Asp His Thr Arg Leu Asp Leu Phe Ile Ile Asp Glu Lys Asn Gly
225                 230                 235                 240

Ile Pro Leu Gly Arg Pro Trp Leu Thr Val Leu Tyr Asp Thr His Thr
               245                 250                 255

Lys Ser Ile Val Gly Phe Tyr Leu Gly Phe Glu Pro Pro Ser Tyr Leu
            260                 265                 270

Ser Val Ser Leu Ala Leu Val Asn Ala Ile Leu Pro Lys Glu His Val
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        275                 280                 285

Lys Glu Leu Tyr Pro Ser Val Glu Gly Cys Trp Pro Cys Tyr Gly Leu
    290                 295                 300

Pro Glu His Leu Ile Val Asp Asn Gly Thr Glu Phe Asn Ser Ser Asp
305                 310                 315                 320

Phe Lys Ile Ala Cys Lys Asp Leu Lys Ile Lys Val Lys Lys Asn Pro
                325                 330                 335

Thr Lys Lys Pro Trp Leu Lys Gly Ser Val Glu Arg Tyr Phe Arg Thr
            340                 345                 350

Ile Asn Asn Arg Phe Leu Ser Arg Met Pro Gly Lys Ser Phe Thr Asn
        355                 360                 365

Ile Phe Glu Arg Lys Asp Tyr Asp Pro Leu Lys Asn Ala Val Ile Asp
    370                 375                 380

Asn Ser Leu Leu Gln Glu Met Val His Ile Trp Ile Val Asp Val Tyr
385                 390                 395                 400

Gln Asn Gly Lys Asn Gly Leu Glu Asn Asn Ile Pro Asn Leu Ser Trp
                405                 410                 415

Val Asp Ala Val Asn Ser Ser Ile Pro Pro Arg Pro Phe Lys Gly Ser
            420                 425                 430

Arg Asp Glu Leu Lys Phe Asn Leu Gly Lys Asn Arg Glu Val Ser Leu
        435                 440                 445

Asp Lys Asn Gly Val Arg Leu Gly Thr Thr Ile Arg Tyr Ser Ser Val
    450                 455                 460

Arg Leu Ala Arg Tyr Phe Gly His Lys Thr Cys Lys Asp Met Lys Ser
465                 470                 475                 480
```

```
Val Arg Val Arg Ile Lys Tyr Asp Pro Ser Cys Leu Gly Arg Val Tyr
                485                 490                 495


Val Leu Asp Glu Thr Lys Glu Glu Phe Phe Ala Val Asp Ala Ile Asp
            500                 505                 510


Ala Asp Tyr Ala Tyr Ser Val Ser Glu Trp Leu His Lys Thr Cys Cys
        515                 520                 525


Asn Tyr Ala Arg Arg His Ile Arg Lys Asn Tyr Asn His Arg Asp Val
    530                 535                 540


Val Lys Ala Trp Arg Lys Ile Leu Asp Ile Ile Asp Glu Ala Phe Glu
545                 550                 555                 560


Lys Thr Gly Gln Asn Lys Lys Gln Asn Ser Leu Gly Thr Thr Thr Thr
                565                 570                 575


Ser Arg Val Gln Arg Ile Lys Glu His Ser Lys Arg Ala Thr Ser Glu
            580                 585                 590


Ala Lys Thr Gln Gln Val Asp Tyr Val Lys Ser Glu Leu Asp Asp Glu
        595                 600                 605


Leu Asp Trp Asp Ile Glu Val Asn Thr Asn Gly Trp Ser Ile Lys
    610                 615                 620
```

<210> 1951
<211> 326
<212> PRT
<213> Vibrio sp. F12

<400> 1951

```
Met Asp Ser Asn Lys Thr Glu Ser Thr Ala Glu Met Val Lys Gln Ile
1               5                   10                  15


Phe Ile Gln Ser Pro Leu Ile Thr Asp Ile Leu Asp Asp Ile Ser Asp
            20                  25                  30
```

```
Cys Arg Glu Phe Ser Asp Gly Ile His Glu Pro Asp Cys Met Ile Val
        35                  40                  45

Val Gly Asp Thr Gly Ser Gly Lys Thr Thr Leu Ile Asn Lys Tyr Leu
    50                  55                  60

Asn Glu Asn Pro Arg Ser Glu Thr Ser Glu Gly Ser Phe Ile Pro Ile
65                  70                  75                  80

Leu Ser Thr Ser Leu Pro Pro Asn Ala Thr Pro Ile Thr Ala Ser Glu
                85                  90                  95

Gln Leu Leu Ser Asp Leu Gly Asp Pro Leu Ala Phe Ser Arg Gly Ser
            100                 105                 110

Asp Pro Val Lys Val Ala Gln Glu Met Ser Asp Leu Met Lys Ser Cys
        115                 120                 125

Gly Val Glu Leu Ile Ile Ile Asp Glu Phe Gln His Met Ile Asp Arg
    130                 135                 140

Lys Asn Lys Gln Ile Leu His Ser Ala Ala Asp Trp Leu Lys Met Leu
145                 150                 155                 160

Ile Val Arg Ser Lys Val Pro Val Val Leu Phe Gly Met Pro Tyr Ser
                165                 170                 175

Val Val Ile Leu Glu Ala Asn Ser Gln Leu Ala Gly Arg Phe Glu Leu
            180                 185                 190

Gln His Thr Leu Glu Pro Phe Arg Leu Asn Ser Lys Asn Asn Arg Ser
        195                 200                 205

Ile Tyr Lys Thr Phe Leu Thr Met Leu Asp Asp Ala Leu Pro Phe Gly
    210                 215                 220
```

```
Glu Cys Ser Gly Leu Ala Glu Pro Asp Met Met Lys Arg Ile Tyr Ala
225                 230                 235                 240


Phe Ser Gln Gly Asn Leu Arg Arg Ile Arg Lys Leu Ile Asn Arg Ala
                245                 250                 255


Ser Arg Leu Ala Leu Arg Asp His Ser Asn Lys Val Ala Leu Lys His
            260                 265                 270


Phe Ala Lys Ala Ala Pro Lys Val Ser Gln Val Ala Cys Glu Asn Leu
        275                 280                 285


Asn Pro Phe Glu Val Thr Ile Lys Glu Leu Lys Ile Asn His Pro Pro
    290                 295                 300


Gln Asp Ile Gly Trp Glu Asn Tyr Leu Phe Gln Gln Glu Lys Asp Val
305                 310                 315                 320


Ser Ala Lys Gly Leu Phe
                325


<210>  1952
<211>  394
<212>  PRT
<213>  Vibrio sp. F12

<400>  1952

Met Leu Leu Gln Arg Pro Lys Pro His Ser Asn Glu Ser Leu Glu Ser
1               5                   10                  15


Phe Phe Ile Arg Val Ala Asn Lys Asn Gly Tyr Glu Asp Val Asn Arg
            20                  25                  30


Phe Leu Met Ala Thr Lys Arg Tyr Leu Gln Asp Ile Asp Phe Ser Gly
        35                  40                  45


Phe Gln Thr Phe Pro Thr Asn Ile Cys Lys Met Asn Pro Ala Ser Ala
    50                  55                  60
```

```
Lys Ser Ser Ser Ser Ala Arg Thr Ala Ser Leu Leu Lys Leu Ala Gln
65                  70                  75                  80

Leu Thr Phe Asn Glu Pro Thr Glu Leu Leu Gly Leu Ala Val Asn Arg
                85                  90                  95

Thr Asn Leu Lys Tyr Ser Pro Ser Thr Ser Ala Val Ile Arg Gly Ser
            100                 105                 110

Glu Val Phe Pro Arg Ser Leu Leu Arg Thr Lys Ser Ile Pro Cys Cys
        115                 120                 125

Pro Leu Cys Leu Gln Glu Asn Gly Tyr Ala Ser Tyr Leu Trp His Phe
    130                 135                 140

Glu Gly Tyr Asp His Cys His Ile His Asn Val Pro Leu Leu Asn Ser
145                 150                 155                 160

Cys Arg Cys Gly Ala Glu Tyr Asp Tyr Arg Val Ser Gly Leu Ser Gly
                165                 170                 175

Met Cys Gly Ser Cys Glu Ala Pro Ile Ala Ile Lys Ser Arg Glu Lys
            180                 185                 190

Ser His Asn Ala Thr Leu Ser Val Ala Asn Trp Leu Ala Gly Asn Glu
        195                 200                 205

Ser Lys Asp Leu Pro Asp Leu Pro Pro Ser Tyr Arg Trp Gly Leu Val
    210                 215                 220

His Trp Trp Ile His Ile Ser Asn Asp Pro Phe Glu His Leu Ser Phe
225                 230                 235                 240

Val Gln Phe Phe Ser Asn Trp Pro Ser Ser Phe His Ser Ile Ile Asp
                245                 250                 255

Ser Glu Ile Glu Phe Asn Leu Glu His Ala Ile Val Gly Lys Ser Glu
```

```
            260                 265                 270

Leu Arg Ile Lys Asp Leu Leu Gly Arg Ile Leu Phe Ser Ser Val Arg
        275                 280                 285

Leu Pro Glu Arg Asn Leu Gln His Asn Ile Val Leu Gly Glu Leu Leu
    290                 295                 300

Arg His Thr Glu Met His Leu Trp Asp Asn Asn Gly Leu Ile Ala Asn
305                 310                 315                 320

Leu Arg Met Asn Ala Leu Glu Thr Thr Val Phe Leu Asn Cys Ser Lys
                325                 330                 335

Asp Glu Leu Ala Ser Met Val Glu Gln Arg Ile Leu Lys Pro Asn Arg
            340                 345                 350

Lys Thr Lys Pro Asn Ile Pro Leu Val Val Asn Asp Tyr Leu Phe Tyr
        355                 360                 365

Phe Gly Asp Ile Phe Cys Leu Trp Leu Ala Glu Phe Gln Thr Asp Glu
    370                 375                 380

Phe Asn Arg Ser Phe Tyr Val Ser Arg Trp
385                 390


<210>  1953
<211>  640
<212>  PRT
<213>  Vibrio sp. F12

<400>  1953

Met Glu Ser Leu Lys Glu Leu Leu Gln Ser Arg Pro Asp Asp Leu Asn
1               5                   10                  15

Val Glu Leu Lys Arg Thr Phe Arg Pro Leu Thr Pro His Ile Asn Ile
            20                  25                  30
```

```
Asp Gly Lys Glu Leu Asp Ala Leu Thr Val Leu Val Asn Leu Thr Asp
        35                  40                  45

Lys Thr Ala Val Gln Lys Asp Leu Leu Asp Arg Val Lys Cys Lys Gln
    50                  55                  60

Lys Leu Arg Asp Glu Lys Trp Trp Ala Arg Cys Leu Lys Thr Val Glu
65                  70                  75                  80

Tyr Arg Gln Ser His Asn Leu Lys Phe Pro Asp Ile Arg Ser Glu Gly
                85                  90                  95

Val Ile Arg Ala Thr Pro Leu Gly Gln Leu Pro Asp Phe Leu Leu Ser
            100                 105                 110

Ser Ser Lys Leu Glu Pro His Asn Trp Ala Tyr Ser His Asp Ser Ser
        115                 120                 125

Asp Val Asn Lys Ser Ala Leu Leu Thr Asn Glu Phe Arg Trp Asn Gly
    130                 135                 140

Val Ile Ser Cys Leu Gly Asp Leu Leu Lys Asp Val Glu His Pro Leu
145                 150                 155                 160

Trp Gln Lys Leu Asn Thr Leu Gly Cys Tyr Gln Lys Thr Arg Lys Ala
                165                 170                 175

Ile Ala Lys Gln Leu Ala Gln Ile Ser Gln Thr Thr Ile Asn Val Ser
            180                 185                 190

Leu Ala Pro Asn Tyr Leu Thr Gln Leu Ser Leu Pro Asp Asn Asp Ser
        195                 200                 205

Ser Tyr Ile Ser Leu Ser Pro Val Ala Ser Gln Ser Met Gln Ser His
    210                 215                 220

Cys Tyr Gln Ala Leu Lys Asn Glu Tyr Arg Tyr Thr Ala Leu Thr Arg
225                 230                 235                 240
```

```
Tyr Ser Arg Ser Thr Asn Met Gly Val Leu Pro Met Thr Cys Gly Gly
                245                 250                 255

Ala Leu Lys Met Leu Lys Thr Val Pro Asn Phe Ser Leu Thr His His
            260                 265                 270

Tyr Gln Ile Asn Ile Gly Lys Ser Trp Leu Thr Ser Ser His Ile Gln
        275                 280                 285

Ser Leu Lys Gln Tyr Gln Thr His Thr Gln Tyr Leu Met Pro Lys Asn
    290                 295                 300

Lys Arg Val Ala Tyr Arg Arg Thr Val Lys Asn Glu Ile Gln Glu Met
305                 310                 315                 320

Val Lys Ala Trp Leu Ala Thr Gln Asp Asn Thr Met Asp Val Asn Thr
                325                 330                 335

Leu Val Gln His Leu Asn Asp Asp Leu Ser Arg Phe Lys Ser Ala Lys
            340                 345                 350

Cys Phe Ala Tyr Glu Pro Ser Ile Thr Lys Leu Leu Leu Gly Leu Ile
        355                 360                 365

Lys Arg Glu Leu Thr Glu Pro Thr Thr Val Ser Thr Asn Ile Cys Arg
    370                 375                 380

Ser Glu Lys Lys Asp Ser Phe Phe Val Ile Pro Asn Ile Arg Val Cys
385                 390                 395                 400

Gly Ala Ser Ala Leu Ser Ser Pro Ile Thr Val Gly Leu Pro Ser Leu
                405                 410                 415

Thr Ala Phe Leu Gly Phe Thr His Ala Phe Glu Arg Asn Leu Asn Glu
            420                 425                 430
```

```
Ser Phe Pro Thr Leu Ala Ile Asp Ser Phe Ala Ile Cys Val His Gln
        435                 440                 445

Leu His Val Glu Lys Arg Gly Leu Thr Lys Glu Tyr Ile Gln Lys Ala
    450                 455                 460

Asn His Thr Ile Ser Pro Pro Ala Thr Tyr Asp Asp Trp Gln Ser Asp
465                 470                 475                 480

Leu Val Phe Ser Leu Val Ile Arg Phe Asn Arg Ser Leu Asn Val Asp
                485                 490                 495

Asp Asn Thr Ile Val Arg Ala Leu Pro Lys Arg Phe Ala Arg Gly Ser
            500                 505                 510

Ala Lys Ile Ala Ile Ala Asp Phe Lys Tyr Ile Arg Ser Phe Ser Thr
        515                 520                 525

Leu Glu Lys Thr Ile Gln Ser Phe Pro Gln Lys Thr Gly Lys Trp Leu
    530                 535                 540

Ser Met His Thr Glu Pro Ile Glu Asn Met Ser Asp Ile Leu Ser Glu
545                 550                 555                 560

Val Lys Glu Asn Arg Lys Leu Thr Pro Ser Cys Val Gly Tyr His Phe
                565                 570                 575

Leu Glu Glu Pro Thr Asp Lys Pro Asn Ser Leu Arg Gly Tyr Lys His
            580                 585                 590

Ala Phe Ser Glu Cys Ile Ile Gly Leu Ile Glu Pro Ile Thr Phe Asp
        595                 600                 605

Gln Asn Thr Asp Ile Asn Thr Ile Leu Trp His His Lys Cys Tyr Gln
    610                 615                 620

Asn Tyr Leu Ser Val Gln Pro Arg Ser Thr Tyr His Gly Thr Thr Asp
625                 630                 635                 640
```

<210> 1954
<211> 353
<212> PRT
<213> Vibrio sp. F12

<400> 1954

Met Glu Leu Pro Thr Asn Leu Ala Tyr Glu Arg Ser Ile Asp Pro Ser
1 5 10 15

Asp Val Cys Phe Leu Val Val Trp Pro Asp Gly Arg Lys Thr Pro Leu
20 25 30

Thr Tyr Thr Ser Arg Thr Val Leu Gly Gln Met Glu Thr Ala Ala Leu
35 40 45

Ala Tyr Glu Pro Ser Gly Arg Thr Lys Glu Ser Ala Thr Ala Glu Lys
50 55 60

Leu Ala Gln Gly Asn Pro His Gln Val Asp Phe Cys His Ala Pro Phe
65 70 75 80

Gly Ala Ser His Ile Glu Cys Tyr Phe Ser Val Ser Phe Ser Ser Glu
85 90 95

Leu Arg Lys Pro Tyr Lys Cys Asn Ser Ser Thr Val Lys His Thr Leu
100 105 110

Met Gln Leu Ile Lys Ala Tyr Glu Glu Asn Ile Gly Trp Asn Glu Leu
115 120 125

Val Ser Arg Tyr Leu Val Asn Ile Cys Asn Gly Ser Trp Leu Trp Lys
130 135 140

Asn Thr Lys Lys Ala Tyr Cys Trp Asp Ile Glu Leu Thr Pro Trp Pro
145 150 155 160

Trp Ala Gly Gly Ala Val Lys Phe Gln Asn Ile Arg Ala Asn Tyr Leu

```
                165                 170                 175

Glu Arg Ser Asp Phe Glu Asn His Lys Asp Trp Glu Ala Ile Ala Gln
            180                 185                 190

Met Thr Lys Asn Ala Phe Ser His Ser Asn Gly Leu Ala Ile Phe Glu
        195                 200                 205

Val Lys Ala Thr Leu Arg Leu Pro Thr Asn Lys Gln Ile Phe Pro Ser
    210                 215                 220

Gln Ala Phe Thr Glu Asn Glu Ser Asn Asn Thr Asn Lys Ser Lys Lys
225                 230                 235                 240

Gln Ser Lys Gly Arg Ile Phe Gln Ser Thr Thr Val Asp Gly Glu Arg
                245                 250                 255

Ser Pro Ile Leu Gly Ile Tyr Lys Thr Gly Ala Ala Ile Ala Thr Ile
            260                 265                 270

Asp Asp Trp Tyr Pro Asp Ala Thr Glu Ala Leu Arg Val Gly Arg Phe
        275                 280                 285

Gly Val His Lys Glu Asp Val Thr Cys Tyr Arg His Pro Ser Thr Gln
    290                 295                 300

Lys Asp Phe Phe Phe Ile Leu Gln His Thr Glu Ser Tyr Ile Glu Ala
305                 310                 315                 320

Leu Thr Ser Ser Asp Lys Pro Asn Gln Glu Thr Ile Asn Asp Leu His
                325                 330                 335

Phe Leu Val Ala Asn Ile Ile Lys Gly Gly Met Phe Gln His Lys Gly
            340                 345                 350

Asn
```

<210> 1955
<211> 199
<212> PRT
<213> Vibrio sp. F12

<400> 1955

```
Met Lys Trp Tyr Tyr Lys Thr Val Thr Phe Leu Pro Ala Arg Cys Asn
1               5                  10                  15


Asn Glu Ser Leu Ala Ala Lys Cys Leu Arg Ile Leu His Gly Phe Asn
            20                  25                  30


Tyr Glu Tyr Glu Thr Arg Asn Ile Gly Val Ser Phe Pro Leu Trp Ser
        35                  40                  45


Asp Tyr Thr Ile Gly Asn Lys Ile Ser Phe Val Ser Thr Asn Lys Ile
    50                  55                  60


Glu Leu Asp Leu Leu Leu Lys Gln His Tyr Phe Thr Gln Met Lys Glu
65                  70                  75                  80


Leu His Tyr Phe Asp Ile Ser Asn Thr Lys Val Val Pro Asp Gly Cys
                85                  90                  95


Glu Tyr Val Ser Phe Lys Arg Cys Gln Ser Ile Asp Lys Ala Thr Pro
            100                 105                 110


Ala Gly Gln Ala Arg Lys Ala Lys Arg Leu Lys Lys Arg Ala Glu Glu
        115                 120                 125


Arg Gly Glu Val Phe Asp Leu Ser Ser Phe Lys Gln His Glu Val Val
    130                 135                 140


Ala Leu His His Tyr His Ser Leu Glu Glu Asp Ser Lys Ser Arg Gly
145                 150                 155                 160


Gly Ser Phe Arg Leu Asn Ile Arg Thr Phe Lys Glu Ala Arg Leu Asp
                165                 170                 175
```

Gly Asp Ala Leu Phe Ser Ser Tyr Gly Leu Ala Asn Thr Gly Asn Lys
180 185 190

Ser Gln Pro Val Pro Leu Ile
195

<210> 1956
<211> 624
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1956
atgtacgacc aaaccaaaaa atcatcagct gttcacaaca tttgtaaatt catgagtttg 60

aaaaatgact cagttgttcg aacaatgtcc atgcttgagt atgatttttg ttttcatgct 120

gaatacaatc ctcaaatagt tagatatgaa tctcagccac atgggtttga gtactacttc 180

aatgggcgct attgccgcta cacaccagac tttcagcttt tcgatagcat agatacgcct 240

tctctgattg aagtaaagca ttcaagtcag atccttaaac cagattttcg agcaaggttt 300

aaagaaaagc agcttgtcgc tcaagctgag tatggaaaaa aactcatctt agtgaccgag 360

aagcagattc gaactggttt tctacttagt aaccttaaat tactccacgg ctattcaggg 420

attcgtacaa tcactgatat tcaaaaacat gtgcttcagt ttgttcaagc taatagaagc 480

gtgacccttc attatctttc acaccaactt aaaatctctc cagatgaaac attaacagca 540

gctttgtgct ggctatcttc aggtgaaata caaacagatt ttaatcagaa aaaatttgat 600

ttagaaagtt ctgtttggtg ctag 624

<210> 1957
<211> 1866
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1957
atgagtaatg atgctctctt tggttttcgt gatgaatcta gtagtttcga caatgatgta 60

gcagatgata aaacgcttcc aacagaattt ttagcagaag acgaaaatct tgaattggca 120

tttggtgatc taccacacaa agagactgca ttgtatcggt tggacttaat tcgttatttg 180

gaaaggcacg tacaaggagg ttggacgccc aaaaacctag ataagctctt ggaagagtat 240

gctttattga agaaaacttc ggtcccgtca tccagaacgg ttgctgattg gaaaaagctc 300

tattacgagt caggtaaaga tgtagcgtct cttgttcctg ggcatagcaa aaaaggaaac 360

agaatactaa agaatgattc atctgattta gtaacagaag cgattcaaac caagtttctg 420

accaaagagc gagtatcagt caacaccgcc tatgagtact acaaatatcg agttattgaa 480

gagaaccgac aattaacgca aattaaaata gcgacaattt cacaacggac attttacaat 540

cgtgtaaatg cactacctcc ctatgaagtt gctttggctc gttatggtaa acgatatgct 600

gataataagt ttaagactgt tgggtcaatc attccggcaa cgcgtccaat ggaatgtgta 660

gaaatagatc acactacagc tcctgttatt ttgcttgatg atgatttgga tcttcctctt 720

ggcagaccac acttaacaat cctttatgat agatactcta cttgcattgt tggtctttct 780

gtcaattata gagatcctag ttacgagaca gtacgagcag ctttcctcaa ttcagttctc 840

aagaaggatt gggttaaaga aaagtaccca agcattaaat ctgaatggcc ttgctacgga 900

aatattacaa atttgatagt ggataacggt gcggagtttt ggagtgatag cctagagtca 960

gcattaaagc cattagtaac agatattcaa tataatcaac gtggtaaacc gtggcgaaaa 1020

gcgggtgttg aaaagtcttt tgataccttc tataagaaac tatttagtcg tttcccagga 1080

aaaaccttca cgaaccctac tcagttaaaa gactacaacc cgaagcgaga cgctgtcatt 1140

aatgtgtctg attttctcga gctgttacat aagtggctta ttgacgttta tcataaaaaa 1200

gctgacacga ggtacaagag agttccctac cagaaatgga cagagtcgca aggaaagata 1260

atcttttgtg aaggccctga agcagagcaa ttaaagattg agcttggagt tgtaaaccat 1320

cggactataa gaagaggcgc tattgaattg cattctctta aataccaatc tgatgagttg 1380

gaagagtacg gtaagcagta ttctagtcgt gcaagaaaaa gcgcttatgt gaaaaccaag 1440

acagacccaa acgatatcag ctcgatttac gtttatcttg aggaagagaa aaaatacatc 1500

aaagtcccag cagtcgatca tacgggttat acaaaaggcc gatctttata tgaacatcaa 1560

cggattaaca gtttaagaag gttgaaagtt cgtttgggag agcaagacga atcactagcc 1620

gatgcgtcat tgtatttgga cagagctatg gatgaagcaa tagaacgtat gagtcgttct 1680

aagtccaaaa aatcggcgct tcctaaaaca actcatgctt caaaaatagc aaagcaaaga 1740

ggtgttggta gcgaagggcc tagcaccatt gtcattacgt cacctaaacc tatcagtgaa 1800

gtaccaaaag aagtaataga tattggtact gctagtgatg acctcagcga tatagagggg 1860

tattag 1866

<210> 1958
<211> 1068
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1958
gtgaacatac ttagtgagct tcaaatagag caatatacat cttttagaga gtgtttctta 60

gaataccctc agctgacgga aatttataac gtctttgatc gaatggtatt gaacagctgt 120

cttggagggg aacaagagtc actattgcta acgggagata caggtgttgg caagacggcg 180

atgatagata attatgttgc aaggttcgct gctaagggta gccgctgggc tgaaatgcca 240

gtattaaaaa ctcgcatccc aagtaaagtt cgtgagcaaa atacgttaga aagattatta 300

attgatttag atagtcgagc ctctagccgc cgcaggagac cttacaaaga aggagcgtta 360

gaacaaggag tcatcaaaag tttagttgaa aaaaaagtga agcttgtgat cgttaatgag 420

gttcaggagc tgatggaatt caaagatgct aatgaacgac aaacaatagc gaatactttt 480

aagatgataa gtgaggaagc tcaagtttca tttgtcttgg tgggtatgcc ctatgcgact 540

atgctcgctg aagaagacca atggaattct cgtttaggct ggaagcgaca cttaagttat 600

tttcaccttt ctaagctgag cgaagccgat aacaaaggtt atatacctga tgcagaaggg 660

aaacggcatt ttgcaagctt tgttgccgga cttgcaggcc ggatggggtt tgaaaaacgc 720

cctaacttaa ctggggatga aattctattg cctttatttt cagtctgtcg cggagaatgc 780

cgtgtgctga agcactttct tgcggatgcg ttactcaacg cattgcaatc ttcaaaggat 840

acgattgata agccattatt atcggcttgt tttgatacta aataccctta tgcgaaacag 900

aatcctttcg agtgtaagtt aacagaactc aagctagtag aactgaaaac agaaacttct 960

tacaacaaag gtgctcaatt taaagaagac cgattaatag gtcggtcatt tactgattta 1020

ttaccagttc atatgttgct gagtaagaca cctttaaaag ctcagtga 1068

<210> 1959
<211> 1212
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1959
gtgaaaacgg acattcaact ttaccctgac gaatcgctcg aaagcttctt gttgcgctta 60

tcgcaagagc aaggttacga gcgattttct catttcgccg aagatatctg gttcgacacc 120

atggatcagc atgaggcgat tgctggtgct ttccccttag agctcgaacg agtcaatatc 180

taccacgctc aaaccacaag ccaaatgcgg gtgcgagtgc ttatccacct tgagaaccaa 240

ttaaagctca acaactttgg tgtactgcgt ctagcgttat cacattcaaa agctcaattc 300

tctccgcaat acaaagctgt tcatagattt ggtgttgact acccttatgc ttttcttcgc 360

aaacgcttca cgcctatttg ccctctgtgt attggtgaag ctccctacat tcgccagcag 420

tggcaattta tctctcacca agcttgtgaa catcatggct gtaaactgat ttatcactgc 480

cctgagtgta agtcgagact tgaataccaa cgtaccgaga gtagtagtca atgtgaatgt 540

ggtttcgaac tccgaaactc gccagtcgaa gatgctccag aggctgagac cttggttgcc 600

cgatggttgt caggaaatga ttcaaaaccc ttgggattgc tgaaggcaga aatgacgtta 660

tctgagcgct atggtttctt actttggtat gtaaatcgct atggtgatat cgatggtctc 720

tgttttgagt cattcatcga atactgcggc tcttggccaa cgtcattgtg gcaagacttc 780

gatgttttga aagagaagac agagctcgtc cgagcaaaag attggaagaa gatgtttttc 840

aatgaagctt ttggtgctct gcttaaagat tgccgtcagt tacccagtcg gcagctgagt 900

cacaatatcg tgcttactca ggtgttagct tactttacac agctgatggc aacagtatct 960

tcaagcgcga aaggtaatat aggtgatgtg ctgctcagcc ccttagaagc ttctacattg 1020

ctttcttgta caacagatga ggtatatcgg ttgtatgagt ttggtgagat caaagccgcg 1080

atcaggccgc gaatgcacac aaagattgca agtcacgaat cggcgtttac tctgagaagt 1140

atcattgaaa caaagttgac gcgaatgagc tctgaaagtg atggtttaag cgtgtatcta 1200

ccagagtggt aa 1212

<210> 1960
<211> 2088
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1960
atgacaaaat taagtgacct attggcaatc gaagacgaag tagtaaagca ggcttctcta 60

aagaagatgt tcatgcccta tacggaagat gtctgtgttg aagggtttga aaaagaagcg 120

ctaacgatct tgctcaatct cagttcaagc catcaagcgg atagatgctc ggattggttg 180

gatgttgccc gtgctaaaag gtattttaaa gcggctgaga acctagacac atcccttgat 240

gagatcaaat ggttccacac tcataatctc aagtttccag actgccgagt taaagatcag 300

cgaataattg cgcagcctct tgtgacaacc gaggcattta tttcaagcgc agcattagag 360

caacgcttgg ggtgggcgca taactctgca gtgtatcgcc atacattgtg gttattgaat 420

ccttttcgtt ggcaatcaca gtccgtgagt cttctttcac ttattcagca agaaacccct 480

gtttggctcg agctgcttaa aggttttggt ttaggcacta agtcacttgt tcgcttacaa 540

aacacaatgg cagaacagct acctgaaaat agcctccctg acagagtcag tacttacagc 600

aagcaactac ggtttccatg gggggatgat tatgtttcgg tgaccccagt ggtcagtcat 660

gccatccaaa gagagttaga agtgagatcg agaagtcgag aaagcaagct cagctttgtg 720

tcttcatcgc tgccaaactc ggcaagtatc gggaatctgt gtggcagttt aggtgggcat 780

atgaaagtcc ttaactaccc gctagacgtc aaaccagcac aaggtgggac gttaactgaa 840

agtcgcaaaa agagtggctg ctactttgat gactatcagg taactaacgc caaaatttgt 900

caggtgttaa atcacttaat tggatcagaa ccatcaaaaa cacagaagca aagagagatc 960

gctcgtaagg ttagaagtaa gatattgcga aagcagatag ccttgtggat gcttccatta 1020

attgagctaa gagatattgt tgatgctgac cctaatcaac agcaattgga acatgatgac 1080

actttaactc aagccttttg ggcgctacca gaatcggatc taggctcttt agctagtgag 1140

tttaactgtc gcttacatct cgcgtttcaa aataataagt ttgccgcaaa gtttgcctat 1200

caccccaagc ttatgcaggt cgtcaaagcc caaatcgtat gggtactcga acaaatcagt 1260

aaaccaaatg gcaatgaaga taaggtaacg ggtgagcagt atatctattt gtcatcaatg 1320

agagtgcaag atgcggtcgc aatgagtagc ccatacctat gtggtgctcc ttctttgacg 1380

gctatttggg gttttatgca tcgctatcaa agagagttta ataagctagc taattgtgat 1440

tccctgtttg agttttcgag tttctctttt tatgttcgaa gtgagaacat tcaaccgacg 1500

gccaagctta ccgaacccaa ctcagtcgcc aaagcgcgaa cggtttctaa cgcgaagcga 1560

ccaactattc gtagtgaacg attggcagac ctagaaatag acttagttat tagagtccat 1620

agtgacagcc gaatttcaga ttttaagtcc gcgcttaaaa cagctcttcc cgtagttttt 1680

tccggagggg cattatacca accacagcta tcgacgcaga ttgagtggct aaggacgttt 1740

accagcagga gtgagctttt ccatgtcata aaagggttac cagcatacgg gcgatggtta 1800

tatccaagtg aaaaccagcc gagtgatttt gatgagctag agcgttttat tactaaagac 1860

gctgataatt tgccagtttc tattggctac catttgttag aacaaccaac taaacggggc 1920

aactcaatca ccagttgtca cgcttatgca gagaatgcga tagggcttgc tcagcgagta 1980

aacccgatag aagtacgttt tagtggaaga gatcactttt taaaccacgc cttttggtcg 2040

atagaatgca gtagcgaaac tattcttata aaaaactata gggattaa 2088

<210> 1961
<211> 1032
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1961
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taccatcttt ctaaaagtgg tgagatgtgt ccccttgaag ttgatagaac taggttgcgc 120

gcaccaaaag ggggttatgc agaagcctat aaaggggggca agtttgtaaa aaagaatgtt 180

gctccacaag acttagctta ctccaatcct cagttcattg aagagtgtta cgtaaagccg 240

ggtgtagatg atatctactg tgcattcccc cttcgaattc gagccaattc tctaacccct 300

gagatctgta gtgacgatga agtgcgcagt aaactttcgt tactggctaa cacttataaa 360

gagctcaatg ggtatcagga gctcgctcat cgatacgcga aaaatatcct gcttggcagt 420

tggctgtggc gtaacagaga gtgtcgaaag ctgttgatag aagtgaccac cagtgattca 480

caaaccctga ttgtagaaaa cgcaacaaag ctttcttggt atggtcattg ggatgaggct 540

tcagcagaat gcctagaaaa gctcacagcc tatttgatgc gagccctgtc taacccgacc 600

gaatatttct atatggatgt caaagctaaa attggagttg gttggggaga tgaggtttac 660

ccaagccaag agtttttaga gagccgagaa gatggtgttc ctactaagca gttagctact 720

gtcgaactat tggacggaaa agaaaccgtt gcgtttcatg gtcaaaaagt tggagccgcg 780

ttgcaatcga ttgacgattg gtggcatgaa aacgcagata aacccttaag agtgaatgag 840

tatggaactg accgagagta cgttatagca aggcgacatg tttcctatgg aaatgacttt 900

taccagttag tcagaaatac agagaattgg attgagacaa tgacagcttc tcagaccatc 960

ccaaatgacg tgcactttat tatgtcggtc ttgattaaag gtggtctctt caattgttcc 1020

aaagcgaagt aa 1032

<210> 1962
<211> 606
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1962
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ttagcaggac gttgtatctc tcaaatgcac ttgtttatgg tcaataaccg acaagccatc 120

aataaaatag gcgtgagttt tcccgactgg agtgatgtta cggttggtca aaccatagcc 180

tttgttgctg aagataaaga gatgatggtc ggactctctt ttcaacccta tttttctttg 240

atggtaaatg aaggtttatt tgagatttcc agtgtatgtg aggtgccgga tactgcgata 300

gaggtgaggt ttacccgtaa ccaaacgatt gggaaaagct ttctgggttc caagaaacgt 360

cgaatcaaac gtagcatggc gagagccgaa ctatctggtg ttgaaccatc gttaccagcc 420

actaatgaag agcgtgtcat cgatagtttt catcgaatac caatctccag cggttcatct 480

ggagaagatt atatgttgtt tgtacaaaag gagtttgtcg gtgagcgcgg tacagcaaac 540

tttaatagct atggtttagc caccaatcaa gaaagaaaag gcacggtacc tgagttacgt 600

ttttaa 606

<210> 1963
<211> 26
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<400> 1963
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<210> 1964
<211> 510
<212> DNA
<213> Vibrio splendidus strain UCD-SED10

<220>
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<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1964
tgatgcttgc aacataagtc cgcataattc gaaccaagta tcaaagagtt aaagtactat 60

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attcaacgta gtaaaattac cacactccga tcaacccttc gaaagacata gtgtacatgt 180

atgggtaaga attcagtctc tgaaggtttt ggacaatttt gagttagtgt ctttgctaat 240

ttagcaagtc nnnnnnnnnn actatttgag gattgtattc agcatgaaaa caaaaatcat 300

actcaagcat ggacattgtt cgaacaactg agtcattttt caaactcatg aatttacaaa 360

tgttgtgaac agctgatgat tttttggttt ggtcgtacat agcaaaagca cttttgttgt 420

aaacctacaa caaaaaatag accatgaaga cttagggtgc aaataagaaa agaagcctgc 480

aatttatgcg aacatatatt gcaggcttca 510

<210> 1965
<211> 207
<212> PRT
<213> Vibrio splendidus strain UCD-SED10

<400> 1965

Met Tyr Asp Gln Thr Lys Lys Ser Ser Ala Val His Asn Ile Cys Lys
1 5 10 15

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Phe Met Ser Leu Lys Asn Asp Ser Val Val Arg Thr Met Ser Met Leu
            20                  25                  30

Glu Tyr Asp Phe Cys Phe His Ala Glu Tyr Asn Pro Gln Ile Val Arg
        35                  40                  45

Tyr Glu Ser Gln Pro His Gly Phe Glu Tyr Tyr Phe Asn Gly Arg Tyr
    50                  55                  60

Cys Arg Tyr Thr Pro Asp Phe Gln Leu Phe Asp Ser Ile Asp Thr Pro
65                  70                  75                  80

Ser Leu Ile Glu Val Lys His Ser Ser Gln Ile Leu Lys Pro Asp Phe
                85                  90                  95

Arg Ala Arg Phe Lys Glu Lys Gln Leu Val Ala Gln Ala Glu Tyr Gly
            100                 105                 110

Lys Lys Leu Ile Leu Val Thr Glu Lys Gln Ile Arg Thr Gly Phe Leu
        115                 120                 125

Leu Ser Asn Leu Lys Leu Leu His Gly Tyr Ser Gly Ile Arg Thr Ile
    130                 135                 140

Thr Asp Ile Gln Lys His Val Leu Gln Phe Val Gln Ala Asn Arg Ser
145                 150                 155                 160

Val Thr Leu His Tyr Leu Ser His Gln Leu Lys Ile Ser Pro Asp Glu
                165                 170                 175

Thr Leu Thr Ala Ala Leu Cys Trp Leu Ser Ser Gly Glu Ile Gln Thr
            180                 185                 190

Asp Phe Asn Gln Lys Lys Phe Asp Leu Glu Ser Ser Val Trp Cys
        195                 200                 205
```

<210> 1966
<211> 621
<212> PRT
<213> Vibrio splendidus strain UCD-SED10

<400> 1966

```
Met Ser Asn Asp Ala Leu Phe Gly Phe Arg Asp Glu Ser Ser Ser Phe
1               5                   10                  15


Asp Asn Asp Val Ala Asp Asp Lys Thr Leu Pro Thr Glu Phe Leu Ala
            20                  25                  30


Glu Asp Glu Asn Leu Glu Leu Ala Phe Gly Asp Leu Pro His Lys Glu
        35                  40                  45


Thr Ala Leu Tyr Arg Leu Asp Leu Ile Arg Tyr Leu Glu Arg His Val
    50                  55                  60


Gln Gly Gly Trp Thr Pro Lys Asn Leu Asp Lys Leu Leu Glu Glu Tyr
65                  70                  75                  80


Ala Leu Leu Lys Lys Thr Ser Val Pro Ser Ser Arg Thr Val Ala Asp
                85                  90                  95


Trp Lys Lys Leu Tyr Tyr Glu Ser Gly Lys Asp Val Ala Ser Leu Val
            100                 105                 110


Pro Gly His Ser Lys Lys Gly Asn Arg Ile Leu Lys Asn Asp Ser Ser
        115                 120                 125


Asp Leu Val Thr Glu Ala Ile Gln Thr Lys Phe Leu Thr Lys Glu Arg
    130                 135                 140


Val Ser Val Asn Thr Ala Tyr Glu Tyr Tyr Lys Tyr Arg Val Ile Glu
145                 150                 155                 160


Glu Asn Arg Gln Leu Thr Gln Ile Lys Ile Ala Thr Ile Ser Gln Arg
                165                 170                 175
```

```
Thr Phe Tyr Asn Arg Val Asn Ala Leu Pro Pro Tyr Glu Val Ala Leu
            180                 185                 190

Ala Arg Tyr Gly Lys Arg Tyr Ala Asp Asn Lys Phe Lys Thr Val Gly
        195                 200                 205

Ser Ile Ile Pro Ala Thr Arg Pro Met Glu Cys Val Glu Ile Asp His
    210                 215                 220

Thr Thr Ala Pro Val Ile Leu Leu Asp Asp Asp Leu Asp Leu Pro Leu
225                 230                 235                 240

Gly Arg Pro His Leu Thr Ile Leu Tyr Asp Arg Tyr Ser Thr Cys Ile
                245                 250                 255

Val Gly Leu Ser Val Asn Tyr Arg Asp Pro Ser Tyr Glu Thr Val Arg
            260                 265                 270

Ala Ala Phe Leu Asn Ser Val Leu Lys Lys Asp Trp Val Lys Glu Lys
        275                 280                 285

Tyr Pro Ser Ile Lys Ser Glu Trp Pro Cys Tyr Gly Asn Ile Thr Asn
    290                 295                 300

Leu Ile Val Asp Asn Gly Ala Glu Phe Trp Ser Asp Ser Leu Glu Ser
305                 310                 315                 320

Ala Leu Lys Pro Leu Val Thr Asp Ile Gln Tyr Asn Gln Arg Gly Lys
                325                 330                 335

Pro Trp Arg Lys Ala Gly Val Glu Lys Ser Phe Asp Thr Phe Tyr Lys
            340                 345                 350

Lys Leu Phe Ser Arg Phe Pro Gly Lys Thr Phe Thr Asn Pro Thr Gln
        355                 360                 365

Leu Lys Asp Tyr Asn Pro Lys Arg Asp Ala Val Ile Asn Val Ser Asp
```

```
    370                 375                 380

Phe Leu Glu Leu Leu His Lys Trp Leu Ile Asp Val Tyr His Lys Lys
385                 390                 395                 400

Ala Asp Thr Arg Tyr Lys Arg Val Pro Tyr Gln Lys Trp Thr Glu Ser
                405                 410                 415

Gln Gly Lys Ile Ile Phe Cys Glu Gly Pro Glu Ala Glu Gln Leu Lys
            420                 425                 430

Ile Glu Leu Gly Val Val Asn His Arg Thr Ile Arg Arg Gly Ala Ile
        435                 440                 445

Glu Leu His Ser Leu Lys Tyr Gln Ser Asp Glu Leu Glu Glu Tyr Gly
    450                 455                 460

Lys Gln Tyr Ser Ser Arg Ala Arg Lys Ser Ala Tyr Val Lys Thr Lys
465                 470                 475                 480

Thr Asp Pro Asn Asp Ile Ser Ser Ile Tyr Val Tyr Leu Glu Glu Glu
                485                 490                 495

Lys Lys Tyr Ile Lys Val Pro Ala Val Asp His Thr Gly Tyr Thr Lys
            500                 505                 510

Gly Arg Ser Leu Tyr Glu His Gln Arg Ile Asn Ser Leu Arg Arg Leu
        515                 520                 525

Lys Val Arg Leu Gly Glu Gln Asp Glu Ser Leu Ala Asp Ala Ser Leu
    530                 535                 540

Tyr Leu Asp Arg Ala Met Asp Glu Ala Ile Glu Arg Met Ser Arg Ser
545                 550                 555                 560

Lys Ser Lys Lys Ser Ala Leu Pro Lys Thr Thr His Ala Ser Lys Ile
                565                 570                 575
```

```
Ala Lys Gln Arg Gly Val Gly Ser Glu Gly Pro Ser Thr Ile Val Ile
            580                 585                 590


Thr Ser Pro Lys Pro Ile Ser Glu Val Pro Lys Glu Val Ile Asp Ile
        595                 600                 605


Gly Thr Ala Ser Asp Asp Leu Ser Asp Ile Glu Gly Tyr
    610                 615                 620


<210>  1967
<211>  355
<212>  PRT
<213>  Vibrio splendidus strain UCD-SED10

<400>  1967

Met Asn Ile Leu Ser Glu Leu Gln Ile Glu Gln Tyr Thr Ser Phe Arg
1               5                   10                  15


Glu Cys Phe Leu Glu Tyr Pro Gln Leu Thr Glu Ile Tyr Asn Val Phe
            20                  25                  30


Asp Arg Met Val Leu Asn Ser Cys Leu Gly Gly Glu Gln Glu Ser Leu
        35                  40                  45


Leu Leu Thr Gly Asp Thr Gly Val Gly Lys Thr Ala Met Ile Asp Asn
    50                  55                  60


Tyr Val Ala Arg Phe Ala Ala Lys Gly Ser Arg Trp Ala Glu Met Pro
65                  70                  75                  80


Val Leu Lys Thr Arg Ile Pro Ser Lys Val Arg Glu Gln Asn Thr Leu
                85                  90                  95


Glu Arg Leu Leu Ile Asp Leu Asp Ser Arg Ala Ser Ser Arg Arg Arg
            100                 105                 110


Arg Pro Tyr Lys Glu Gly Ala Leu Glu Gln Gly Val Ile Lys Ser Leu
        115                 120                 125
```

```
Val Glu Lys Lys Val Lys Leu Val Ile Val Asn Glu Val Gln Glu Leu
    130                 135                 140

Met Glu Phe Lys Asp Ala Asn Glu Arg Gln Thr Ile Ala Asn Thr Phe
145                 150                 155                 160

Lys Met Ile Ser Glu Glu Ala Gln Val Ser Phe Val Leu Val Gly Met
                165                 170                 175

Pro Tyr Ala Thr Met Leu Ala Glu Glu Asp Gln Trp Asn Ser Arg Leu
            180                 185                 190

Gly Trp Lys Arg His Leu Ser Tyr Phe His Leu Ser Lys Leu Ser Glu
        195                 200                 205

Ala Asp Asn Lys Gly Tyr Ile Pro Asp Ala Glu Gly Lys Arg His Phe
    210                 215                 220

Ala Ser Phe Val Ala Gly Leu Ala Gly Arg Met Gly Phe Glu Lys Arg
225                 230                 235                 240

Pro Asn Leu Thr Gly Asp Glu Ile Leu Leu Pro Leu Phe Ser Val Cys
                245                 250                 255

Arg Gly Glu Cys Arg Val Leu Lys His Phe Leu Ala Asp Ala Leu Leu
            260                 265                 270

Asn Ala Leu Gln Ser Ser Lys Asp Thr Ile Asp Lys Pro Leu Leu Ser
        275                 280                 285

Ala Cys Phe Asp Thr Lys Tyr Pro Tyr Ala Lys Gln Asn Pro Phe Glu
    290                 295                 300

Cys Lys Leu Thr Glu Leu Lys Leu Val Glu Leu Lys Thr Glu Thr Ser
305                 310                 315                 320
```

Tyr Asn Lys Gly Ala Gln Phe Lys Glu Asp Arg Leu Ile Gly Arg Ser
325 330 335

Phe Thr Asp Leu Leu Pro Val His Met Leu Leu Ser Lys Thr Pro Leu
340 345 350

Lys Ala Gln
355

<210> 1968
<211> 403
<212> PRT
<213> Vibrio splendidus strain UCD-SED10

<400> 1968

Met Lys Thr Asp Ile Gln Leu Tyr Pro Asp Glu Ser Leu Glu Ser Phe
1 5 10 15

Leu Leu Arg Leu Ser Gln Glu Gln Gly Tyr Glu Arg Phe Ser His Phe
20 25 30

Ala Glu Asp Ile Trp Phe Asp Thr Met Asp Gln His Glu Ala Ile Ala
35 40 45

Gly Ala Phe Pro Leu Glu Leu Glu Arg Val Asn Ile Tyr His Ala Gln
50 55 60

Thr Thr Ser Gln Met Arg Val Arg Val Leu Ile His Leu Glu Asn Gln
65 70 75 80

Leu Lys Leu Asn Asn Phe Gly Val Leu Arg Leu Ala Leu Ser His Ser
85 90 95

Lys Ala Gln Phe Ser Pro Gln Tyr Lys Ala Val His Arg Phe Gly Val
100 105 110

Asp Tyr Pro Tyr Ala Phe Leu Arg Lys Arg Phe Thr Pro Ile Cys Pro
115 120 125

```
Leu Cys Ile Gly Glu Ala Pro Tyr Ile Arg Gln Gln Trp Gln Phe Ile
    130                 135                 140

Ser His Gln Ala Cys Glu His His Gly Cys Lys Leu Ile Tyr His Cys
145                 150                 155                 160

Pro Glu Cys Lys Ser Arg Leu Glu Tyr Gln Arg Thr Glu Ser Ser Ser
                165                 170                 175

Gln Cys Glu Cys Gly Phe Glu Leu Arg Asn Ser Pro Val Glu Asp Ala
            180                 185                 190

Pro Glu Ala Glu Thr Leu Val Ala Arg Trp Leu Ser Gly Asn Asp Ser
        195                 200                 205

Lys Pro Leu Gly Leu Leu Lys Ala Glu Met Thr Leu Ser Glu Arg Tyr
    210                 215                 220

Gly Phe Leu Leu Trp Tyr Val Asn Arg Tyr Gly Asp Ile Asp Gly Leu
225                 230                 235                 240

Cys Phe Glu Ser Phe Ile Glu Tyr Cys Gly Ser Trp Pro Thr Ser Leu
                245                 250                 255

Trp Gln Asp Phe Asp Val Leu Lys Glu Lys Thr Glu Leu Val Arg Ala
            260                 265                 270

Lys Asp Trp Lys Lys Met Phe Phe Asn Glu Ala Phe Gly Ala Leu Leu
        275                 280                 285

Lys Asp Cys Arg Gln Leu Pro Ser Arg Gln Leu Ser His Asn Ile Val
    290                 295                 300

Leu Thr Gln Val Leu Ala Tyr Phe Thr Gln Leu Met Ala Thr Val Ser
305                 310                 315                 320

Ser Ser Ala Lys Gly Asn Ile Gly Asp Val Leu Leu Ser Pro Leu Glu
```

```
                325                 330                 335

Ala Ser Thr Leu Leu Ser Cys Thr Thr Asp Glu Val Tyr Arg Leu Tyr
            340                 345                 350

Glu Phe Gly Glu Ile Lys Ala Ala Ile Arg Pro Arg Met His Thr Lys
        355                 360                 365

Ile Ala Ser His Glu Ser Ala Phe Thr Leu Arg Ser Ile Ile Glu Thr
    370                 375                 380

Lys Leu Thr Arg Met Ser Ser Glu Ser Asp Gly Leu Ser Val Tyr Leu
385                 390                 395                 400

Pro Glu Trp
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<210> 1969
<211> 695
<212> PRT
<213> Vibrio splendidus strain UCD-SED10

<400> 1969

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Met Thr Lys Leu Ser Asp Leu Leu Ala Ile Glu Asp Glu Val Val Lys
1               5                   10                  15

Gln Ala Ser Leu Lys Lys Met Phe Met Pro Tyr Thr Glu Asp Val Cys
            20                  25                  30

Val Glu Gly Phe Glu Lys Glu Ala Leu Thr Ile Leu Leu Asn Leu Ser
        35                  40                  45

Ser Ser His Gln Ala Asp Arg Cys Ser Asp Trp Leu Asp Val Ala Arg
    50                  55                  60

Ala Lys Arg Tyr Phe Lys Ala Ala Glu Asn Leu Asp Thr Ser Leu Asp
65                  70                  75                  80
```

```
Glu Ile Lys Trp Phe His Thr His Asn Leu Lys Phe Pro Asp Cys Arg
                85                  90                  95

Val Lys Asp Gln Arg Ile Ile Ala Gln Pro Leu Val Thr Thr Glu Ala
            100                 105                 110

Phe Ile Ser Ser Ala Ala Leu Glu Gln Arg Leu Gly Trp Ala His Asn
        115                 120                 125

Ser Ala Val Tyr Arg His Thr Leu Trp Leu Leu Asn Pro Phe Arg Trp
    130                 135                 140

Gln Ser Gln Ser Val Ser Leu Leu Ser Leu Ile Gln Gln Glu Thr Pro
145                 150                 155                 160

Val Trp Leu Glu Leu Leu Lys Gly Phe Gly Leu Gly Thr Lys Ser Leu
                165                 170                 175

Val Arg Leu Gln Asn Thr Met Ala Glu Gln Leu Pro Glu Asn Ser Leu
            180                 185                 190

Pro Asp Arg Val Ser Thr Tyr Ser Lys Gln Leu Arg Phe Pro Trp Gly
        195                 200                 205

Asp Asp Tyr Val Ser Val Thr Pro Val Val Ser His Ala Ile Gln Arg
    210                 215                 220

Glu Leu Glu Val Arg Ser Arg Ser Arg Glu Ser Lys Leu Ser Phe Val
225                 230                 235                 240

Ser Ser Ser Leu Pro Asn Ser Ala Ser Ile Gly Asn Leu Cys Gly Ser
                245                 250                 255

Leu Gly Gly His Met Lys Val Leu Asn Tyr Pro Leu Asp Val Lys Pro
            260                 265                 270

Ala Gln Gly Gly Thr Leu Thr Glu Ser Arg Lys Lys Ser Gly Cys Tyr
        275                 280                 285
```

```
Phe Asp Asp Tyr Gln Val Thr Asn Ala Lys Ile Cys Gln Val Leu Asn
    290                 295                 300

His Leu Ile Gly Ser Glu Pro Ser Lys Thr Gln Lys Gln Arg Glu Ile
305                 310                 315                 320

Ala Arg Lys Val Arg Ser Lys Ile Leu Arg Lys Gln Ile Ala Leu Trp
                325                 330                 335

Met Leu Pro Leu Ile Glu Leu Arg Asp Ile Val Asp Ala Asp Pro Asn
            340                 345                 350

Gln Gln Gln Leu Glu His Asp Asp Thr Leu Thr Gln Ala Phe Trp Ala
        355                 360                 365

Leu Pro Glu Ser Asp Leu Gly Ser Leu Ala Ser Glu Phe Asn Cys Arg
    370                 375                 380

Leu His Leu Ala Phe Gln Asn Asn Lys Phe Ala Ala Lys Phe Ala Tyr
385                 390                 395                 400

His Pro Lys Leu Met Gln Val Val Lys Ala Gln Ile Val Trp Val Leu
                405                 410                 415

Glu Gln Ile Ser Lys Pro Asn Gly Asn Glu Asp Lys Val Thr Gly Glu
            420                 425                 430

Gln Tyr Ile Tyr Leu Ser Ser Met Arg Val Gln Asp Ala Val Ala Met
        435                 440                 445

Ser Ser Pro Tyr Leu Cys Gly Ala Pro Ser Leu Thr Ala Ile Trp Gly
    450                 455                 460

Phe Met His Arg Tyr Gln Arg Glu Phe Asn Lys Leu Ala Asn Cys Asp
465                 470                 475                 480
```

```
Ser Leu Phe Glu Phe Ser Ser Phe Ser Phe Tyr Val Arg Ser Glu Asn
                485                 490                 495

Ile Gln Pro Thr Ala Lys Leu Thr Glu Pro Asn Ser Val Ala Lys Ala
            500                 505                 510

Arg Thr Val Ser Asn Ala Lys Arg Pro Thr Ile Arg Ser Glu Arg Leu
        515                 520                 525

Ala Asp Leu Glu Ile Asp Leu Val Ile Arg Val His Ser Asp Ser Arg
    530                 535                 540

Ile Ser Asp Phe Lys Ser Ala Leu Lys Thr Ala Leu Pro Val Val Phe
545                 550                 555                 560

Ser Gly Gly Ala Leu Tyr Gln Pro Gln Leu Ser Thr Gln Ile Glu Trp
                565                 570                 575

Leu Arg Thr Phe Thr Ser Arg Ser Glu Leu Phe His Val Ile Lys Gly
            580                 585                 590

Leu Pro Ala Tyr Gly Arg Trp Leu Tyr Pro Ser Glu Asn Gln Pro Ser
        595                 600                 605

Asp Phe Asp Glu Leu Glu Arg Phe Ile Thr Lys Asp Ala Asp Asn Leu
    610                 615                 620

Pro Val Ser Ile Gly Tyr His Leu Leu Glu Gln Pro Thr Lys Arg Gly
625                 630                 635                 640

Asn Ser Ile Thr Ser Cys His Ala Tyr Ala Glu Asn Ala Ile Gly Leu
                645                 650                 655

Ala Gln Arg Val Asn Pro Ile Glu Val Arg Phe Ser Gly Arg Asp His
            660                 665                 670

Phe Leu Asn His Ala Phe Trp Ser Ile Glu Cys Ser Ser Glu Thr Ile
        675                 680                 685
```

Leu Ile Lys Asn Tyr Arg Asp
690 695

<210> 1970
<211> 343
<212> PRT
<213> Vibrio splendidus strain UCD-SED10

<400> 1970

Met Glu Leu Cys Thr Gln Leu Asn Tyr Val Arg Ser Leu Ser Ala Gly
1 5 10 15

Lys Ala Tyr Phe Tyr His Leu Ser Lys Ser Gly Glu Met Cys Pro Leu
20 25 30

Glu Val Asp Arg Thr Arg Leu Arg Ala Pro Lys Gly Gly Tyr Ala Glu
35 40 45

Ala Tyr Lys Gly Gly Lys Phe Val Lys Lys Asn Val Ala Pro Gln Asp
50 55 60

Leu Ala Tyr Ser Asn Pro Gln Phe Ile Glu Glu Cys Tyr Val Lys Pro
65 70 75 80

Gly Val Asp Asp Ile Tyr Cys Ala Phe Pro Leu Arg Ile Arg Ala Asn
85 90 95

Ser Leu Thr Pro Glu Ile Cys Ser Asp Asp Glu Val Arg Ser Lys Leu
100 105 110

Ser Leu Leu Ala Asn Thr Tyr Lys Glu Leu Asn Gly Tyr Gln Glu Leu
115 120 125

Ala His Arg Tyr Ala Lys Asn Ile Leu Leu Gly Ser Trp Leu Trp Arg
130 135 140

Asn Arg Glu Cys Arg Lys Leu Leu Ile Glu Val Thr Thr Ser Asp Ser

```
145                 150                 155                 160

Gln Thr Leu Ile Val Glu Asn Ala Thr Lys Leu Ser Trp Tyr Gly His
                165                 170                 175

Trp Asp Glu Ala Ser Ala Glu Cys Leu Glu Lys Leu Thr Ala Tyr Leu
            180                 185                 190

Met Arg Ala Leu Ser Asn Pro Thr Glu Tyr Phe Tyr Met Asp Val Lys
        195                 200                 205

Ala Lys Ile Gly Val Gly Trp Gly Asp Glu Val Tyr Pro Ser Gln Glu
    210                 215                 220

Phe Leu Glu Ser Arg Glu Asp Gly Val Pro Thr Lys Gln Leu Ala Thr
225                 230                 235                 240

Val Glu Leu Leu Asp Gly Lys Glu Thr Val Ala Phe His Gly Gln Lys
                245                 250                 255

Val Gly Ala Ala Leu Gln Ser Ile Asp Asp Trp Trp His Glu Asn Ala
            260                 265                 270

Asp Lys Pro Leu Arg Val Asn Glu Tyr Gly Thr Asp Arg Glu Tyr Val
        275                 280                 285

Ile Ala Arg Arg His Val Ser Tyr Gly Asn Asp Phe Tyr Gln Leu Val
    290                 295                 300

Arg Asn Thr Glu Asn Trp Ile Glu Thr Met Thr Ala Ser Gln Thr Ile
305                 310                 315                 320

Pro Asn Asp Val His Phe Ile Met Ser Val Leu Ile Lys Gly Gly Leu
                325                 330                 335

Phe Asn Cys Ser Lys Ala Lys
            340
```

<210> 1971
<211> 201
<212> PRT
<213> Vibrio splendidus strain UCD-SED10

<400> 1971

```
Met Thr Thr Arg Tyr Tyr Phe Cys Ile Arg Tyr Thr Pro Val Gln Ala
1               5                   10                  15


Asp Tyr Glu Leu Leu Ala Gly Arg Cys Ile Ser Gln Met His Leu Phe
            20                  25                  30


Met Val Asn Asn Arg Gln Ala Ile Asn Lys Ile Gly Val Ser Phe Pro
        35                  40                  45


Asp Trp Ser Asp Val Thr Val Gly Gln Thr Ile Ala Phe Val Ala Glu
    50                  55                  60


Asp Lys Glu Met Met Val Gly Leu Ser Phe Gln Pro Tyr Phe Ser Leu
65                  70                  75                  80


Met Val Asn Glu Gly Leu Phe Glu Ile Ser Ser Val Cys Glu Val Pro
                85                  90                  95


Asp Thr Ala Ile Glu Val Arg Phe Thr Arg Asn Gln Thr Ile Gly Lys
            100                 105                 110


Ser Phe Leu Gly Ser Lys Lys Arg Arg Ile Lys Arg Ser Met Ala Arg
        115                 120                 125


Ala Glu Leu Ser Gly Val Glu Pro Ser Leu Pro Ala Thr Asn Glu Glu
    130                 135                 140


Arg Val Ile Asp Ser Phe His Arg Ile Pro Ile Ser Ser Gly Ser Ser
145                 150                 155                 160


Gly Glu Asp Tyr Met Leu Phe Val Gln Lys Glu Phe Val Gly Glu Arg
                165                 170                 175
```

Gly Thr Ala Asn Phe Asn Ser Tyr Gly Leu Ala Thr Asn Gln Glu Arg
180 185 190

Lys Gly Thr Val Pro Glu Leu Arg Phe
195 200

<210> 1972
<211> 2490
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1972
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aagaatgatt cgatcattcg tacagaatct atgcttgaat ttgatatgtg ctttcatctt 120

gaatattctc ctgatgttgt tagctttgaa tctcaacctc aaggctttca ttacgaatat 180

caaggaaaac gcctccccta tactccagat tttctcatta cacattcatc tggacagcaa 240

caattacttg aagttaaacc tctttctaaa acccaatgtc ctgattttca atcaaaattc 300

atccaaaaac agcaagcagc ccagaaatta aatctttcat taatccttat taccgaaaag 360

caaattagaa caggtcattt actcaacaac ttcaaacttc tgcatagata tgctggccta 420

catagtatat cggccactca aaaatcaatc attaacctca tccagacagt aaataaaatt 480

caaattaatc aaattgcaca caggttaaat atcagtaatg gagaggtatt agctggtgtt 540

ttaagttggc tatcaaaagg gacactgcaa acggtttaca caaatgaaat gattaatggc 600

aactctattg tatcgttagg tttatcaatg gatatagaat ttccatttac tgatgaattt 660

caaaaaatat taactactca atcctatcca gctgaaatca ctaatgataa aaaaacagaa 720

gtgcttacgc cttctcttga ttcatacgat gacgctataa aagcagaagt attgcgtcgt 780

atttcttttc ttaggtggat aaagcctcgt ttaaaaggtg gttggacaga aaaaaattta 840

acacctcttc ttaacgatgc tgaaattgat ttaaaagtga gcgcaccaaa atggcgaacc 900

cttgctgaat ggcataagaa ttatcacaaa agtggggaaa aggtatcctc tttaattcca 960

aagcactcac ataaaggtaa taaaaatatg aatactgata gcgatttttt gataacaaaa 1020

gcaattaacg aaaaatattt aacactaaac cgatgctcta tcagtcaaac ttttaagtac 1080

tattgtgatt tagtaataat tgaaaatcgc tctataccta caaagaaaat aaaactggtc 1140

agtcaacgta ctttttataa ccgaatcaat gcactaccta aatatgatgt cgctttaaag 1200

cgttacggaa aacgatatgc tgatattaat taccgcaccg tagataaaat gataacagca 1260

acaaggcctt tagaacgagt agaaatagac cacacgcctc ttgacttaat cttgctcgat 1320

gacactttag agataccatt aggtcgccca tacttaacaa ttttaataga tagctatagt 1380

aaatgcatcg tgggctacaa tcttagcttc aggcctccta gctttgaatc tattcgccat 1440

gctttttgta atgcatgcct tgataaatct ttaattacac agcaatatcc tcaccttcaa 1500

cacgattggc ctgttgcagg aaaaattgaa aatcttgttg ttgataatgg cgctgagttc 1560

tggagtaata gcttagaaga tagtttactg ccttttgcta ccaatatttt atataacaag 1620

gttggtgaac catggatgaa acctcttgtt gaaaagtttt ttgacctgtt aaataaaggc 1680

ttagtccatt ccctcccagg aacaactcgc tcaagaatag agcaactgaa aggttataat 1740

cctaaaaaag atgcagcgat tacattcagt ttatttttag aactatttca tacgtggatt 1800

atcgatatct atcatatgac ttccgataca agagagactg ctgttcctta ttttaaatgg 1860

caagaaggag taacggcttt acccccctctc acctatacag atgaagaggc tcaacaatta 1920

cgaatagagc ttggaatatt aaatactcga acggttcgtc ttggaggtat ttttcttcat 1980

ggattacgtt atgaatcaga agagttaagt gaatacagaa aaatttgggg ggctattgat 2040

aagaataacc taacgctgaa aacaaaaacc gacccttcag atatatcaca tatttttgtc 2100

tatttaacta atgaatcacg ctatattaaa gttccttgca taacagatat tagttataca 2160

tctggcctta cgttatttca gcatcaaacc gctcaaaaat tgcaaagaac taaaacaaga 2220

ttacaaatag atcatgaaaa actcgctgat tcacgtatgt atgttgaaaa tagaattgcg 2280

gaagaagtgg agaaaatcaa atctaataaa aaacgtactg cgaaaactac ccatgcatca 2340

aagatcgctc gacaccaaga tattggtagt catactcaaa agtcgattca agtacctaat 2400

gagcaaagtg aaatcaaaaa actgaataaa aatgaacatg atgttttaaa tggatgggat 2460

gaacaacatg atgatttaga gggattctga 2490

<210> 1973
<211> 1011
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1973
atgcacactt tatcttcgac tcaaaaagag caactcatca gctttaatca atgctttatt 60

gagtatccaa taattactca tatctactct atttttaatg atttacgaat gaatcaaggt 120

ttaggtgcag aaccacaatg tatgctctta cttggtgata ctggctcagg aaaatcagca 180

ctcattaata actatctgtt acgacaaccg ccatcaaatt tttccgcact cagttcatta 240

cccgttttac atacacgtat cccacgtaga gtgaataacg aacaaaccat gtatcaactg 300

ttaactgact taggacaatc accttcagga tcgagaagag caaaacgctc agaaatcgct 360

ctcgccgaag gagtcgttcg agctttaaag cgtaaaaaaa cagaactcat tattattaat 420

gaattccaag aactcatcga attttcaagt gctaaagaac gtcagaatgt cgctaacacg 480

cttaaataca ttagtgaaga agctagagta tcaattgtgt tagttggtat gccctatgca 540

gatattattg ctgaagagcc tcaatgggga tctcgcttaa catggaaaac acaaatcgaa 600

tatttttcat taaaaaatga catgaaaaca tatgttcaat tcctaaaagg cctagcaaat 660

cgaatgggat atgatgaggt gccatcattg catagcaagg agcttgctat tccactgttt 720

tcaatttgta ggggtgagct aaggcaactt aagaacttct gctctgatgc gatgctagaa 780

agctttaagc aaaacaaaaa cacactaact catgatgtat taagtgccac tttcaagtac 840

aaattcccaa cgaagaaaaa tccatttgaa atgaatgtag ctgacgttcc aattcaagag 900

gtagagtctt attcaaagta taatctaaac gcaatgactg atgatgaacg tcttactgca 960

actaagtttc ttgatgctat gtctttatct tcactgttga gtaagacttg a 1011

<210> 1974
<211> 1200
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1974
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agtcagaata attgctatga ttcatttcag gattttagcg atgaagtttg gtttcaagtc 120

aaagaagagg atcgtgaggt tcgaggaact ttccctgcaa ccctaaatac ggtaaatatc 180

tatcactctc acacatcaag tgacttaaag ctcaaagcac taattaaaat tgagcagtgg 240

cttgagataa ataactcccc tttattaaaa agcgccttaa gcagatcaag cagtactttc 300

ttacgccaac attctgctgt ttttagaaat ggtgttgata taccaagaat cctgctcaga 360

aaaaatggaa ttccagtatg ccctgagtgc ctaaaagaga acgaatacat acgtcaagaa 420

tggcacttca tcactcacga tgtatgcaca aggcataaaa taggtctatt acatcactgc 480

ccagagtgta aagcctctat caattatcaa aaaattgaaa acattacggt ttgtcagtgt 540

ggattcaaat tcagtgatca cttagctccg caagcaaata gcaatgcctt actcattgca 600

caatggctta acggcgaaaa tactaaatta gctaatattt ggggagaaca ccaagcaata 660

tcatctcgct ttggtgtctt actttggtat atcaatagat ataatctgac agatgatttt 720

tctacttcat ttgtaaaata ttcattgaat tggccctcga acttctattc cgaactcgat 780

gagcaaatag ataaagctaa aacagttcag attaaaccat ttaataagat atttttaat 840

gagatatttg ataacctgtt attagattgc caacgcttac ctacacgaga atttaaaacg 900

aatcccatat taagtcatgt atatcagtac tttctatctc gctaccaaat tcaacctaac 960

tctgatgtct tctcaatctt gctaagccca ttagaggcat cgagcttgct ttcttgcact 1020

accgatcaaa tctatcgttt atatgaatta ggttttctta aattaggcgt taggccaaaa 1080

ctgcatcaaa aaatagcaag tcaccaatca gtttttacac tctcaagtat tattctagtc 1140

aagctttcaa acatgcaatc cagtcaagat gaattgcatc actacctttc agcgtggtaa 1200

<210> 1975
<211> 2070
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1975
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gttgcatttg ctcactactc ttcagctatt tttattgatg atcatgaagt cgaagcgatt 120

acatgcctac ttaatttgtg tacgccaaaa acggaggatt acctagacaa aactagcgca 180

tctctgtttt taaataatca tgataatatt caaaagtgtc ttgacgaact taagtggttc 240

catagtcaca atgttaaata tccagattgc cgagttaagg ggcaaagcat tatttcttta 300

ccaatcgatt cagtaagtaa caccataaac agtaatgtag ttccttatcg attaggttgg 360

tctcatgaca gtggaaaggt taactatact cattttctac tctcttgctt taaatggaga 420

ggagtacaaa caactcttag tcaattattc ataaccgaca cgctgttttg gttagatatc 480

ataaaaaaaa tacaatgtaa ctggaccaag aaacaaactg agcaatttat tcattccata 540

caaaaagaaa tgcctgcaaa aacacttcca gaagatatca gcccatactc aaaacagatc 600

ttattcccat ataaaaatga ctatctaact ttaactcctg ttacttctaa ctcaattcaa 660

acatggttag aacaccaatc taggaaacct aatgatattc gttggattaa acgagaaagt 720

aagcaccctg ctagtgtagg cgctttatca tcttctatcg gtggttacca tagcttacta 780

tcttcgctac caagcacatc acaatcacca cactcgtatc acgataatat gactagcaaa 840

actgaatgta gagaagcttt ttgtgcttca gctatcactg agaaaagtac gactgacgca 900

ttacaaaggc tcatcagttc tgaagtaaga atgaatgtga aacatagaaa acaaatcaga 960

aaatcaggga ttcatttcat tagacaaaaa atagctcttt ggcttactcc tctgattcga 1020

tggagagatc atatagataa taaccagata caaatcacta atgaccatcc atcattagtt 1080

aacctattct tgtcgtctcc tattgctaat tttcccgatt tattaacacc attgcataat 1140

cacctaaatc aaactctagg aaataataaa tacacaaaac gctttgctta tcaccctgat 1200

ttaatgccta ttttcaaatc acaaatttca tggattctga ataaactaac acaagatgaa 1260

aatataaatc agcagcccgt tttaactaga acccaattta tccatcttaa aaatttaagg 1320

ctatacaatg gcaatgcgtt aagctccccc tatgtttgtg gactaccttc actaactggt 1380

ttttgggggt ttatgcatga cttcgaacga agattaaaaa caaagattga agaaaacatt 1440

cattttgaag ctttcagcct atttgttcat caatatgaat tacaatcatc tcctccgctc 1500

tgtgaagctt cggatgttta taaaaaaaga gaactatcac ctgcaaaacg tttattaacg 1560

caaccttctt attcttgtga tatgcgtttt gacctcatta tcaaagttca cactgaggtt 1620

aatttaagcg atattagtca acgtatgcaa tctgcaatgc ctgctcgttg tgttggtggt 1680

acgttacatc aaccttcgtt acatgaaagc ttagaatggc ttagaaccta tacatcgtct 1740

gagcatttat ttgaagaatt agcttgtctt cctaactctg gtcgttggat atacccacca 1800

tcggaaacat ttaacactcc agatgaattt ctttctatat tgggaaatag cacacacctt 1860

gctatttgta atggttattc atttcttgaa gatccaacat atagagagaa tgtgagcctt 1920

aatcaacacg tattttgtga acctttaatt ggattagcag agcaagtaat acctatagat 1980

atgagactta accgacaaaa acattatttt tcaaatgctt tttggtcgat caatagtgat 2040

ttcaattcta ttcttatttc aaaagcatga 2070

<210> 1976
<211> 1035
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1976
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tattatgaaa gtaaagatgg tcaaatgaat cctattaagt gtgagcaaac tcatttaaga 120

gcgcctaaag ctggattttc agaagctttt aatagcgatt actcaactaa aaacactgct 180

ccacaagatc tctcctttag taaccctcaa tttattgaag agtgttatgt tcctgttggt 240

attgatgaaa tcaaaattcg attttcatta cgtatagaag cgaattcatt acaaccagat 300

aaatgctctg atattcaaat tagagaaata ttgcaagctt tcgccactaa atataaagaa 360

aatggcggct atcaagaact tggtgaacga tacgcaaaaa acttactttc tggtacttgg 420

ctatggcgga atgagcataa tctaggtaca agtatttcaa taaaaacaac aagtaaccaa 480

gaatttaata tcaataatgc ctttaagcta tcaagaaaaa cctccgctaa agataaaaaa 540

acaatatcaa agttaggaag tgaaatcgca agtgcattat ctgaccctga ccattattac 600

tttgccgata taacagcaac aatcaatgtg gctttctgcc aagaaattta tcctagccaa 660

gagtttttag acactaaaga aaaagggaag ccaagcaaag tatatgcaaa aacgtcactt 720

caaactggtg aaaaaaccat tgcttttcat gcacaaaaga ttggagctgc aattcaactt 780

atcgacgatt ggtgggctga cgatgccgat attccattaa gagtaaatga gtttggtgct 840

gatcatcaca atgtcatagc cagaaggcac ccctcacatc gtaatgactt ttatacctta 900

attcaaaacg ctgataacta ctgcgcgcaa ctgaatgaaa attcagatat tactgatgat 960

atgcattacg ttatggctgt attagtaaaa ggaggactgt ttcaaaaaag tgcttcttca 1020

aaaaaaggaa agtag 1035

<210> 1977
<211> 642
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1977
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gcaggacgtt gcatcgctga atttcacaag tttatctcta gtctaaggct gatagaaaac 120

aactcttttg ccattggctt cccaaattgg tctgaacaaa gtattgggaa tgaatttgct 180

atttttctg ataactctga attattaagt gccattaagt accagcccta tttcaattta 240

atgaagagtg aggaattatt ttctattaca gatatcaagc ctgtgccaaa taatcttcct 300

caaataagat tcatcagaaa ccagtctatt gggaaaatat ttataggttc aaaaaaacgt 360

agaattcagc gttcaatcac aagaaataat aaagagcata cacctatatc aaatgaagac 420

agagagtttg ataccttcca caaagtgtcg tgctctagta aaagtaaaca gcaacaattt 480

atccttcata ttcaaaaaga tatcaccccg agaactacag actctaacga tagctacaat 540

agttatggct tagcgacaaa tagtaaacat ttaggcactg ttcctgattt atcaaaaata 600

ccttttttatt gcgaagacaa attatcaaat aaagatcaat ga 642

<210> 1978
<211> 28
<212> DNA
<213> Aliivibrio wodanis 06/09/160

<400> 1978
gtaacctgcc ggataggcag ccaagaat 28

<210> 1979
<211> 510
<212> DNA

<213> Aliivibrio wodanis 06/09/160

<220>
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<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1979
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tttgcaacat aagatcacat ggttttgcag tgatagtctg caaaatgttt taccttaaaa 120

tatgactgta attttagtat gtaatttaat ttcatgtgtt attaataaat gtaacttttt 180

tttggacaga accttcttag agtagccact taaattagat aaatacagat aacttttgta 240

tcataaaatc nnnnnnnnnn acaacatcag gagaatattc aagatgaaag cacatatcaa 300

attcaagcat agattctgta cgaatgatcg aatcattctt caggctcata aatttgctaa 360

tgtttttac ttgagattgt tttagtgtac gaacgtacat gatattcacc tctatgttgt 420

aaacttacaa ctaaaggtag tttatgcagg cttattttgc aaatttgtag acttctttgc 480

aatttatgca gagtaatttt gcaagcatca 510

<210> 1980
<211> 829
<212> PRT
<213> Aliivibrio wodanis 06/09/160

<400> 1980

Met Tyr Val Arg Thr Leu Lys Gln Ser Gln Val Lys Asn Ile Ser Lys
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Phe Met Ser Leu Lys Asn Asp Ser Ile Ile Arg Thr Glu Ser Met Leu
            20   25   30

Glu Phe Asp Met Cys Phe His Leu Glu Tyr Ser Pro Asp Val Val Ser
        35   40   45

Phe Glu Ser Gln Pro Gln Gly Phe His Tyr Glu Tyr Gln Gly Lys Arg
    50   55   60

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Leu Pro Tyr Thr Pro Asp Phe Leu Ile Thr His Ser Ser Gly Gln Gln
65                  70                  75                  80

Gln Leu Leu Glu Val Lys Pro Leu Ser Lys Thr Gln Cys Pro Asp Phe
                85                  90                  95

Gln Ser Lys Phe Ile Gln Lys Gln Gln Ala Ala Gln Lys Leu Asn Leu
            100                 105                 110

Ser Leu Ile Leu Ile Thr Glu Lys Gln Ile Arg Thr Gly His Leu Leu
        115                 120                 125

Asn Asn Phe Lys Leu Leu His Arg Tyr Ala Gly Leu His Ser Ile Ser
    130                 135                 140

Ala Thr Gln Lys Ser Ile Ile Asn Leu Ile Gln Thr Val Asn Lys Ile
145                 150                 155                 160

Gln Ile Asn Gln Ile Ala His Arg Leu Asn Ile Ser Asn Gly Glu Val
                165                 170                 175

Leu Ala Gly Val Leu Ser Trp Leu Ser Lys Gly Thr Leu Gln Thr Val
            180                 185                 190

Tyr Thr Asn Glu Met Ile Asn Gly Asn Ser Ile Val Ser Leu Gly Leu
        195                 200                 205

Ser Met Asp Ile Glu Phe Pro Phe Thr Asp Glu Phe Gln Lys Ile Leu
    210                 215                 220

Thr Thr Gln Ser Tyr Pro Ala Glu Ile Thr Asn Asp Lys Lys Thr Glu
225                 230                 235                 240

Val Leu Thr Pro Ser Leu Asp Ser Tyr Asp Asp Ala Ile Lys Ala Glu
                245                 250                 255

Val Leu Arg Arg Ile Ser Phe Leu Arg Trp Ile Lys Pro Arg Leu Lys
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            260                 265                 270

Gly Gly Trp Thr Glu Lys Asn Leu Thr Pro Leu Leu Asn Asp Ala Glu
        275                 280                 285

Ile Asp Leu Lys Val Ser Ala Pro Lys Trp Arg Thr Leu Ala Glu Trp
    290                 295                 300

His Lys Asn Tyr His Lys Ser Gly Glu Lys Val Ser Ser Leu Ile Pro
305                 310                 315                 320

Lys His Ser His Lys Gly Asn Lys Asn Met Asn Thr Asp Ser Asp Phe
                325                 330                 335

Leu Ile Thr Lys Ala Ile Asn Glu Lys Tyr Leu Thr Leu Asn Arg Cys
            340                 345                 350

Ser Ile Ser Gln Thr Phe Lys Tyr Tyr Cys Asp Leu Val Ile Ile Glu
        355                 360                 365

Asn Arg Ser Ile Pro Thr Lys Lys Ile Lys Leu Val Ser Gln Arg Thr
    370                 375                 380

Phe Tyr Asn Arg Ile Asn Ala Leu Pro Lys Tyr Asp Val Ala Leu Lys
385                 390                 395                 400

Arg Tyr Gly Lys Arg Tyr Ala Asp Ile Asn Tyr Arg Thr Val Asp Lys
                405                 410                 415

Met Ile Thr Ala Thr Arg Pro Leu Glu Arg Val Glu Ile Asp His Thr
            420                 425                 430

Pro Leu Asp Leu Ile Leu Leu Asp Asp Thr Leu Glu Ile Pro Leu Gly
        435                 440                 445

Arg Pro Tyr Leu Thr Ile Leu Ile Asp Ser Tyr Ser Lys Cys Ile Val
    450                 455                 460
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Gly Tyr Asn Leu Ser Phe Arg Pro Pro Ser Phe Glu Ser Ile Arg His
465                 470                 475                 480


Ala Phe Cys Asn Ala Cys Leu Asp Lys Ser Leu Ile Thr Gln Gln Tyr
                485                 490                 495


Pro His Leu Gln His Asp Trp Pro Val Ala Gly Lys Ile Glu Asn Leu
            500                 505                 510


Val Val Asp Asn Gly Ala Glu Phe Trp Ser Asn Ser Leu Glu Asp Ser
        515                 520                 525


Leu Leu Pro Phe Ala Thr Asn Ile Leu Tyr Asn Lys Val Gly Glu Pro
    530                 535                 540


Trp Met Lys Pro Leu Val Glu Lys Phe Phe Asp Leu Leu Asn Lys Gly
545                 550                 555                 560


Leu Val His Ser Leu Pro Gly Thr Thr Arg Ser Arg Ile Glu Gln Leu
                565                 570                 575


Lys Gly Tyr Asn Pro Lys Lys Asp Ala Ala Ile Thr Phe Ser Leu Phe
            580                 585                 590


Leu Glu Leu Phe His Thr Trp Ile Ile Asp Ile Tyr His Met Thr Ser
        595                 600                 605


Asp Thr Arg Glu Thr Ala Val Pro Tyr Phe Lys Trp Gln Glu Gly Val
    610                 615                 620


Thr Ala Leu Pro Pro Leu Thr Tyr Thr Asp Glu Glu Ala Gln Gln Leu
625                 630                 635                 640


Arg Ile Glu Leu Gly Ile Leu Asn Thr Arg Thr Val Arg Leu Gly Gly
                645                 650                 655


Ile Phe Leu His Gly Leu Arg Tyr Glu Ser Glu Glu Leu Ser Glu Tyr
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            660                 665                 670

Arg Lys Ile Trp Gly Ala Ile Asp Lys Asn Asn Leu Thr Leu Lys Thr
        675                 680                 685

Lys Thr Asp Pro Ser Asp Ile Ser His Ile Phe Val Tyr Leu Thr Asn
    690                 695                 700

Glu Ser Arg Tyr Ile Lys Val Pro Cys Ile Thr Asp Ile Ser Tyr Thr
705                 710                 715                 720

Ser Gly Leu Thr Leu Phe Gln His Gln Thr Ala Gln Lys Leu Gln Arg
                725                 730                 735

Thr Lys Thr Arg Leu Gln Ile Asp His Glu Lys Leu Ala Asp Ser Arg
            740                 745                 750

Met Tyr Val Glu Asn Arg Ile Ala Glu Glu Val Glu Lys Ile Lys Ser
        755                 760                 765

Asn Lys Lys Arg Thr Ala Lys Thr Thr His Ala Ser Lys Ile Ala Arg
    770                 775                 780

His Gln Asp Ile Gly Ser His Thr Gln Lys Ser Ile Gln Val Pro Asn
785                 790                 795                 800

Glu Gln Ser Glu Ile Lys Lys Leu Asn Lys Asn Glu His Asp Val Leu
                805                 810                 815

Asn Gly Trp Asp Glu Gln His Asp Asp Leu Glu Gly Phe
            820                 825
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<210> 1981
<211> 336
<212> PRT
<213> Aliivibrio wodanis 06/09/160

<400> 1981

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Met His Thr Leu Ser Ser Thr Gln Lys Glu Gln Leu Ile Ser Phe Asn
1               5                  10                  15

Gln Cys Phe Ile Glu Tyr Pro Ile Ile Thr His Ile Tyr Ser Ile Phe
            20                  25                  30

Asn Asp Leu Arg Met Asn Gln Gly Leu Gly Ala Glu Pro Gln Cys Met
        35                  40                  45

Leu Leu Leu Gly Asp Thr Gly Ser Gly Lys Ser Ala Leu Ile Asn Asn
    50                  55                  60

Tyr Leu Leu Arg Gln Pro Pro Ser Asn Phe Ser Ala Leu Ser Ser Leu
65                  70                  75                  80

Pro Val Leu His Thr Arg Ile Pro Arg Arg Val Asn Asn Glu Gln Thr
                85                  90                  95

Met Tyr Gln Leu Leu Thr Asp Leu Gly Gln Ser Pro Ser Gly Ser Arg
            100                 105                 110

Arg Ala Lys Arg Ser Glu Ile Ala Leu Ala Glu Gly Val Val Arg Ala
        115                 120                 125

Leu Lys Arg Lys Lys Thr Glu Leu Ile Ile Ile Asn Glu Phe Gln Glu
    130                 135                 140

Leu Ile Glu Phe Ser Ser Ala Lys Glu Arg Gln Asn Val Ala Asn Thr
145                 150                 155                 160

Leu Lys Tyr Ile Ser Glu Glu Ala Arg Val Ser Ile Val Leu Val Gly
                165                 170                 175

Met Pro Tyr Ala Asp Ile Ile Ala Glu Glu Pro Gln Trp Gly Ser Arg
            180                 185                 190

Leu Thr Trp Lys Thr Gln Ile Glu Tyr Phe Ser Leu Lys Asn Asp Met
        195                 200                 205
```

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Lys Thr Tyr Val Gln Phe Leu Lys Gly Leu Ala Asn Arg Met Gly Tyr
    210                 215                 220

Asp Glu Val Pro Ser Leu His Ser Lys Glu Leu Ala Ile Pro Leu Phe
225                 230                 235                 240

Ser Ile Cys Arg Gly Glu Leu Arg Gln Leu Lys Asn Phe Cys Ser Asp
                245                 250                 255

Ala Met Leu Glu Ser Phe Lys Gln Asn Lys Asn Thr Leu Thr His Asp
            260                 265                 270

Val Leu Ser Ala Thr Phe Lys Tyr Lys Phe Pro Thr Lys Lys Asn Pro
        275                 280                 285

Phe Glu Met Asn Val Ala Asp Val Pro Ile Gln Glu Val Glu Ser Tyr
    290                 295                 300

Ser Lys Tyr Asn Leu Asn Ala Met Thr Asp Asp Glu Arg Leu Thr Ala
305                 310                 315                 320

Thr Lys Phe Leu Asp Ala Met Ser Leu Ser Ser Leu Leu Ser Lys Thr
                325                 330                 335
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<210> 1982
<211> 399
<212> PRT
<213> Aliivibrio wodanis 06/09/160

<400> 1982

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Met Leu Asn Pro Ile Glu Leu Tyr Glu Asp Glu Ser Leu Glu Ser Cys
1               5                   10                  15

Leu Leu Arg Ile Ser Gln Asn Asn Cys Tyr Asp Ser Phe Gln Asp Phe
            20                  25                  30

Ser Asp Glu Val Trp Phe Gln Val Lys Glu Glu Asp Arg Glu Val Arg
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```
        35                  40                  45

Gly Thr Phe Pro Ala Thr Leu Asn Thr Val Asn Ile Tyr His Ser His
    50                  55                  60

Thr Ser Ser Asp Leu Lys Leu Lys Ala Leu Ile Lys Ile Glu Gln Trp
65                  70                  75                  80

Leu Glu Ile Asn Asn Ser Pro Leu Leu Lys Ser Ala Leu Ser Arg Ser
                85                  90                  95

Ser Ser Thr Phe Leu Arg Gln His Ser Ala Val Phe Arg Asn Gly Val
            100                 105                 110

Asp Ile Pro Arg Ile Leu Leu Arg Lys Asn Gly Ile Pro Val Cys Pro
        115                 120                 125

Glu Cys Leu Lys Glu Asn Glu Tyr Ile Arg Gln Glu Trp His Phe Ile
    130                 135                 140

Thr His Asp Val Cys Thr Arg His Lys Ile Gly Leu Leu His His Cys
145                 150                 155                 160

Pro Glu Cys Lys Ala Ser Ile Asn Tyr Gln Lys Ile Glu Asn Ile Thr
                165                 170                 175

Val Cys Gln Cys Gly Phe Lys Phe Ser Asp His Leu Ala Pro Gln Ala
            180                 185                 190

Asn Ser Asn Ala Leu Leu Ile Ala Gln Trp Leu Asn Gly Glu Asn Thr
        195                 200                 205

Lys Leu Ala Asn Ile Trp Gly Glu His Gln Ala Ile Ser Ser Arg Phe
    210                 215                 220

Gly Val Leu Leu Trp Tyr Ile Asn Arg Tyr Asn Leu Thr Asp Asp Phe
225                 230                 235                 240
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Ser Thr Ser Phe Val Lys Tyr Ser Leu Asn Trp Pro Ser Asn Phe Tyr
                245                 250                 255


Ser Glu Leu Asp Glu Gln Ile Asp Lys Ala Lys Thr Val Gln Ile Lys
            260                 265                 270


Pro Phe Asn Lys Ile Phe Phe Asn Glu Ile Phe Asp Asn Leu Leu Leu
        275                 280                 285


Asp Cys Gln Arg Leu Pro Thr Arg Glu Phe Lys Thr Asn Pro Ile Leu
    290                 295                 300


Ser His Val Tyr Gln Tyr Phe Leu Ser Arg Tyr Gln Ile Gln Pro Asn
305                 310                 315                 320


Ser Asp Val Phe Ser Ile Leu Leu Ser Pro Leu Glu Ala Ser Ser Leu
                325                 330                 335


Leu Ser Cys Thr Thr Asp Gln Ile Tyr Arg Leu Tyr Glu Leu Gly Phe
            340                 345                 350


Leu Lys Leu Gly Val Arg Pro Lys Leu His Gln Lys Ile Ala Ser His
        355                 360                 365


Gln Ser Val Phe Thr Leu Ser Ser Ile Ile Leu Val Lys Leu Ser Asn
    370                 375                 380


Met Gln Ser Ser Gln Asp Glu Leu His His Tyr Leu Ser Ala Trp
385                 390                 395


<210>  1983
<211>  689
<212>  PRT
<213>  Aliivibrio wodanis 06/09/160

<400>  1983

Met Glu Phe Thr Asp Ile Leu Ile Ile Gln Asp Val Lys Glu Arg Asn
1               5                   10                  15
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Arg Ala Phe Lys Val Ala Phe Ala His Tyr Ser Ser Ala Ile Phe Ile
            20                  25                  30

Asp Asp His Glu Val Glu Ala Ile Thr Cys Leu Leu Asn Leu Cys Thr
        35                  40                  45

Pro Lys Thr Glu Asp Tyr Leu Asp Lys Thr Ser Ala Ser Leu Phe Leu
    50                  55                  60

Asn Asn His Asp Asn Ile Gln Lys Cys Leu Asp Glu Leu Lys Trp Phe
65                  70                  75                  80

His Ser His Asn Val Lys Tyr Pro Asp Cys Arg Val Lys Gly Gln Ser
                85                  90                  95

Ile Ile Ser Leu Pro Ile Asp Ser Val Ser Asn Thr Ile Asn Ser Asn
            100                 105                 110

Val Val Pro Tyr Arg Leu Gly Trp Ser His Asp Ser Gly Lys Val Asn
        115                 120                 125

Tyr Thr His Phe Leu Leu Ser Cys Phe Lys Trp Arg Gly Val Gln Thr
    130                 135                 140

Thr Leu Ser Gln Leu Phe Ile Thr Asp Thr Leu Phe Trp Leu Asp Ile
145                 150                 155                 160

Ile Lys Lys Ile Gln Cys Asn Trp Thr Lys Lys Gln Thr Glu Gln Phe
                165                 170                 175

Ile His Ser Ile Gln Lys Glu Met Pro Ala Lys Thr Leu Pro Glu Asp
            180                 185                 190

Ile Ser Pro Tyr Ser Lys Gln Ile Leu Phe Pro Tyr Lys Asn Asp Tyr
        195                 200                 205
```

```
Leu Thr Leu Thr Pro Val Thr Ser Asn Ser Ile Gln Thr Trp Leu Glu
    210                 215                 220

His Gln Ser Arg Lys Pro Asn Asp Ile Arg Trp Ile Lys Arg Glu Ser
225                 230                 235                 240

Lys His Pro Ala Ser Val Gly Ala Leu Ser Ser Ser Ile Gly Gly Tyr
                245                 250                 255

His Ser Leu Leu Ser Ser Leu Pro Ser Thr Ser Gln Ser Pro His Ser
            260                 265                 270

Tyr His Asp Asn Met Thr Ser Lys Thr Glu Cys Arg Glu Ala Phe Cys
        275                 280                 285

Ala Ser Ala Ile Thr Glu Lys Ser Thr Thr Asp Ala Leu Gln Arg Leu
    290                 295                 300

Ile Ser Ser Glu Val Arg Met Asn Val Lys His Arg Lys Gln Ile Arg
305                 310                 315                 320

Lys Ser Gly Ile His Phe Ile Arg Gln Lys Ile Ala Leu Trp Leu Thr
                325                 330                 335

Pro Leu Ile Arg Trp Arg Asp His Ile Asp Asn Asn Gln Ile Gln Ile
            340                 345                 350

Thr Asn Asp His Pro Ser Leu Val Asn Leu Phe Leu Ser Ser Pro Ile
        355                 360                 365

Ala Asn Phe Pro Asp Leu Leu Thr Pro Leu His Asn His Leu Asn Gln
    370                 375                 380

Thr Leu Gly Asn Asn Lys Tyr Thr Lys Arg Phe Ala Tyr His Pro Asp
385                 390                 395                 400

Leu Met Pro Ile Phe Lys Ser Gln Ile Ser Trp Ile Leu Asn Lys Leu
                405                 410                 415
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Thr Gln Asp Glu Asn Ile Asn Gln Gln Pro Val Leu Thr Arg Thr Gln
            420                 425                 430

Phe Ile His Leu Lys Asn Leu Arg Leu Tyr Asn Gly Asn Ala Leu Ser
        435                 440                 445

Ser Pro Tyr Val Cys Gly Leu Pro Ser Leu Thr Gly Phe Trp Gly Phe
    450                 455                 460

Met His Asp Phe Glu Arg Arg Leu Lys Thr Lys Ile Glu Glu Asn Ile
465                 470                 475                 480

His Phe Glu Ala Phe Ser Leu Phe Val His Gln Tyr Glu Leu Gln Ser
                485                 490                 495

Ser Pro Pro Leu Cys Glu Ala Ser Asp Val Tyr Lys Lys Arg Glu Leu
            500                 505                 510

Ser Pro Ala Lys Arg Leu Leu Thr Gln Pro Ser Tyr Ser Cys Asp Met
        515                 520                 525

Arg Phe Asp Leu Ile Ile Lys Val His Thr Glu Val Asn Leu Ser Asp
    530                 535                 540

Ile Ser Gln Arg Met Gln Ser Ala Met Pro Ala Arg Cys Val Gly Gly
545                 550                 555                 560

Thr Leu His Gln Pro Ser Leu His Glu Ser Leu Glu Trp Leu Arg Thr
                565                 570                 575

Tyr Thr Ser Ser Glu His Leu Phe Glu Glu Leu Ala Cys Leu Pro Asn
            580                 585                 590

Ser Gly Arg Trp Ile Tyr Pro Pro Ser Glu Thr Phe Asn Thr Pro Asp
        595                 600                 605
```

```
Glu Phe Leu Ser Ile Leu Gly Asn Ser Thr His Leu Ala Ile Cys Asn
    610                 615                 620

Gly Tyr Ser Phe Leu Glu Asp Pro Thr Tyr Arg Glu Asn Val Ser Leu
625                 630                 635                 640

Asn Gln His Val Phe Cys Glu Pro Leu Ile Gly Leu Ala Glu Gln Val
                645                 650                 655

Ile Pro Ile Asp Met Arg Leu Asn Arg Gln Lys His Tyr Phe Ser Asn
            660                 665                 670

Ala Phe Trp Ser Ile Asn Ser Asp Phe Asn Ser Ile Leu Ile Ser Lys
        675                 680                 685

Ala
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<210> 1984
<211> 344
<212> PRT
<213> Aliivibrio wodanis 06/09/160

<400> 1984

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Met Lys Leu Cys Asn Asn Leu Asn Tyr Thr Arg Ser Leu Ser Pro Gly
1               5                   10                  15

Lys Ala Val Phe Tyr Tyr Glu Ser Lys Asp Gly Gln Met Asn Pro Ile
            20                  25                  30

Lys Cys Glu Gln Thr His Leu Arg Ala Pro Lys Ala Gly Phe Ser Glu
        35                  40                  45

Ala Phe Asn Ser Asp Tyr Ser Thr Lys Asn Thr Ala Pro Gln Asp Leu
    50                  55                  60

Ser Phe Ser Asn Pro Gln Phe Ile Glu Glu Cys Tyr Val Pro Val Gly
65                  70                  75                  80
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```
Ile Asp Glu Ile Lys Ile Arg Phe Ser Leu Arg Ile Glu Ala Asn Ser
                85                  90                  95

Leu Gln Pro Asp Lys Cys Ser Asp Ile Gln Ile Arg Glu Ile Leu Gln
            100                 105                 110

Ala Phe Ala Thr Lys Tyr Lys Glu Asn Gly Gly Tyr Gln Glu Leu Gly
        115                 120                 125

Glu Arg Tyr Ala Lys Asn Leu Leu Ser Gly Thr Trp Leu Trp Arg Asn
    130                 135                 140

Glu His Asn Leu Gly Thr Ser Ile Ser Ile Lys Thr Thr Ser Asn Gln
145                 150                 155                 160

Glu Phe Asn Ile Asn Asn Ala Phe Lys Leu Ser Arg Lys Thr Ser Ala
                165                 170                 175

Lys Asp Lys Lys Thr Ile Ser Lys Leu Gly Ser Glu Ile Ala Ser Ala
            180                 185                 190

Leu Ser Asp Pro Asp His Tyr Tyr Phe Ala Asp Ile Thr Ala Thr Ile
        195                 200                 205

Asn Val Ala Phe Cys Gln Glu Ile Tyr Pro Ser Gln Glu Phe Leu Asp
    210                 215                 220

Thr Lys Glu Lys Gly Lys Pro Ser Lys Val Tyr Ala Lys Thr Ser Leu
225                 230                 235                 240

Gln Thr Gly Glu Lys Thr Ile Ala Phe His Ala Gln Lys Ile Gly Ala
                245                 250                 255

Ala Ile Gln Leu Ile Asp Asp Trp Trp Ala Asp Asp Ala Asp Ile Pro
            260                 265                 270

Leu Arg Val Asn Glu Phe Gly Ala Asp His His Asn Val Ile Ala Arg
```

```
        275                 280                 285

Arg His Pro Ser His Arg Asn Asp Phe Tyr Thr Leu Ile Gln Asn Ala
    290                 295                 300

Asp Asn Tyr Cys Ala Gln Leu Asn Glu Asn Ser Asp Ile Thr Asp Asp
305                 310                 315                 320

Met His Tyr Val Met Ala Val Leu Val Lys Gly Gly Leu Phe Gln Lys
                325                 330                 335

Ser Ala Ser Ser Lys Lys Gly Lys
            340
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<210> 1985
<211> 213
<212> PRT
<213> Aliivibrio wodanis 06/09/160

<400> 1985

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Met Leu Thr His Tyr Phe Ser Ile Thr Tyr Val Pro Asp Asp Cys Asp
1               5                   10                  15

Asn Glu Leu Leu Ala Gly Arg Cys Ile Ala Glu Phe His Lys Phe Ile
            20                  25                  30

Ser Ser Leu Arg Leu Ile Glu Asn Asn Ser Phe Ala Ile Gly Phe Pro
        35                  40                  45

Asn Trp Ser Glu Gln Ser Ile Gly Asn Glu Phe Ala Ile Phe Ser Asp
    50                  55                  60

Asn Ser Glu Leu Leu Ser Ala Ile Lys Tyr Gln Pro Tyr Phe Asn Leu
65                  70                  75                  80

Met Lys Ser Glu Glu Leu Phe Ser Ile Thr Asp Ile Lys Pro Val Pro
                85                  90                  95
```

```
Asn Asn Leu Pro Gln Ile Arg Phe Ile Arg Asn Gln Ser Ile Gly Lys
            100                 105                 110

Ile Phe Ile Gly Ser Lys Lys Arg Arg Ile Gln Arg Ser Ile Thr Arg
        115                 120                 125

Asn Asn Lys Glu His Thr Pro Ile Ser Asn Glu Asp Arg Glu Phe Asp
    130                 135                 140

Thr Phe His Lys Val Ser Cys Ser Ser Lys Ser Lys Gln Gln Gln Phe
145                 150                 155                 160

Ile Leu His Ile Gln Lys Asp Ile Thr Pro Arg Thr Thr Asp Ser Asn
                165                 170                 175

Asp Ser Tyr Asn Ser Tyr Gly Leu Ala Thr Asn Ser Lys His Leu Gly
            180                 185                 190

Thr Val Pro Asp Leu Ser Lys Ile Pro Phe Tyr Cys Glu Asp Lys Leu
        195                 200                 205

Ser Asn Lys Asp Gln
    210
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<210> 1986
<211> 2454
<212> DNA
<213> Parashewanella spongiae strain HJ039

<400> 1986

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aacttcaaaa atcctaacag tgaaaaacga attgctgagt ctcacaatga atttttagct      120

gctcattttc tgaattattt tcctattgtt aagtctttcc agttccagcc attagctttt      180

gattatgaaa atcaagatga aatacattca tacactagtg attttctagt agaactagaa      240

acaggaaaat ttgtttatat agaagtaaaa gaagagaaag cattatattc agaagacttt      300

aaatcaattt ttgaagctaa aagagcagct gcaagacagt taaataaaga attaattctt      360
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attacagaga accagtacaa catccctcct cgaatagaca atataaaatc tcttttgaac 420

gttggaggtt tttgggctga cgacaatata tctaacctag tggttggtat agtaaaaaaa 480

agtgaaacga tcgatataga gggtattgct tatcatttaa gtcaattttc tagagaggaa 540

atctttaaag caatacgtat attgattcta aaacgagaga tatattttga tttatctagt 600

tctgaactca catttgattc gaaagtatca agcgatacta cgcaatacaa taatgcagag 660

tttttcattg atgaattcgt tgagtttgat ttcaacaaaa agccggcaaa aaatgaggtg 720

aaattatttc caaaagatat ggatattttc cctgaaaagt ataaacaaga agctctagct 780

aagaagcgct atattaaatg ggttgaacgt aagctcgtag gaaagtggac agaaaagaat 840

ataaatttac ttttacatga aataccaaat tttggggtta atccgacacc gtgttcgaga 900

agtataatgc gttggaaaga tgcgtacacg aaaggaagtc gaaaactaat agctcttgtt 960

cccaagcatg tgtctaaagg caggactatt gctgtcagtg aacatgacga gtttatcgaa 1020

catggaatca gtaactatct aactgaacta agattatcaa ttaatgaatg ttataagaaa 1080

tatgaaacac aactgcgaac taataccgac ttagaacctg tcagttataa tacttttaag 1140

ttgcgcatag ataaattgcc taagtacgat gttaaatgtg cgagagaagg gaaagcagct 1200

gctgatatag actttaacaa ttatgacgaa cattgcccac ccaaaaggct ttacgaacaa 1260

gtagaaatag accatacggt attgactgtt attttgcttg attctgagta tttatttcca 1320

attggtaggc caaccttaac cgttttaatt gataaattaa gtcattgtat ttgtggtttt 1380

tatgttagct atgaacctcc atcttacaat agtgctaggc aggcaattct tcacagtatc 1440

aagcctaaag attatattaa aaacttatat ccttcgataa aaaacgagtg gaactgtcac 1500

ggaaaaattg aaaatttgat agtcgataac ggtgccgaat tttggagtac caatttagag 1560

gttgcttgcg agaattggat gaacattcag tttaatcctg tagggaaacc ttggaagaag 1620

gcatttgttg agaggtttat tggaactact tgccgtgaat ttactgcacg gtttaaagga 1680

aaaacatttt ctaatatttt agagaaaatg aaatacgatc ctaaaaaaga tgctgtcatg 1740

aggtttgatt tgtttcttga gctatttcat aagtggatta tcgatgatta tcatcaaaga 1800

gcagacagta gattcaaata cattccaaat gagctctggc agaaaaatta tcttaaaagc 1860

ccagttttaa agttagatca agctgaggaa gaaaaactgg aaaatgactt cctttgtact 1920

gaatggcgtg agtggcgaaa gggtggaata catatattta atcttcgtta tgatagcgaa 1980

tatctttcaa aggtgagaaa acagtacgtt aaggaaggaa atgataaaaa acagaagatt 2040

ttagttaaat actctcctga aaatattaat actattagaa tttacattga agacttaggt 2100

aaatacatcg aagtcccttg tgtggatagc gtaggttata caaaaggtct atccctattt 2160

aatcatcagg taaaccttag agttcatcga acttacatta aatcgaaaat tgatgtcgtg 2220

tcattagcag aagtaagaaa atatgttaat gatcgtgttg aagaagaaga ggagtttgta 2280

gaaaagggta gaaagaagaa cctttcggcc aataaagcaa gatcgaggta taaatcaata 2340

aacagtaaaa acagtataag taaaaaagac aataaatttg aagatattga aaaaagtgaa 2400

gatgcttcac ctgaagattg gaataacttc gctgaaggtt tggagggttt ctaa 2454

<210> 1987
<211> 1131
<212> DNA
<213> Parashewanella spongiae strain HJ039

<400> 1987
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ttaggcggcg aacaattgtg catgttgatt tatggcgacg aaggaagcgg aaaaaaatct 180

attataaagg cttatgaaga taaatgtaaa aatgaagagg ttattgatga agggaaattt 240

aaagtacccg ttttattttc tgaagtgaaa ctgccaataa ctgtgaactc attctttacg 300

caacttctta tagatttagg tgagttcgct ggggcatata gaaaagctga gggtaagaat 360

aagaataagg atatgagtaa acagctagaa gatatattga aagaacgcct tataaagctt 420

gaaactgaac tcattataat ttacaaattt gaactgttat tgcaatttga taaaaaaatg 480

aggatagatg agcttgcaaa ccaattaaaa agcatggctc aagagcttgg aatccctttg 540

gtgatcatcg gaatgccatg tatcaaaagg ttgatgttaa cttcaggatg gagaagctat 600

attcatattt gtcggttaat tccatatttc aaattaagta atgaacttga aaaggcattt 660

tacgttaagg ttatcaaggg gctttcgaat agagcccaaa aactattttc ttttgcacca 720

aaattagagg ataaaagcat ttcttatcct ctatttgctg tttcgtcagg atgttttaga 780

acaattagaa actatactaa taaagctgta ttactagcag taaatgaagg tgctgaagaa 840

ttgacaatag agcatttttc taaagttttc gaaagggata atgagtaccc gttattagga 900

aaggttgatt caacgaatga tgattccatg aaaaagttga atgaaagtat taaagatgaa 960

agggacaaaa gagattctat taacccttttt aaaatatctg tagataaact aatggtcaat 1020

gaggtgatag attatgcaac ttataaatat gacgaagagt ctgcttcaga agtaaaattt 1080

gacactaggt ttgccgataa aatttcaata aatgatttat tgagaaaata a 1131

<210> 1988
<211> 1194
<212> DNA
<213> Parashewanella spongiae strain HJ039

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tggctggtcg atcatgatca tgaattagaa ggtgcatttc cctgttcttt agacttggtc 180

aatctttatc atgctaaaga cagtagtatt tttagagtac gagcattaaa actcttcgaa 240

acccttacga gctttaaacc ttcaacgtta ttatctcaat ctcttttacg cacgaactat 300

aaattcgctc aatatacggc attaaaattt ggttccagct taataccaag agtaatgctt 360

cgagaaaaca aagcaccaat tcctatttgc ccacaatgca taaaagagtc agcttatata 420

aggcaatgct ggcacttaaa accttatacc ttttgccaca agcataatct aaggcttctc 480

aatgaatgcc ctaaatgcgg cgacgaaatc aattatatac gctacgaagt aattgaaaag 540

tgtatatgcg gagctgacct gtcaaaaatg gcagcagtac acggagatat taagtatcag 600

aaatgcatta aaaatttatt taacgaaata gaaggcgaca aatcatcaga aataggtaag 660

ttgctttggt tttcaaagta taaaaatatt gagttagatg atactgaatt actcaatgag 720

ttttatgatt attttgaatt ctggcccgct acctatctaa gcgaacttga gcaatttgaa 780

ttaggtggaa ttaacaagca aataagacct ttcaaccaga ctccagtaaa tgatatttgg 840

aaggaacaaa tagcactgtc aaaattggcg tccccattta aacagaacaa tgaagtattg 900

aaggtgctct cagagtattt tgttgatctt gtttatcgat atcctaaatc tgaaacacta 960

aaccctgcgg acacattgct tacaaagtta gaagcatcaa ttttgttgag aacgcctcta 1020

gagcaagtga atcgactatt gaacgagaac tatttacatc gagctattaa gccaaaaaaa 1080

cacgaaataa tagagccgtt caaaccgctt ttgtatttaa ggcaagtcat tgagctaatg 1140

gaagtaagag gaatcaatca agcttattct aatttatata caacaacttg gtga 1194

<210> 1989
<211> 2085
<212> DNA
<213> Parashewanella spongiae strain HJ039

<400> 1989
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ctcattgtgc tgttaaattt gggttacagc tcaaaagaac aagttgattt gctagagcag 180

aagtcagcac aacaatttct taaaggcgaa gagcttttg gaaagacgat ctctgaagct 240

gaatggatac atacgcacaa tttaaagtat ccggacatca gagtaagtaa gcaaacaatt 300

cgagcgaccc ttcctgaaga tgtagaaggc gtttgcagta aagatatcct agaaagcata 360

gagttaggtt ggtctcataa tgcaacgttt gtcggtaaag taacaccatt aattacagag 420

tttaaatggc aaggtaaagt gacctgtctt ataaatttac tgttaagtga gagtgccttc 480

tgggttaact tgctcataac gttaggtgtc tcaaaaaggt gggtgaaccg aactaaaata 540

caacttgcag atataacggc aaattctttt cctgaagaag tagatcgtta ctctccacag 600

ttaagattct ataatcaacg aggctatgta tcagtcacac cagttacaaa ccataaacta 660

ctatctgaaa tacaaaagcg ttgttttaat aaagaatttc gatgtcgtaa ggtcaaacat 720

ccaagggcaa catgcgcagg tcacttgata acatcattgg gcggatacgt ttcagtattg 780

gcttactatc ccgacagagg ctttaatcga aatattaacc agtatattga cgacaagact 840

gatagtaact tttttaattc gaagtacctc aacaatcata acttcttaga ggctttaggt 900

gagctggttt tttcaccgaa acgagaaacg ttgaagctaa ctcgcattgc tagggtagca 960

gcaataaagt caataaggca gacactgtat tggtggttag ctaaagctac agattacaaa 1020

aagcatgcga atatatcatc ggatgtttct tctaacgcaa agttattcaa aaggtatttg 1080

aatcaaggcg aatcaaagaa tgaattagcg agtgagctta gtaacttaat tcatgagcag 1140

ttagcacaag ctaatcaaac aaagcagttt gcatatcact ctaagctaat atcaccaatt 1200

aaacggcaac tccaattctt actaaaaaat agagctaata gtgaaacaga gcagcaagaa 1260

caaagagttt tttatcttca tctaaaacga cttagggttg aagatctgga aaccctgagt 1320

tgtccatatt tatgggggat gccttcaata atagcttttg ctggttttgc ccataaattt 1380

gaacttaatt taaaaaagct gggttttcat aatattcgag taatgggggt cgcttgtttt 1440

gttcatttat atcaagtaac agctaaaaca tcattgcctg catattcaca tttaaagaaa 1500

gaaaaacaaa gtgatcaatt aaggcctaca cgacctgctt tagtttcagc gccaaagagt 1560

caaatgctat ttgatttggt gttaaggctt tggaatggag gtaatgagta caatttagaa 1620

agtttaccta atcctgtaca gataagggaa gcattaccca ctcgctatgc aggtggaact 1680

attttcccaa caatccggaa gctagaggag cgatttacga cctcacataa ccttacagag 1740

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gtagctattg gctatcagta tcttgaagaa ccaaagtata gggatggtgg cataagtgaa 1920

ctgcattgct atgcagaaaa cttacttggc ctgactcgat gcactaacag tgtggatgtt 1980

agagttggtg gagctcaaag gtttttaaga gaggcgtttt gggctcaaaa aacaactgat 2040

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<211> 1035
<212> DNA
<213> Parashewanella spongiae strain HJ039

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ggcaggatgt caggttccgc agttgcatat aataaagatg gtaaacttaa aaatgtaacg 180

gctaatgatc ttggtcacgc aaatttacat gcgagtgaat attgttatgt acctccaaaa 240

attaaggaat tttactgtaa gttttcattg accattgctc ccaatagtct ttctccctat 300

atatgcaatg atcaagattt agtaatgtat ttggaaaagt tagctcaatg ttatgctgag 360

aaaggcggtt atcaagagtt agcaaccaga tatgcaaaga atattttaaa tggattgtgg 420

ctatggcgga acaaaaagtc tcctaaagtt gatatttctg tgtatgactt tttgagtgaa 480

caagaggttg ctaatacagc gggtgttcaa tcgctgtctt gggatggaaa ctgggggaaa 540

tatcacgatg agctacaaaa attatctaag ataattgctc aggctcttca taataatgaa 600

gcatgcgaac tggaagttgt tgcaacaatt cgcaatcgct ttatgcaaga aatatatcca 660

agtcagcttt tacctgaaga aaacaaagtc cacaagcaat tagctacaac aagggttgaa 720

gatggctctg aaactacctg tttgggtcgt tttaaagttg gagcagcaat acagataatt 780

gatgattggc atggtggaga taagcctcta agggtgagta gttatggttc tgtaccagaa 840

aggttagtcg cattacgaac tccttcaaac aaaaaagatg tttattcact cttacctaaa 900

attatcgatt acattaactt tttagaatct aataacctcg gtgaaaatga gacttcaaat 960

gaaattaatt atctaatggc tatgttggta aaaggtgatg tattaggcat gggatcggag 1020

aaaaaaagca aatga 1035

<210> 1991
<211> 600
<212> DNA
<213> Parashewanella spongiae strain HJ039

<400> 1991
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attagttttc cggcgtggag tgaacataca gtagggaatc aacttgcctt tgtatcgaca 180

agtaaaagta agctgacaag gatacttcat cacaattatt tctcaatgat gaaagaagat 240

ggtctttttt atatttctaa cattgagcca gtgccaacag ggttaaaaga gattcaattt 300

ttaagaaata atacaattgc aaaaacaacg cttggtgaaa aacgacgcag aaataaaaga 360

gcgtttgaaa gggctgaagc tagaggagac gaatacgcgc ctgttcaaaa taatcaagct 420

caattcatcc acaattatca tattctcaat tgtacaagtg gtagtaaaaa catgtcattc 480

cctctttata ttcaaaagag ggaagatacc tctcaccaaa actgtgactt taatcactac 540

ggcctcgctt ctaataagtt atatagtgga actgtaccag agtttaactt tgaccaataa 600

<210> 1992
<211> 28
<212> DNA
<213> Parashewanella spongiae strain HJ039

<400> 1992
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<210> 1993
<211> 510
<212> DNA
<213> Parashewanella spongiae strain HJ039

<220>
<221> misc_feature
<222> (251)..(260)
<223> n is a, c, g, or t

<400> 1993
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gtaataactg tcataaaact gctcagtttc caatgctaaa atagtaccag aaaactcgat 180

ttgattagcc ccttcgatta gaagaaaaaa gtgaaattat agaggataat gtataagagt 240

ggtggttact nnnnnnnnnn tttgaagtta gagagcttag aaagattttt aactcttgag 300

tgactaatat ttcgacgcga tataggcata gcgctcacct tcaactaact gaagatcaca 360

tactgaacgc ttatcggata aactcaattt ttttgagagc ttttcgtaaa tcttaatctg 420

aagttaattt agaattaacg ttatgacagt ttttcctgaa aactcgacag cttttcctga 480

aaataatgac aacttatgtt gaaagcgaca 510

<210> 1994
<211> 817
<212> PRT
<213> Parashewanella spongiae strain HJ039

<400> 1994

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Met Pro Ile Ser Arg Arg Asn Ile Ser His Ser Arg Val Lys Asn Leu
1               5                   10                  15


Ser Lys Leu Ser Asn Phe Lys Asn Pro Asn Ser Glu Lys Arg Ile Ala
            20                  25                  30


Glu Ser His Asn Glu Phe Leu Ala Ala His Phe Leu Asn Tyr Phe Pro
        35                  40                  45


Ile Val Lys Ser Phe Gln Phe Gln Pro Leu Ala Phe Asp Tyr Glu Asn
    50                  55                  60


Gln Asp Glu Ile His Ser Tyr Thr Ser Asp Phe Leu Val Glu Leu Glu
65                  70                  75                  80


Thr Gly Lys Phe Val Tyr Ile Glu Val Lys Glu Glu Lys Ala Leu Tyr
                85                  90                  95


Ser Glu Asp Phe Lys Ser Ile Phe Glu Ala Lys Arg Ala Ala Ala Arg
            100                 105                 110


Gln Leu Asn Lys Glu Leu Ile Leu Ile Thr Glu Asn Gln Tyr Asn Ile
        115                 120                 125


Pro Pro Arg Ile Asp Asn Ile Lys Ser Leu Leu Asn Val Gly Gly Phe
    130                 135                 140


Trp Ala Asp Asp Asn Ile Ser Asn Leu Val Val Gly Ile Val Lys Lys
145                 150                 155                 160


Ser Glu Thr Ile Asp Ile Glu Gly Ile Ala Tyr His Leu Ser Gln Phe
                165                 170                 175
```

```
Ser Arg Glu Glu Ile Phe Lys Ala Ile Arg Ile Leu Ile Leu Lys Arg
            180                 185                 190

Glu Ile Tyr Phe Asp Leu Ser Ser Ser Glu Leu Thr Phe Asp Ser Lys
        195                 200                 205

Val Ser Ser Asp Thr Thr Gln Tyr Asn Asn Ala Glu Phe Phe Ile Asp
    210                 215                 220

Glu Phe Val Glu Phe Asp Phe Asn Lys Lys Pro Ala Lys Asn Glu Val
225                 230                 235                 240

Lys Leu Phe Pro Lys Asp Met Asp Ile Phe Pro Glu Lys Tyr Lys Gln
                245                 250                 255

Glu Ala Leu Ala Lys Lys Arg Tyr Ile Lys Trp Val Glu Arg Lys Leu
            260                 265                 270

Val Gly Lys Trp Thr Glu Lys Asn Ile Asn Leu Leu Leu His Glu Ile
        275                 280                 285

Pro Asn Phe Gly Val Asn Pro Thr Pro Cys Ser Arg Ser Ile Met Arg
    290                 295                 300

Trp Lys Asp Ala Tyr Thr Lys Gly Ser Arg Lys Leu Ile Ala Leu Val
305                 310                 315                 320

Pro Lys His Val Ser Lys Gly Arg Thr Ile Ala Val Ser Glu His Asp
                325                 330                 335

Glu Phe Ile Glu His Gly Ile Ser Asn Tyr Leu Thr Glu Leu Arg Leu
            340                 345                 350

Ser Ile Asn Glu Cys Tyr Lys Lys Tyr Glu Thr Gln Leu Arg Thr Asn
        355                 360                 365

Thr Asp Leu Glu Pro Val Ser Tyr Asn Thr Phe Lys Leu Arg Ile Asp
```

```
    370                 375                 380

Lys Leu Pro Lys Tyr Asp Val Lys Cys Ala Arg Glu Gly Lys Ala Ala
385                 390                 395                 400

Ala Asp Ile Asp Phe Asn Asn Tyr Asp Glu His Cys Pro Pro Lys Arg
                405                 410                 415

Leu Tyr Glu Gln Val Glu Ile Asp His Thr Val Leu Thr Val Ile Leu
            420                 425                 430

Leu Asp Ser Glu Tyr Leu Phe Pro Ile Gly Arg Pro Thr Leu Thr Val
        435                 440                 445

Leu Ile Asp Lys Leu Ser His Cys Ile Cys Gly Phe Tyr Val Ser Tyr
    450                 455                 460

Glu Pro Pro Ser Tyr Asn Ser Ala Arg Gln Ala Ile Leu His Ser Ile
465                 470                 475                 480

Lys Pro Lys Asp Tyr Ile Lys Asn Leu Tyr Pro Ser Ile Lys Asn Glu
                485                 490                 495

Trp Asn Cys His Gly Lys Ile Glu Asn Leu Ile Val Asp Asn Gly Ala
            500                 505                 510

Glu Phe Trp Ser Thr Asn Leu Glu Val Ala Cys Glu Asn Trp Met Asn
        515                 520                 525

Ile Gln Phe Asn Pro Val Gly Lys Pro Trp Lys Lys Ala Phe Val Glu
    530                 535                 540

Arg Phe Ile Gly Thr Thr Cys Arg Glu Phe Thr Ala Arg Phe Lys Gly
545                 550                 555                 560

Lys Thr Phe Ser Asn Ile Leu Glu Lys Met Lys Tyr Asp Pro Lys Lys
                565                 570                 575
```

```
Asp Ala Val Met Arg Phe Asp Leu Phe Leu Glu Leu Phe His Lys Trp
            580                 585                 590

Ile Ile Asp Asp Tyr His Gln Arg Ala Asp Ser Arg Phe Lys Tyr Ile
        595                 600                 605

Pro Asn Glu Leu Trp Gln Lys Asn Tyr Leu Lys Ser Pro Val Leu Lys
    610                 615                 620

Leu Asp Gln Ala Glu Glu Glu Lys Leu Glu Asn Asp Phe Leu Cys Thr
625                 630                 635                 640

Glu Trp Arg Glu Trp Arg Lys Gly Gly Ile His Ile Phe Asn Leu Arg
                645                 650                 655

Tyr Asp Ser Glu Tyr Leu Ser Lys Val Arg Lys Gln Tyr Val Lys Glu
            660                 665                 670

Gly Asn Asp Lys Lys Gln Lys Ile Leu Val Lys Tyr Ser Pro Glu Asn
        675                 680                 685

Ile Asn Thr Ile Arg Ile Tyr Ile Glu Asp Leu Gly Lys Tyr Ile Glu
    690                 695                 700

Val Pro Cys Val Asp Ser Val Gly Tyr Thr Lys Gly Leu Ser Leu Phe
705                 710                 715                 720

Asn His Gln Val Asn Leu Arg Val His Arg Thr Tyr Ile Lys Ser Lys
                725                 730                 735

Ile Asp Val Val Ser Leu Ala Glu Val Arg Lys Tyr Val Asn Asp Arg
            740                 745                 750

Val Glu Glu Glu Glu Glu Phe Val Glu Lys Gly Arg Lys Lys Asn Leu
        755                 760                 765

Ser Ala Asn Lys Ala Arg Ser Arg Tyr Lys Ser Ile Asn Ser Lys Asn
```

770 775 780

Ser Ile Ser Lys Lys Asp Asn Lys Phe Glu Asp Ile Glu Lys Ser Glu
785 790 795 800

Asp Ala Ser Pro Glu Asp Trp Asn Asn Phe Ala Glu Gly Leu Glu Gly
805 810 815

Phe

<210> 1995
<211> 376
<212> PRT
<213> Parashewanella spongiae strain HJ039

<400> 1995

Met Ala Arg Leu Ser Thr Glu Gln Cys Val Leu Leu Lys Asn Phe Lys
1 5 10 15

Asn Glu Phe Ile Pro His Ala Ile Ala Glu Thr Ile His Asp Asp Phe
20 25 30

Glu Arg Leu Arg Glu Asn His Arg Leu Gly Gly Glu Gln Leu Cys Met
35 40 45

Leu Ile Tyr Gly Asp Glu Gly Ser Gly Lys Lys Ser Ile Ile Lys Ala
50 55 60

Tyr Glu Asp Lys Cys Lys Asn Glu Glu Val Ile Asp Glu Gly Lys Phe
65 70 75 80

Lys Val Pro Val Leu Phe Ser Glu Val Lys Leu Pro Ile Thr Val Asn
85 90 95

Ser Phe Phe Thr Gln Leu Leu Ile Asp Leu Gly Glu Phe Ala Gly Ala
100 105 110

```
Tyr Arg Lys Ala Glu Gly Lys Asn Lys Asn Lys Asp Met Ser Lys Gln
        115                 120                 125

Leu Glu Asp Ile Leu Lys Glu Arg Leu Ile Lys Leu Glu Thr Glu Leu
    130                 135                 140

Ile Ile Ile Tyr Lys Phe Glu Leu Leu Leu Gln Phe Asp Lys Lys Met
145                 150                 155                 160

Arg Ile Asp Glu Leu Ala Asn Gln Leu Lys Ser Met Ala Gln Glu Leu
                165                 170                 175

Gly Ile Pro Leu Val Ile Ile Gly Met Pro Cys Ile Lys Arg Leu Met
            180                 185                 190

Leu Thr Ser Gly Trp Arg Ser Tyr Ile His Ile Cys Arg Leu Ile Pro
        195                 200                 205

Tyr Phe Lys Leu Ser Asn Glu Leu Glu Lys Ala Phe Tyr Val Lys Val
    210                 215                 220

Ile Lys Gly Leu Ser Asn Arg Ala Gln Lys Leu Phe Ser Phe Ala Pro
225                 230                 235                 240

Lys Leu Glu Asp Lys Ser Ile Ser Tyr Pro Leu Phe Ala Val Ser Ser
                245                 250                 255

Gly Cys Phe Arg Thr Ile Arg Asn Tyr Thr Asn Lys Ala Val Leu Leu
            260                 265                 270

Ala Val Asn Glu Gly Ala Glu Glu Leu Thr Ile Glu His Phe Ser Lys
        275                 280                 285

Val Phe Glu Arg Asp Asn Glu Tyr Pro Leu Leu Gly Lys Val Asp Ser
    290                 295                 300

Thr Asn Asp Asp Ser Met Lys Lys Leu Asn Glu Ser Ile Lys Asp Glu
305                 310                 315                 320
```

```
Arg Asp Lys Arg Asp Ser Ile Asn Pro Phe Lys Ile Ser Val Asp Lys
                325                 330                 335


Leu Met Val Asn Glu Val Ile Asp Tyr Ala Thr Tyr Lys Tyr Asp Glu
            340                 345                 350


Glu Ser Ala Ser Glu Val Lys Phe Asp Thr Arg Phe Ala Asp Lys Ile
        355                 360                 365


Ser Ile Asn Asp Leu Leu Arg Lys
    370                 375
```

<210> 1996
<211> 397
<212> PRT
<213> Parashewanella spongiae strain HJ039

<400> 1996

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Met Arg Phe Thr Val Gln Thr Glu Leu Phe Lys Asp Glu Ser Leu Glu
1               5                   10                  15


Ser Tyr Leu Leu Arg Leu Ala Val Asp Asn Thr Tyr Ile Asp Tyr Ser
            20                  25                  30


Glu Phe Ala Asp Val Ile Gly Arg Trp Leu Val Asp His Asp His Glu
        35                  40                  45


Leu Glu Gly Ala Phe Pro Cys Ser Leu Asp Leu Val Asn Leu Tyr His
    50                  55                  60


Ala Lys Asp Ser Ser Ile Phe Arg Val Arg Ala Leu Lys Leu Phe Glu
65                  70                  75                  80


Thr Leu Thr Ser Phe Lys Pro Ser Thr Leu Leu Ser Gln Ser Leu Leu
                85                  90                  95


Arg Thr Asn Tyr Lys Phe Ala Gln Tyr Thr Ala Leu Lys Phe Gly Ser
```

```
            100                 105                 110

Ser Leu Ile Pro Arg Val Met Leu Arg Glu Asn Lys Ala Pro Ile Pro
        115                 120                 125

Ile Cys Pro Gln Cys Ile Lys Glu Ser Ala Tyr Ile Arg Gln Cys Trp
    130                 135                 140

His Leu Lys Pro Tyr Thr Phe Cys His Lys His Asn Leu Arg Leu Leu
145                 150                 155                 160

Asn Glu Cys Pro Lys Cys Gly Asp Glu Ile Asn Tyr Ile Arg Tyr Glu
                165                 170                 175

Val Ile Glu Lys Cys Ile Cys Gly Ala Asp Leu Ser Lys Met Ala Ala
            180                 185                 190

Val His Gly Asp Ile Lys Tyr Gln Lys Cys Ile Lys Asn Leu Phe Asn
        195                 200                 205

Glu Ile Glu Gly Asp Lys Ser Ser Glu Ile Gly Lys Leu Leu Trp Phe
    210                 215                 220

Ser Lys Tyr Lys Asn Ile Glu Leu Asp Asp Thr Glu Leu Leu Asn Glu
225                 230                 235                 240

Phe Tyr Asp Tyr Phe Glu Phe Trp Pro Ala Thr Tyr Leu Ser Glu Leu
                245                 250                 255

Glu Gln Phe Glu Leu Gly Gly Ile Asn Lys Gln Ile Arg Pro Phe Asn
            260                 265                 270

Gln Thr Pro Val Asn Asp Ile Trp Lys Glu Gln Ile Ala Leu Ser Lys
        275                 280                 285

Leu Ala Ser Pro Phe Lys Gln Asn Asn Glu Val Leu Lys Val Leu Ser
    290                 295                 300
```

```
Glu Tyr Phe Val Asp Leu Val Tyr Arg Tyr Pro Lys Ser Glu Thr Leu
305                 310                 315                 320


Asn Pro Ala Asp Thr Leu Leu Thr Lys Leu Glu Ala Ser Ile Leu Leu
                325                 330                 335


Arg Thr Pro Leu Glu Gln Val Asn Arg Leu Leu Asn Glu Asn Tyr Leu
            340                 345                 350


His Arg Ala Ile Lys Pro Lys Lys His Glu Ile Ile Glu Pro Phe Lys
        355                 360                 365


Pro Leu Leu Tyr Leu Arg Gln Val Ile Glu Leu Met Glu Val Arg Gly
    370                 375                 380


Ile Asn Gln Ala Tyr Ser Asn Leu Tyr Thr Thr Thr Trp
385                 390                 395


<210>  1997
<211>  694
<212>  PRT
<213>  Parashewanella spongiae strain HJ039

<400>  1997

Met Leu Thr Ile Asn Glu Leu Leu Glu Ile Ala Asp Ile Glu Glu Arg
1               5                   10                  15


Asn Lys Ala Ile Arg Ser Arg Leu Arg Pro Phe His Glu Pro Leu Asn
            20                  25                  30


Val Asp Gly Ser Glu Lys Glu Ile Leu Ile Val Leu Leu Asn Leu Gly
        35                  40                  45


Tyr Ser Ser Lys Glu Gln Val Asp Leu Leu Glu Gln Lys Ser Ala Gln
    50                  55                  60


Gln Phe Leu Lys Gly Glu Glu Leu Phe Gly Lys Thr Ile Ser Glu Ala
65                  70                  75                  80
```

```
Glu Trp Ile His Thr His Asn Leu Lys Tyr Pro Asp Ile Arg Val Ser
                85                  90                  95

Lys Gln Thr Ile Arg Ala Thr Leu Pro Glu Asp Val Glu Gly Val Cys
            100                 105                 110

Ser Lys Asp Ile Leu Glu Ser Ile Glu Leu Gly Trp Ser His Asn Ala
        115                 120                 125

Thr Phe Val Gly Lys Val Thr Pro Leu Ile Thr Glu Phe Lys Trp Gln
    130                 135                 140

Gly Lys Val Thr Cys Leu Ile Asn Leu Leu Leu Ser Glu Ser Ala Phe
145                 150                 155                 160

Trp Val Asn Leu Leu Ile Thr Leu Gly Val Ser Lys Arg Trp Val Asn
                165                 170                 175

Arg Thr Lys Ile Gln Leu Ala Asp Ile Thr Ala Asn Ser Phe Pro Glu
            180                 185                 190

Glu Val Asp Arg Tyr Ser Pro Gln Leu Arg Phe Tyr Asn Gln Arg Gly
        195                 200                 205

Tyr Val Ser Val Thr Pro Val Thr Asn His Lys Leu Leu Ser Glu Ile
    210                 215                 220

Gln Lys Arg Cys Phe Asn Lys Glu Phe Arg Cys Arg Lys Val Lys His
225                 230                 235                 240

Pro Arg Ala Thr Cys Ala Gly His Leu Ile Thr Ser Leu Gly Gly Tyr
                245                 250                 255

Val Ser Val Leu Ala Tyr Tyr Pro Asp Arg Gly Phe Asn Arg Asn Ile
            260                 265                 270
```

```
Asn Gln Tyr Ile Asp Asp Lys Thr Asp Ser Asn Phe Phe Asn Ser Lys
        275                 280                 285

Tyr Leu Asn Asn His Asn Phe Leu Glu Ala Leu Gly Glu Leu Val Phe
    290                 295                 300

Ser Pro Lys Arg Glu Thr Leu Lys Leu Thr Arg Ile Ala Arg Val Ala
305                 310                 315                 320

Ala Ile Lys Ser Ile Arg Gln Thr Leu Tyr Trp Trp Leu Ala Lys Ala
                325                 330                 335

Thr Asp Tyr Lys Lys His Ala Asn Ile Ser Ser Asp Val Ser Ser Asn
            340                 345                 350

Ala Lys Leu Phe Lys Arg Tyr Leu Asn Gln Gly Glu Ser Lys Asn Glu
        355                 360                 365

Leu Ala Ser Glu Leu Ser Asn Leu Ile His Glu Gln Leu Ala Gln Ala
    370                 375                 380

Asn Gln Thr Lys Gln Phe Ala Tyr His Ser Lys Leu Ile Ser Pro Ile
385                 390                 395                 400

Lys Arg Gln Leu Gln Phe Leu Leu Lys Asn Arg Ala Asn Ser Glu Thr
                405                 410                 415

Glu Gln Gln Glu Gln Arg Val Phe Tyr Leu His Leu Lys Arg Leu Arg
            420                 425                 430

Val Glu Asp Leu Glu Thr Leu Ser Cys Pro Tyr Leu Trp Gly Met Pro
        435                 440                 445

Ser Ile Ile Ala Phe Ala Gly Phe Ala His Lys Phe Glu Leu Asn Leu
    450                 455                 460

Lys Lys Leu Gly Phe His Asn Ile Arg Val Met Gly Val Ala Cys Phe
465                 470                 475                 480
```

```
Val His Leu Tyr Gln Val Thr Ala Lys Thr Ser Leu Pro Ala Tyr Ser
               485                 490                 495

His Leu Lys Lys Glu Lys Gln Ser Asp Gln Leu Arg Pro Thr Arg Pro
            500                 505                 510

Ala Leu Val Ser Ala Pro Lys Ser Gln Met Leu Phe Asp Leu Val Leu
        515                 520                 525

Arg Leu Trp Asn Gly Gly Asn Glu Tyr Asn Leu Glu Ser Leu Pro Asn
    530                 535                 540

Pro Val Gln Ile Arg Glu Ala Leu Pro Thr Arg Tyr Ala Gly Gly Thr
545                 550                 555                 560

Ile Phe Pro Thr Ile Arg Lys Leu Glu Glu Arg Phe Thr Thr Ser His
               565                 570                 575

Asn Leu Thr Glu Leu Phe Asn Ser Leu Ser Phe Met Pro Ala Lys Gly
            580                 585                 590

Cys Trp Leu Tyr Pro Ser Gln Phe Lys Val His Ser Leu Asp Glu Leu
        595                 600                 605

His Lys Ala Leu Asp Thr Asp Leu Asn Leu Arg Pro Val Ala Ile Gly
    610                 615                 620

Tyr Gln Tyr Leu Glu Glu Pro Lys Tyr Arg Asp Gly Gly Ile Ser Glu
625                 630                 635                 640

Leu His Cys Tyr Ala Glu Asn Leu Leu Gly Leu Thr Arg Cys Thr Asn
               645                 650                 655

Ser Val Asp Val Arg Val Gly Gly Ala Gln Arg Phe Leu Arg Glu Ala
            660                 665                 670
```

Phe Trp Ala Gln Lys Thr Thr Asp Ser Glu Val Leu Met Val Lys Ser
675 680 685

Arg Phe Glu Phe Lys Leu
690

<210> 1998
<211> 344
<212> PRT
<213> Parashewanella spongiae strain HJ039

<400> 1998

Met Lys Ile Pro Thr His Leu Ser Tyr Met Arg Ser Leu Ser Pro Ser
1 5 10 15

Pro Ala Leu Phe Phe Tyr Lys Thr Asp Glu Ser Asp Phe Asn Pro Ile
20 25 30

Glu Val Phe Ser Glu Gly Ile Asn Gly Arg Met Ser Gly Ser Ala Val
35 40 45

Ala Tyr Asn Lys Asp Gly Lys Leu Lys Asn Val Thr Ala Asn Asp Leu
50 55 60

Gly His Ala Asn Leu His Ala Ser Glu Tyr Cys Tyr Val Pro Pro Lys
65 70 75 80

Ile Lys Glu Phe Tyr Cys Lys Phe Ser Leu Thr Ile Ala Pro Asn Ser
85 90 95

Leu Ser Pro Tyr Ile Cys Asn Asp Gln Asp Leu Val Met Tyr Leu Glu
100 105 110

Lys Leu Ala Gln Cys Tyr Ala Glu Lys Gly Gly Tyr Gln Glu Leu Ala
115 120 125

Thr Arg Tyr Ala Lys Asn Ile Leu Asn Gly Leu Trp Leu Trp Arg Asn
130 135 140

```
Lys Lys Ser Pro Lys Val Asp Ile Ser Val Tyr Asp Phe Leu Ser Glu
145                 150                 155                 160

Gln Glu Val Ala Asn Thr Ala Gly Val Gln Ser Leu Ser Trp Asp Gly
                165                 170                 175

Asn Trp Gly Lys Tyr His Asp Glu Leu Gln Lys Leu Ser Lys Ile Ile
            180                 185                 190

Ala Gln Ala Leu His Asn Asn Glu Ala Cys Glu Leu Glu Val Val Ala
        195                 200                 205

Thr Ile Arg Asn Arg Phe Met Gln Glu Ile Tyr Pro Ser Gln Leu Leu
    210                 215                 220

Pro Glu Glu Asn Lys Val His Lys Gln Leu Ala Thr Thr Arg Val Glu
225                 230                 235                 240

Asp Gly Ser Glu Thr Thr Cys Leu Gly Arg Phe Lys Val Gly Ala Ala
                245                 250                 255

Ile Gln Ile Ile Asp Asp Trp His Gly Gly Asp Lys Pro Leu Arg Val
            260                 265                 270

Ser Ser Tyr Gly Ser Val Pro Glu Arg Leu Val Ala Leu Arg Thr Pro
        275                 280                 285

Ser Asn Lys Lys Asp Val Tyr Ser Leu Leu Pro Lys Ile Ile Asp Tyr
    290                 295                 300

Ile Asn Phe Leu Glu Ser Asn Asn Leu Gly Glu Asn Glu Thr Ser Asn
305                 310                 315                 320

Glu Ile Asn Tyr Leu Met Ala Met Leu Val Lys Gly Asp Val Leu Gly
                325                 330                 335

Met Gly Ser Glu Lys Lys Ser Lys
```

340

<210> 1999
<211> 199
<212> PRT
<213> Parashewanella spongiae strain HJ039

<400> 1999

Met Arg Ser Tyr Phe Tyr Ile Thr Tyr Leu Pro Glu Asn Val Asn Asn
1 5 10 15

Glu Leu Leu Ala Ala Arg Cys Val Asn Val Leu His Gly Phe Val Ala
20 25 30

Lys Glu Asp Val Val Asp Ile Gly Ile Ser Phe Pro Ala Trp Ser Glu
35 40 45

His Thr Val Gly Asn Gln Leu Ala Phe Val Ser Thr Ser Lys Ser Lys
50 55 60

Leu Thr Arg Ile Leu His His Asn Tyr Phe Ser Met Met Lys Glu Asp
65 70 75 80

Gly Leu Phe Tyr Ile Ser Asn Ile Glu Pro Val Pro Thr Gly Leu Lys
85 90 95

Glu Ile Gln Phe Leu Arg Asn Asn Thr Ile Ala Lys Thr Thr Leu Gly
100 105 110

Glu Lys Arg Arg Arg Asn Lys Arg Ala Phe Glu Arg Ala Glu Ala Arg
115 120 125

Gly Asp Glu Tyr Ala Pro Val Gln Asn Asn Gln Ala Gln Phe Ile His
130 135 140

Asn Tyr His Ile Leu Asn Cys Thr Ser Gly Ser Lys Asn Met Ser Phe
145 150 155 160

Pro Leu Tyr Ile Gln Lys Arg Glu Asp Thr Ser His Gln Asn Cys Asp
165 170 175

Phe Asn His Tyr Gly Leu Ala Ser Asn Lys Leu Tyr Ser Gly Thr Val
180 185 190

Pro Glu Phe Asn Phe Asp Gln
195

<210> 2000
<211> 11759
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 2000
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gcgctatcat gccataccgc gaaaggtttt gcgccattcg atggtgtccg ggatctcgac 180

gctctccctt atgcgactcc tgcattagga atggataacc gtattaccgc ctttgagtga 240

gctgataccg ctcgccgcag ccgaacgacc gagcgcagcg agtcagtgag cgaggacaca 300

agctgtaata cgactcacta taggggaatt gtgagcggat aacaattcct attagttaag 360

tataagaagg agatatacgt atgtttttgc aaagacctaa accttacagc gatgaaagtt 420

tagaaagttt ctttatccga gtggctaaca aaaatggcta cggtgatgtc catcgcttcc 480

tagaagccac taaacgattc cttcaagaca ttgaccataa tggctatcaa acctttccga 540

ctgatataac tcggataaac ccatactcag ctaaaaacag ttccagcgca cgaactgcgt 600

cattcctgaa acttgcacaa ttgacattta atgaaccgcc agagctactt gggttggcaa 660

ttaacagaac aaacatgaaa tactcgccgt caactagcgc ggttgttaga ggtgcagaag 720

tctttcctcg cagtttacta cggacgcact ccatcccctg ctgtcctttg tgtctgcgag 780

aaaatggcta cgcctcctac ctttggcact ttcaggggta cgaatactgc cacagccata 840

acgtaccttt aattaccact tgtagctgtg gtaaggagtt tgactaccga gtatctgggt 900

taaagggcat ttgctgcaaa tgcaaggagc ctatcacctt aaccagcagg gagaacggtc 960

atgaggcagc gtgtactgtt tcaaactggc ttgctggcca tgaatctaaa cctctgccaa 1020

atcttcctaa aagctaccga tggggtttag ttcattggtg gatgggtatt aaagatagcg 1080

agttcgatca cttttcgttc gttcaatttt tctcaaactg gccaaggtca ttccactcga 1140

taatcgaaga tgaagtagag ttcaaccttg agcatgctgt tgtcagcacg tctgaattac 1200

gactaaaaga tcttcttggt cgattgtttt tcggttcaat tcggttacct gagcggaatc 1260

ttcaacacaa tatcatcctt ggtgagcttc tctgctattt agaaaatcgt ttatggcaag 1320

acaagggatt aatcgccaac ctcaaaatga acgcgttaga ggcgactgta atgttaaatt 1380

gtagcctcga tcagattgca tcaatggttg aacaacgcat cttgaagcca aatcgaaaaa 1440

gcaagcccaa cagccctctt gatgttaccg attatctatt tcatttcggc gatattttct 1500

gtctttggtt agctgagttc caaagcgatg agtttaaccg ttcgttttat gtgtcgaggt 1560

ggtaaatgca aactctgaaa gaactaatcg catccaatcc tgacgactta acaactgaac 1620

ttaagagagc atttcgtcca ctcacaccgc atattgcaat tgatggtaat gaacttgacg 1680

cactgacgat attagtcaat ttaaccgata agactgatga tcagaaagac ctgctcgatc 1740

gagccaaatg caagcaaaaa cttcgagatg aaaaatggtg ggctagctgc ataaattgcg 1800

ttaattacag acaaagccat aacccaaaat tcccggatat acgttctgaa ggcgtgattc 1860

gaacccaagc cctgggtgaa ttaccgagtt tcctactctc gtcctcaaaa atcccaccat 1920

accattggtc atatagccat gattcaaaat acgtcaacaa aagcgcattc ctcaccaatg 1980

agttttgttg ggatggtgag atctcatgtt tgggtgagct tcttaaagat gcagatcacc 2040

cactttggaa tactttgaaa aagttaggtt gttctcaaaa aacttgcaaa gcaatggcaa 2100

aacaactagc tgatattact ctcacgacta tcaatgtcac actcgcacca aattacctga 2160

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tatcgatgca aagccacttt catcagaggc tccaagatga aaatcggcat agcgcgataa 2280

cgcggtttag ccgaactacc aacatggggg tcactgcgat gacatgtggc ggcgcattta 2340

gaatgttaaa gtctggcgct aagttttcca gccccccctca tcaccgatta aacagtaaac 2400

gaagttggtt gacgtcagag catgttcagt cattaaaaca gtaccagcgc ctcaacaaaa 2460

gcctcatacc tgaaaactct cggattgcac tccgtagaaa atacaaaatc gagcttcaaa 2520

atatggtcag atcttggttt gcaatgcaag accataccct tgattcgaac atacttatcc 2580

aacatttgaa tcatgaccta tcttacttag gagccacaaa acgttttgca tacgatccag 2640

cgatgaccaa gctctttact gagcttttga aacgagagtt atcaaattca atcaataatg 2700

gtgagcaaca cactaatgga tcgtttttag tcctaccgaa tatcagggtt tgtggcgcaa 2760

cagctttaag ctccccggta acggtgggga ttccatcact tacagctttc tttggcttcg 2820

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