SEQUENCE LISTING

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<120> Alpha (1,2) Fucosyltransferase Syngenes For Use in the Production of Fucosylated Oligosaccharides

<130> 37847-517001WO

<140> PCT/US2015/030823
<141> 2015-05-14

<160> 294

<170> PatentIn version 3.5

<210> 1
<211> 300
<212> PRT
<213> Helicobacter pylori

<400> 1

Met Ala Phe Lys Val Val Gln Ile Cys Gly Gly Leu Gly Asn Gln Met
1 5 10 15

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

Val Leu Leu Asp Ile Thr Ser Phe Asp Trp Ser Asp Arg Lys Met Gln
35 40 45

Leu Glu Leu Phe Pro Ile Asn Leu Pro Tyr Ala Ser Ala Lys Glu Ile
50 55 60

Ala Ile Ala Lys Met Gln His Leu Pro Lys Leu Val Arg Asp Ala Leu
65 70 75 80

Lys Cys Met Gly Phe Asp Arg Val Ser Gln Glu Ile Val Phe Glu Tyr
85 90 95

Glu Pro Glu Leu Leu Lys Pro Ser Arg Leu Thr Tyr Phe Tyr Gly Tyr
100 105 110

Phe Gln Asp Pro Arg Tyr Phe Asp Ala Ile Ser Pro Leu Ile Lys Gln
115 120 125

Thr Phe Thr Leu Pro Pro Pro Pro Glu Asn Asn Lys Asn Asn Asn Lys
130 135 140

Lys Glu Glu Glu Tyr His Arg Lys Leu Ser Leu Ile Leu Ala Ala Lys
145 150 155 160

Asn Ser Val Phe Val His Ile Arg Arg Gly Asp Tyr Val Gly Ile Gly
165 170 175

```
Cys Gln Leu Gly Ile Asp Tyr Gln Lys Lys Ala Leu Glu Tyr Met Ala
            180                 185                 190

Lys Arg Val Pro Asn Met Glu Leu Phe Val Phe Cys Glu Asp Leu Glu
        195                 200                 205

Phe Thr Gln Asn Leu Asp Leu Gly Tyr Pro Phe Met Asp Met Thr Thr
    210                 215                 220

Arg Asn Lys Glu Glu Glu Ala Tyr Trp Asp Met Leu Leu Met Gln Ser
225                 230                 235                 240

Cys Gln His Gly Ile Ile Ala Asn Ser Thr Tyr Ser Trp Trp Ala Ala
                245                 250                 255

Tyr Leu Ile Glu Asn Pro Glu Lys Ile Ile Ile Gly Pro Lys His Trp
            260                 265                 270

Leu Phe Gly His Glu Asn Ile Leu Cys Lys Glu Trp Val Lys Ile Glu
        275                 280                 285

Ser His Phe Glu Val Lys Ser Gln Lys Tyr Asn Ala
    290                 295                 300


<210>  2
<211>  286
<212>  PRT
<213>  Helicobacter mustelae

<400>  2

Met Asp Phe Lys Ile Val Gln Val His Gly Gly Leu Gly Asn Gln Met
1               5                   10                  15

Phe Gln Tyr Ala Phe Ala Lys Ser Leu Gln Thr His Leu Asn Ile Pro
            20                  25                  30

Val Leu Leu Asp Thr Thr Trp Phe Asp Tyr Gly Asn Arg Glu Leu Gly
        35                  40                  45

Leu His Leu Phe Pro Ile Asp Leu Gln Cys Ala Ser Ala Gln Gln Ile
    50                  55                  60

Ala Ala Ala His Met Gln Asn Leu Pro Arg Leu Val Arg Gly Ala Leu
65                  70                  75                  80

Arg Arg Met Gly Leu Gly Arg Val Ser Lys Glu Ile Val Phe Glu Tyr
                85                  90                  95

Met Pro Glu Leu Phe Glu Pro Ser Arg Ile Ala Tyr Phe His Gly Tyr
            100                 105                 110
```

```
Phe Gln Asp Pro Arg Tyr Phe Glu Asp Ile Ser Pro Leu Ile Lys Gln
        115                 120                 125

Thr Phe Thr Leu Pro His Pro Thr Glu His Ala Glu Gln Tyr Ser Arg
    130                 135                 140

Lys Leu Ser Gln Ile Leu Ala Ala Lys Asn Ser Val Phe Val His Ile
145                 150                 155                 160

Arg Arg Gly Asp Tyr Met Arg Leu Gly Trp Gln Leu Asp Ile Ser Tyr
                165                 170                 175

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

Leu Phe Leu Phe Cys Glu Asp Leu Glu Phe Val Gln Asn Leu Asp Leu
        195                 200                 205

Gly Tyr Pro Phe Val Asp Met Thr Thr Arg Asp Gly Ala Ala His Trp
    210                 215                 220

Asp Met Met Leu Met Gln Ser Cys Lys His Gly Ile Ile Thr Asn Ser
225                 230                 235                 240

Thr Tyr Ser Trp Trp Ala Ala Tyr Leu Ile Lys Asn Pro Glu Lys Ile
                245                 250                 255

Ile Ile Gly Pro Ser His Trp Ile Tyr Gly Asn Glu Asn Ile Leu Cys
            260                 265                 270

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


<210>  3
<211>  281
<212>  PRT
<213>  Bacteroides vulgatus

<400>  3

Met Arg Leu Ile Lys Val Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Phe Tyr Leu Arg Met Lys Lys Tyr Tyr Pro Lys Val Arg Ile
            20                  25                  30

Asp Leu Ser Asp Met Met His Tyr Lys Val His Tyr Gly Tyr Glu Met
        35                  40                  45

His Arg Val Phe Asn Leu Pro His Thr Glu Phe Cys Ile Asn Gln Pro
    50                  55                  60
```

```
Leu Lys Lys Val Ile Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65                  70                  75                  80

Lys Gln Ala Pro Asn Ser Leu Arg Ala Phe Glu Lys Lys Tyr Phe Trp
                85                  90                  95

Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
            100                 105                 110

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

Ala Asn Ser Arg Ser Leu Asn Met Leu Glu Ile Leu Asp Lys Asp Glu
    130                 135                 140

Asn Ala Val Ser Leu His Ile Arg Arg Gly Asp Tyr Leu Gln Pro Lys
145                 150                 155                 160

His Trp Ala Thr Thr Gly Ser Val Cys Gln Leu Pro Tyr Tyr Gln Asn
                165                 170                 175

Ala Ile Ala Glu Met Ser Arg Arg Val Ala Ser Pro Ser Tyr Tyr Ile
            180                 185                 190

Phe Ser Asp Asp Ile Ala Trp Val Lys Glu Asn Leu Pro Leu Gln Asn
        195                 200                 205

Ala Val Tyr Ile Asp Trp Asn Thr Asp Glu Asp Ser Trp Gln Asp Met
    210                 215                 220

Met Leu Met Ser His Cys Lys His His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Asn Met Asp Lys Thr Val Ile
                245                 250                 255

Val Pro Ser Arg Trp Phe Gln His Ser Glu Ala Pro Asp Ile Tyr Pro
            260                 265                 270

Thr Gly Trp Ile Lys Val Pro Val Ser
        275                 280
```

<210> 4
<211> 297
<212> PRT
<213> Escherichia coli

<400> 4

```
Met Ser Ile Ile Arg Leu Gln Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Phe Ser Phe Gly Tyr Ala Leu Ser Lys Ile Asn Gly Thr Pro Leu Tyr
```

20 25 30

Phe Asp Ile Ser His Tyr Ala Glu Asn Asp Asp His Gly Gly Tyr Arg
35 40 45

Leu Asn Asn Leu Gln Ile Pro Glu Glu Tyr Leu Gln Tyr Tyr Thr Pro
50 55 60

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

Pro Asp Ile Phe Leu Phe Leu Gly Phe Cys Asn Glu Phe His Ala Tyr
85 90 95

Gly Tyr Asp Phe Glu Tyr Ile Ala Gln Lys Trp Lys Ser Lys Lys Tyr
100 105 110

Ile Gly Tyr Trp Gln Ser Glu His Phe Phe His Lys His Ile Leu Asp
115 120 125

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

Leu Ala Ala Lys Ile Leu Glu Ser Gln Ser Ser Leu Ser Ile His Ile
145 150 155 160

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

Val Cys Ser Leu Glu Tyr Tyr Lys Lys Ala Leu Asn Lys Ile Arg Asp
180 185 190

Leu Ala Met Ile Arg Asp Val Phe Ile Phe Ser Asp Asp Ile Phe Trp
195 200 205

Cys Lys Glu Asn Ile Glu Thr Leu Leu Ser Lys Lys Tyr Asn Ile Tyr
210 215 220

Tyr Ser Glu Asp Leu Ser Gln Glu Glu Asp Leu Trp Leu Met Ser Leu
225 230 235 240

Ala Asn His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
245 250 255

Tyr Leu Gly Ser Ser Ala Ser Gln Ile Val Ile Tyr Pro Thr Pro Trp
260 265 270

Tyr Asp Ile Thr Pro Lys Asn Thr Tyr Ile Pro Ile Val Asn His Trp
275 280 285

Ile Asn Val Asp Lys His Ser Ser Cys

290 295

<210> 5
<211> 293
<212> PRT
<213> Helicobacter bilis

<400> 5

Met Gly Asp Tyr Lys Ile Val Glu Leu Thr Cys Gly Leu Gly Asn Gln
1 5 10 15

Met Phe Gln Tyr Ala Phe Ala Lys Ala Leu Gln Lys His Leu Gln Val
20 25 30

Pro Val Leu Leu Asp Lys Thr Trp Tyr Asp Thr Gln Asp Asn Ser Thr
35 40 45

Gln Phe Ser Leu Asp Ile Phe Asn Val Asp Leu Glu Tyr Ala Thr Asn
50 55 60

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

Leu Arg Lys Met Phe Gly Leu Lys Lys His Asn Ile Ala Tyr Ser Gln
85 90 95

Ser Phe Asp Phe His Asp Glu Tyr Leu Leu Pro Asn Asp Phe Thr Tyr
100 105 110

Phe Ser Gly Phe Phe Gln Asn Ala Lys Tyr Leu Lys Gly Leu Glu Gln
115 120 125

Glu Leu Lys Ser Ile Phe Tyr Tyr Asp Ser Asn Asn Phe Ser Asn Phe
130 135 140

Gly Lys Gln Arg Leu Glu Leu Ile Leu Gln Ala Lys Asn Ser Ile Phe
145 150 155 160

Ile His Ile Arg Arg Gly Asp Tyr Cys Lys Ile Gly Trp Glu Leu Gly
165 170 175

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

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

Gln Phe Gln Lys Asn Leu Gly Leu Asn Glu Asn Asn Ser Ala Asn Leu
210 215 220

Ser Glu Lys Thr Ile Thr Gln Asp Asn Gln His Glu Asp Met Phe Leu
225 230 235 240

```
Met Cys Tyr Cys Lys His Ala Ile Leu Ala Asn Ser Ser Tyr Ser Phe
                245                 250                 255

Trp Ser Ala Tyr Leu Asn Asn Asp Ala Asn Asn Ile Val Ile Ala Pro
            260                 265                 270

Thr Pro Trp Leu Leu Asp Asn Asp Asn Ile Ile Cys Asp Asp Trp Ile
        275                 280                 285

Lys Ile Ser Ser Lys
    290
```

<210> 6
<211> 283
<212> PRT
<213> Escherichia coli

<400> 6

```
Met Glu Val Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr
1               5                   10                  15

Ala Thr Ala Phe Ala Ile Ala Lys Arg Thr His Gln Asn Leu Thr Val
            20                  25                  30

Asp Ile Ser Asp Ala Val Lys Tyr Lys Thr His Pro Leu Arg Leu Val
        35                  40                  45

Glu Leu Ser Cys Ser Ser Glu Phe Val Lys Lys Ala Trp Pro Phe Glu
    50                  55                  60

Lys Tyr Leu Phe Ser Glu Lys Ile Pro His Phe Met Lys Lys Gly Met
65                  70                  75                  80

Phe Arg Lys His Tyr Val Glu Lys Ser Leu Glu Tyr Asp Pro Asp Ile
                85                  90                  95

Asp Thr Lys Ser Ile Asn Lys Lys Ile Val Gly Tyr Phe Gln Thr Glu
            100                 105                 110

Lys Tyr Phe Lys Glu Phe Arg His Glu Leu Ile Lys Glu Phe Gln Pro
        115                 120                 125

Lys Thr Lys Phe Asn Ser Tyr Gln Asn Glu Leu Leu Asn Leu Ile Lys
    130                 135                 140

Glu Asn Asp Thr Cys Ser Leu His Ile Arg Arg Gly Asp Tyr Val Ser
145                 150                 155                 160

Ser Lys Ile Ala Asn Glu Thr His Gly Thr Cys Ser Glu Lys Tyr Phe
                165                 170                 175
```

```
Glu Arg Ala Ile Asp Tyr Leu Met Asn Lys Gly Val Ile Asn Lys Lys
            180                 185                 190

Thr Leu Leu Phe Ile Phe Ser Asp Asp Ile Lys Trp Cys Arg Glu Asn
        195                 200                 205

Ile Phe Phe Asn Asn Gln Ile Cys Phe Val Gln Gly Asp Ala Tyr His
    210                 215                 220

Val Glu Leu Asp Met Leu Leu Met Ser Lys Cys Lys Asn Asn Ile Ile
225                 230                 235                 240

Ser Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Glu Asn Lys
                245                 250                 255

Asn Lys Thr Val Ile Ala Pro Ser Lys Trp Phe Lys Lys Asp Ile Lys
            260                 265                 270

His Asp Ile Ile Pro Glu Ser Trp Val Lys Leu
        275                 280
```

<210> 7
<211> 281
<212> PRT
<213> Vibrio cholerae

<400> 7

```
Met Ile Val Met Lys Ile Ser Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Val Gly Arg Ala Ile Ala Ile Gln Tyr Gly Val Pro Leu Lys
            20                  25                  30

Leu Asp Val Ser Ala Tyr Lys Asn Tyr Lys Leu His Asn Gly Tyr Arg
        35                  40                  45

Leu Asp Gln Phe Asn Ile Asn Ala Asp Ile Ala Asn Glu Asp Glu Ile
    50                  55                  60

Phe His Leu Lys Gly Ser Ser Asn Arg Leu Ser Arg Ile Leu Arg Arg
65                  70                  75                  80

Leu Gly Trp Leu Lys Lys Asn Thr Tyr Tyr Ala Glu Lys Gln Arg Thr
                85                  90                  95

Ile Tyr Asp Val Ser Val Phe Met Gln Ala Pro Arg Tyr Leu Asp Gly
            100                 105                 110

Tyr Trp Gln Asn Glu Gln Tyr Phe Ser Gln Ile Arg Ala Val Leu Leu
        115                 120                 125
```

```
Gln Glu Leu Trp Pro Asn Gln Pro Leu Ser Ile Asn Ala Gln Ala His
    130                 135                 140

Gln Ile Lys Ile Gln Gln Thr His Ala Val Ser Ile His Val Arg Arg
145                 150                 155                 160

Gly Asp Tyr Leu Asn His Pro Glu Ile Gly Val Leu Asp Ile Asp Tyr
                165                 170                 175

Tyr Lys Arg Ala Val Asp Tyr Ile Lys Glu Lys Ile Glu Ala Pro Val
            180                 185                 190

Phe Phe Val Phe Ser Asn Asp Val Ala Trp Cys Lys Asp Asn Phe Asn
        195                 200                 205

Phe Ile Asp Ser Pro Val Phe Ile Glu Asp Thr Gln Thr Glu Ile Asp
    210                 215                 220

Asp Leu Met Leu Met Cys Gln Cys Gln His Asn Ile Val Ala Asn Ser
225                 230                 235                 240

Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Ser Asn Val Asp Lys Ile
                245                 250                 255

Val Ile Ala Pro Lys Thr Trp Met Ala Glu Asn Pro Lys Gly Tyr Lys
            260                 265                 270

Trp Val Pro Asp Ser Trp Arg Glu Ile
        275                 280
```

<210> 8
<211> 289
<212> PRT
<213> Bacteroides fragilis

<400> 8

```
Met Ile Val Ser Ser Leu Arg Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Met Val Lys Ala Met Ala Leu Arg Asn Asn Val Pro Phe Ala
            20                  25                  30

Phe Asn Leu Thr Thr Asp Phe Ala Asn Asp Glu Val Tyr Lys Arg Lys
        35                  40                  45

Leu Leu Leu Ser Tyr Phe Ala Leu Asp Leu Pro Glu Asn Lys Lys Leu
    50                  55                  60

Thr Phe Asp Phe Ser Tyr Gly Asn Tyr Tyr Arg Arg Leu Ser Arg Asn
65                  70                  75                  80

Leu Gly Cys His Ile Leu His Pro Ser Tyr Arg Tyr Ile Cys Glu Glu
```

85 90 95

Arg Pro Pro His Phe Glu Ser Arg Leu Ile Ser Ser Lys Ile Thr Asn
100 105 110

Ala Phe Leu Glu Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Leu Asp Tyr
115 120 125

Lys Gln Glu Ile Lys Glu Asp Phe Val Ile Gln Lys Lys Leu Glu Tyr
130 135 140

Thr Ser Tyr Leu Glu Leu Glu Glu Ile Lys Leu Leu Asp Lys Asn Ala
145 150 155 160

Ile Met Ile Gly Val Arg Arg Tyr Gln Glu Ser Asp Val Ala Pro Gly
165 170 175

Gly Val Leu Glu Asp Asp Tyr Tyr Lys Cys Ala Met Asp Ile Met Ala
180 185 190

Ser Lys Val Thr Ser Pro Val Phe Phe Cys Phe Ser Gln Asp Leu Glu
195 200 205

Trp Val Glu Lys His Leu Ala Gly Lys Tyr Pro Val Arg Leu Ile Ser
210 215 220

Lys Lys Glu Asp Asp Ser Gly Thr Ile Asp Asp Met Phe Leu Met Met
225 230 235 240

His Phe Arg Asn Tyr Ile Ile Ser Asn Ser Ser Phe Tyr Trp Trp Gly
245 250 255

Ala Trp Leu Ser Lys Tyr Asp Asp Lys Leu Val Ile Ala Pro Gly Asn
260 265 270

Phe Ile Asn Lys Asp Ser Val Pro Glu Ser Trp Phe Lys Leu Asn Val
275 280 285

Arg

<210> 9
<211> 290
<212> PRT
<213> Escherichia coli

<400> 9

Met Ser Ile Val Val Ala Arg Leu Ala Gly Gly Leu Gly Asn Gln Met
1 5 10 15

Phe Gln Tyr Ala Lys Gly Tyr Ala Glu Ser Val Glu Arg Asn Ser Tyr
20 25 30

```
Leu Lys Leu Asp Leu Arg Gly Tyr Lys Asn Tyr Thr Leu His Gly Gly
        35                  40                  45

Phe Arg Leu Asp Lys Leu Asn Ile Asp Asn Thr Phe Val Met Ser Lys
    50                  55                  60

Lys Glu Met Cys Ile Phe Pro Asn Phe Ile Val Arg Ala Ile Asn Lys
65                  70                  75                  80

Phe Pro Lys Leu Ser Leu Cys Ser Lys Arg Phe Glu Ser Glu Gln Tyr
                85                  90                  95

Ser Lys Lys Ile Asn Gly Ser Met Lys Gly Ser Val Glu Phe Ile Gly
            100                 105                 110

Phe Trp Gln Asn Glu Arg Tyr Phe Leu Glu His Lys Glu Lys Leu Arg
        115                 120                 125

Glu Ile Phe Thr Pro Ile Asn Ile Asn Leu Asp Ala Lys Glu Leu Ser
    130                 135                 140

Asp Val Ile Arg Cys Thr Asn Ser Val Ser Val His Ile Arg Arg Gly
145                 150                 155                 160

Asp Tyr Val Ser Asn Val Glu Ala Leu Lys Ile His Gly Leu Cys Thr
                165                 170                 175

Glu Arg Tyr Tyr Ile Asp Ser Ile Arg Tyr Leu Lys Glu Arg Phe Asn
            180                 185                 190

Asn Leu Val Phe Phe Val Phe Ser Asp Asp Ile Glu Trp Cys Lys Lys
        195                 200                 205

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

Gly Asn Thr Gln Glu Val Asp Met Trp Leu Met Ser Asn Ala Lys Tyr
225                 230                 235                 240

His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Lys
                245                 250                 255

Asn Tyr Asp Leu Gly Ile Thr Ile Ala Pro Thr Pro Trp Phe Glu Arg
            260                 265                 270

Glu Glu Leu Asn Ser Phe Asp Pro Cys Pro Glu Lys Trp Val Arg Ile
        275                 280                 285

Glu Lys
    290
```

<210> 10
<211> 288
<212> PRT
<213> Prevotella melaninogenica

<400> 10

Met Lys Ile Val Lys Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Leu Ser Leu Gln Glu Ser Phe Pro Lys Glu Arg Val
20 25 30

Ala Leu Asp Leu Ser Ser Phe His Gly Tyr His Leu His Asn Gly Phe
35 40 45

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

Asp Ile Met Arg Ile Ala Tyr Tyr Tyr Pro Asn Tyr Leu Leu Trp Arg
65 70 75 80

Ile Gly Lys Arg Phe Leu Pro Arg Arg Lys Gly Met Cys Leu Glu Ser
85 90 95

Ser Ser Leu Arg Phe Asp Glu Ser Val Leu Arg Gln Glu Gly Asn Arg
100 105 110

Tyr Phe Asp Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Ala Ala Tyr Arg
115 120 125

Glu Lys Val Leu Lys Ala Phe Thr Phe Pro Ala Phe Lys Arg Ala Glu
130 135 140

Asn Leu Ser Leu Leu Glu Lys Leu Asp Glu Asn Ser Ile Ala Leu His
145 150 155 160

Val Arg Arg Gly Asp Tyr Val Gly Asn Asn Leu Tyr Gln Gly Ile Cys
165 170 175

Asp Leu Asp Tyr Tyr Arg Thr Ala Ile Glu Lys Met Cys Ala His Val
180 185 190

Thr Pro Ser Leu Phe Cys Ile Phe Ser Asn Asp Ile Thr Trp Cys Gln
195 200 205

Gln His Leu Gln Pro Tyr Leu Lys Ala Pro Val Val Tyr Val Thr Trp
210 215 220

Asn Thr Gly Val Glu Ser Tyr Arg Asp Met Gln Leu Met Ser Cys Cys
225 230 235 240

```
Ala His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp
               245                 250                 255

Leu Asn Gln Asn Arg Glu Lys Val Val Ile Ala Pro Lys Lys Trp Leu
            260                 265                 270

Asn Met Glu Glu Cys His Phe Thr Leu Pro Ala Ser Trp Ile Lys Ile
        275                 280                 285
```

<210> 11
<211> 265
<212> PRT
<213> Clostridium bolteae

<400> 11

```
Met Phe Gln Tyr Ala Leu Tyr Lys Ala Phe Glu Gln Lys His Ile Asp
1               5                   10                  15

Val Tyr Ala Asp Leu Ala Trp Tyr Lys Asn Lys Ser Val Lys Phe Glu
            20                  25                  30

Leu Tyr Asn Phe Gly Ile Lys Ile Asn Val Ala Ser Glu Lys Asp Ile
        35                  40                  45

Asn Arg Leu Ser Asp Cys Gln Ala Asp Phe Val Ser Arg Ile Arg Arg
    50                  55                  60

Lys Ile Phe Gly Lys Lys Lys Ser Phe Val Ser Glu Lys Asn Asp Ser
65                  70                  75                  80

Cys Tyr Glu Asn Asp Ile Leu Arg Met Asp Asn Val Tyr Leu Ser Gly
                85                  90                  95

Tyr Trp Gln Thr Glu Lys Tyr Phe Ser Asn Thr Arg Glu Lys Leu Leu
            100                 105                 110

Glu Asp Tyr Ser Phe Ala Leu Val Asn Ser Gln Val Ser Glu Trp Glu
        115                 120                 125

Asp Ser Ile Arg Asn Lys Asn Ser Val Ser Ile His Ile Arg Arg Gly
    130                 135                 140

Asp Tyr Leu Gln Gly Glu Leu Tyr Gly Gly Ile Cys Thr Ser Leu Tyr
145                 150                 155                 160

Tyr Ala Glu Ala Ile Glu Tyr Ile Lys Met Arg Val Pro Asn Ala Lys
                165                 170                 175

Phe Phe Val Phe Ser Asp Asp Val Glu Trp Val Lys Gln Gln Glu Asp
            180                 185                 190
```

```
Phe Lys Gly Phe Val Ile Val Asp Arg Asn Glu Tyr Ser Ser Ala Leu
        195                 200                 205


Ser Asp Met Tyr Leu Met Ser Leu Cys Lys His Asn Ile Ile Ala Asn
    210                 215                 220


Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Arg Asn Glu Glu Lys
225                 230                 235                 240


Ile Val Ile Ala Pro Arg Arg Trp Leu Asn Gly Lys Cys Thr Pro Asp
                245                 250                 255


Ile Trp Cys Lys Lys Trp Ile Arg Ile
            260                 265


<210>  12
<211>  289
<212>  PRT
<213>  Lachnospiraceae bacterium 3_1_57FAA_CT1

<400>  12

Met Val Ile Val Gln Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15


Tyr Ala Leu Tyr Leu Ser Leu Lys Ala Lys Gly Lys Glu Val Lys Ile
            20                  25                  30


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


Asp Val Phe Gly Ile Thr Tyr Asp Arg Ala Ser Arg Glu Glu Leu Thr
    50                  55                  60


Glu Met Thr Asp Ala Ser Met Asp Ala Leu Ser Arg Val Arg Arg Lys
65                  70                  75                  80


Leu Thr Gly Arg Arg Thr Lys Ala Tyr Arg Glu Arg Asp Ile Asn Phe
                85                  90                  95


Asp Pro Leu Val Met Glu Lys Asp Pro Ala Leu Leu Glu Gly Cys Phe
            100                 105                 110


Gln Ser Asp Lys Tyr Phe Arg Asp Cys Glu Gly Arg Val Arg Glu Ala
        115                 120                 125


Tyr Arg Phe Arg Gly Ile Glu Ser Gly Ala Phe Pro Leu Pro Glu Asp
    130                 135                 140


Tyr Leu Arg Leu Glu Lys Gln Ile Glu Asp Cys Gln Ser Val Ser Val
145                 150                 155                 160


His Ile Arg Arg Gly Asp Tyr Leu Asp Glu Ser His Gly Gly Leu Tyr
```

165 170 175

Thr Gly Ile Cys Thr Glu Ala Tyr Tyr Lys Glu Ala Phe Ala Arg Met
180 185 190

Glu Arg Leu Val Pro Gly Ala Arg Phe Phe Leu Phe Ser Asn Asp Pro
195 200 205

Glu Trp Thr Arg Glu His Phe Glu Ser Lys Asn Cys Val Leu Val Glu
210 215 220

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

Cys Arg His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
245 250 255

Trp Leu Asn Glu Asn Pro Glu Lys Lys Val Ile Ala Pro Ala Lys Trp
260 265 270

Leu Asn Gly Arg Glu Cys Arg Asp Ile Tyr Thr Glu Arg Met Ile Arg
275 280 285

Leu

<210> 13
<211> 295
<212> PRT
<213> Methanosphaerula palustris

<400> 13

Met Ile Ile Val Arg Leu Lys Gly Gly Leu Gly Asn Gln Leu Ser Gln
1 5 10 15

Tyr Ala Leu Gly Arg Lys Ile Ala His Leu His Asn Thr Glu Leu Lys
20 25 30

Leu Asp Thr Thr Trp Phe Thr Thr Ile Ser Ser Asp Thr Pro Arg Thr
35 40 45

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

Glu Ile Gln Leu Ile Glu Arg Gly Arg Ala Gln Gly Arg Gly Tyr Leu
65 70 75 80

Leu Ser Lys Ile Ser Asp Leu Leu Thr Pro Met Tyr Arg Arg Thr Tyr
85 90 95

Val Arg Glu Arg Met His Thr Phe Asp Lys Ala Ile Leu Thr Val Pro
100 105 110

```
Asp Asn Val Tyr Leu Asp Gly Tyr Trp Gln Thr Glu Lys Tyr Phe Lys
        115                 120                 125

Asp Ile Glu Glu Ile Leu Arg Arg Glu Val Thr Leu Lys Asp Glu Pro
    130                 135                 140

Asp Ser Ile Asn Leu Glu Met Ala Glu Arg Ile Gln Ala Cys His Ser
145                 150                 155                 160

Val Ser Leu His Val Arg Arg Gly Asp Tyr Val Ser Asn Pro Thr Thr
                165                 170                 175

Gln Gln Phe His Gly Cys Cys Ser Ile Asp Tyr Tyr Asn Arg Ala Ile
            180                 185                 190

Ser Leu Ile Glu Glu Lys Val Asp Asp Pro Ser Phe Phe Ile Phe Ser
        195                 200                 205

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

Thr Phe Val Ala His Asn Gly Pro Glu Lys Glu Tyr Cys Asp Leu Trp
225                 230                 235                 240

Leu Met Ser Leu Cys Gln His His Ile Ile Ala Asn Ser Ser Phe Ser
                245                 250                 255

Trp Trp Gly Ala Trp Leu Gly Gln Asp Ala Glu Lys Met Val Ile Ala
            260                 265                 270

Pro Arg Arg Trp Ala Leu Ser Glu Ser Phe Asp Thr Ser Asp Ile Ile
        275                 280                 285

Pro Asp Ser Trp Ile Thr Ile
    290                 295
```

<210> 14
<211> 287
<212> PRT
<213> Tannerella sp. CAG:118

<400> 14

```
Met Val Arg Ile Val Glu Ile Ile Gly Gly Leu Gly Asn Gln Met Phe
1               5                   10                  15

Gln Tyr Ala Phe Ser Leu Tyr Leu Lys Asn Lys Ser His Ile Trp Asp
            20                  25                  30

Arg Leu Tyr Val Asp Ile Glu Ala Met Lys Thr Tyr Asp Arg His Tyr
        35                  40                  45
```

```
Gly Leu Glu Leu Glu Lys Val Phe Asn Leu Ser Leu Cys Pro Ile Ser
    50                  55                  60

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

Val Lys Ser Leu Tyr Glu His Ser Glu Cys Glu Phe Asp Glu Pro Val
                85                  90                  95

Tyr Arg Gly Leu Arg Pro Tyr Arg Tyr Tyr Arg Gly Tyr Trp Gln Asn
            100                 105                 110

Glu Gly Tyr Phe Val Asp Ile Glu Pro Met Ile Arg Glu Ala Phe Gln
        115                 120                 125

Phe Asn Val Asn Ile Leu Ser Lys Lys Thr Lys Ala Ile Ala Ser Lys
    130                 135                 140

Met Arg Arg Glu Leu Ser Val Ser Ile His Val Arg Arg Gly Asp Tyr
145                 150                 155                 160

Glu Asn Leu Pro Glu Ala Lys Ala Met His Gly Gly Ile Cys Ser Leu
                165                 170                 175

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

Asn Ile Cys Phe Tyr Leu Phe Ser Asp Asp Ile Asn Trp Val Glu Glu
        195                 200                 205

Asn Leu Gln Leu Glu Asn Arg Cys Ile Ile Asp Trp Asn Gln Gly Glu
    210                 215                 220

Asp Ser Trp Gln Asp Met Tyr Leu Met Ser Cys Cys Arg His His Ile
225                 230                 235                 240

Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Pro Asn
                245                 250                 255

Lys Asn Lys Ile Val Leu Thr Pro Asn Lys Trp Phe Asn His Thr Asp
            260                 265                 270

Ala Val Gly Ile Val Pro Lys Ser Trp Ile Lys Ile Pro Val Phe
        275                 280                 285
```

<210> 15
<211> 289
<212> PRT
<213> Bacteroides caccae

<400> 15

```
Met Lys Ile Val Lys Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Phe Leu Ser Leu Lys Glu Arg Phe Pro His Glu Gln Val
            20                  25                  30

Met Ile Asp Thr Ser Cys Phe Arg Asn Tyr Pro Leu His Asn Gly Phe
        35                  40                  45

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

Asn Ile Leu Lys Val Ala Tyr Pro Tyr Pro Asn Tyr Arg Phe Trp Lys
65                  70                  75                  80

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

Lys Asn Phe Ser Phe Asp Ala Ala Val Leu Thr Arg Lys Gly Asp Cys
            100                 105                 110

Tyr Tyr Asp Gly Tyr Trp Gln His Glu Glu Tyr Phe Cys Asp Met Lys
        115                 120                 125

Glu Thr Ile Trp Glu Ala Phe Ser Phe Pro Glu Pro Val Asp Gly Arg
    130                 135                 140

Asn Lys Glu Ile Gly Ala Leu Leu Gln Ala Ser Asp Ser Ala Ser Leu
145                 150                 155                 160

His Val Arg Arg Gly Asp Tyr Val Asn His Pro Leu Phe Arg Gly Ile
                165                 170                 175

Cys Asp Leu Asp Tyr Tyr Lys Arg Ala Ile His Tyr Met Glu Glu Arg
            180                 185                 190

Val Asn Pro Gln Leu Tyr Cys Val Phe Ser Asn Asp Met Ala Trp Cys
        195                 200                 205

Glu Ser His Leu Arg Ala Leu Leu Pro Gly Lys Glu Val Val Tyr Val
    210                 215                 220

Asp Trp Asn Lys Gly Ala Glu Ser Tyr Val Asp Met Arg Leu Met Ser
225                 230                 235                 240

Leu Cys Arg His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ala Trp Leu Asn Arg Asn Pro Gln Lys Val Val Val Ala Pro Glu Arg
            260                 265                 270
```

Trp Met Asn Ser Pro Ile Glu Asp Pro Val Ser Asp Lys Trp Ile Lys
275 280 285

Leu

<210> 16
<211> 290
<212> PRT
<213> Butyrivibrio sp. AE2015

<400> 16

Met Ile Ile Ile Gln Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

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

Asp Asp Lys Thr Gly Phe Val Asn Asp Lys Leu Arg Ile Pro Val Leu
35 40 45

Ser Arg Trp Gly Val Glu Tyr Asp Arg Ala Thr Asp Glu Glu Ile Ile
50 55 60

Asn Leu Thr Asp Ser Lys Met Asp Leu Phe Ser Arg Ile Arg Arg Lys
65 70 75 80

Leu Thr Gly Arg Lys Thr Phe Arg Ile Asp Glu Glu Ser Gly Lys Phe
85 90 95

Asn Pro Glu Ile Leu Glu Lys Glu Asn Ala Tyr Leu Val Gly Tyr Trp
100 105 110

Gln Cys Asp Lys Tyr Phe Asp Asp Lys Asp Val Val Arg Glu Ile Arg
115 120 125

Glu Ala Phe Glu Lys Lys Pro Gln Glu Leu Met Thr Asp Ala Ser Ser
130 135 140

Trp Ser Thr Leu Gln Gln Ile Glu Cys Cys Glu Ser Val Ser Leu His
145 150 155 160

Val Arg Arg Thr Asp Tyr Val Asp Glu Glu His Ile His Ile His Asn
165 170 175

Ile Cys Thr Glu Lys Tyr Tyr Lys Asn Ala Ile Asp Arg Val Arg Lys
180 185 190

Gln Tyr Pro Ser Ala Val Phe Phe Ile Phe Thr Asp Asp Lys Glu Trp
195 200 205

Cys Arg Asp His Phe Lys Gly Pro Asn Phe Ile Val Val Glu Leu Glu

210 215 220

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

Lys His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp
245 250 255

Leu Asn Asp Ser Pro Glu Lys Ile Val Ile Ala Pro Gln Lys Trp Ile
260 265 270

Asn Asn Arg Asp Met Asp Asp Ile Tyr Thr Glu Arg Met Thr Lys Ile
275 280 285

Ala Leu
290

<210> 17
<211> 282
<212> PRT
<213> Prevotella sp. CAG:891

<400> 17

Met Arg Leu Val Lys Met Ile Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Phe Tyr Leu Gln Met Arg Lys Arg Phe Ser Asn Val Arg Ile
20 25 30

Asp Leu Thr Asp Met Met His Tyr Asn Val His Tyr Gly Tyr Glu Leu
35 40 45

His Lys Val Phe Gly Leu Pro Arg Thr Glu Phe Cys Met Asn Gln Pro
50 55 60

Leu Lys Lys Val Leu Glu Phe Leu Phe Phe Arg Thr Ile Val Glu Arg
65 70 75 80

Lys Gln His Gly Arg Met Glu Pro Tyr Thr Cys Gln Tyr Val Trp Pro
85 90 95

Leu Val Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Tyr Phe Ser Glu
100 105 110

Val Lys Asp Glu Val Arg Glu Cys Phe Thr Phe Asn Pro Ala Leu Ala
115 120 125

Asn Arg Ser Ser Gln Gln Met Met Glu Gln Ile Gln Asn Asp Pro Gln
130 135 140

Ala Val Ser Ile His Ile Arg Arg Gly Asp Tyr Leu Asn Pro Lys His
145 150 155 160

Tyr Asp Thr Ile Gly Cys Ile Cys Gln Leu Pro Tyr Tyr Lys His Ala
165 170 175

Val Ser Glu Ile Lys Lys Tyr Val Ser Asn Pro His Phe Tyr Val Phe
180 185 190

Ser Glu Asp Leu Asp Trp Val Lys Ala Asn Leu Pro Leu Glu Asn Ala
195 200 205

Gln Tyr Ile Asp Trp Asn Lys Gly Ala Asp Ser Trp Gln Asp Met Met
210 215 220

Leu Met Ser Cys Cys Lys His His Ile Ile Cys Asn Ser Thr Phe Ser
225 230 235 240

Trp Trp Ala Ala Trp Leu Asn Pro Ser Val Glu Lys Thr Val Ile Met
245 250 255

Pro Glu Gln Trp Thr Ser Arg Gln Asp Ser Val Asp Phe Val Ala Ser
260 265 270

Cys Gly Arg Trp Val Arg Val Lys Thr Glu
275 280

<210> 18
<211> 281
<212> PRT
<213> Parabacteroides johnsonii

<400> 18

Met Arg Leu Ile Lys Met Ile Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Phe Tyr Leu Lys Met Lys His His Tyr Pro Asp Thr Asn Ile
20 25 30

Asp Leu Ser Asp Met Val His Tyr Lys Val His Asn Gly Tyr Glu Met
35 40 45

Asn Arg Ile Phe Asp Leu Ser Gln Thr Glu Phe Cys Ile Asn Arg Thr
50 55 60

Leu Lys Lys Ile Leu Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65 70 75 80

Arg Gln Asp Pro Ser Thr Leu Tyr Pro Tyr Glu Lys Arg Tyr Phe Trp
85 90 95

Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Phe
100 105 110

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

Ala Asn Pro Glu Ser Leu Glu Leu Leu Lys Gln Ile Glu Val Asp Asp
    130                 135                 140

Gln Ala Val Ser Ile His Ile Arg Arg Gly Asp Tyr Leu Leu Pro Arg
145                 150                 155                 160

His Trp Ala Asn Thr Gly Ser Val Cys Gln Leu Pro Tyr Tyr Lys Asn
                165                 170                 175

Ala Ile Ala Glu Met Glu Asn Arg Ile Thr Gly Pro Ser Tyr Tyr Val
            180                 185                 190

Phe Ser Asp Asp Ile Ser Trp Val Lys Glu Asn Ile Pro Leu Lys Lys
        195                 200                 205

Ala Val Tyr Val Thr Trp Asn Lys Gly Glu Asp Ser Trp Gln Asp Met
    210                 215                 220

Met Leu Met Ser His Cys Arg His His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Arg Lys Glu Lys Ile Val Ile
                245                 250                 255

Ala Pro Cys Arg Trp Phe Gln His Lys Glu Thr Pro Asp Met Tyr Pro
            260                 265                 270

Lys Glu Trp Ile Lys Val Pro Ile Asn
        275                 280


<210>  19
<211>  290
<212>  PRT
<213>  Akkermansia muciniphila

<400>  19

Met Arg Leu Phe Gly Gly Leu Gly Asn Gln Leu Phe Gln Tyr Ala Phe
1               5                   10                  15

Leu Phe Ala Leu Ser Arg Gln Gly Gly Lys Ala Arg Leu Glu Thr Ser
            20                  25                  30

Ser Tyr Glu His Asp Asp Lys Arg Val Cys Glu Leu His His Phe Arg
        35                  40                  45

Val Ser Leu Pro Ile Glu Gly Gly Pro Pro Pro Trp Ala Phe Arg Lys
    50                  55                  60
```

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

Pro His Phe Arg Glu Glu Lys Arg His Gly Phe Asp Pro Gly Leu Ala
85 90 95

Ala Pro Pro Arg Arg His Thr Tyr Phe Lys Gly Tyr Phe Gln Thr Glu
100 105 110

Gln Tyr Phe Leu His Cys Arg Glu Gln Leu Cys Arg Glu Phe Arg Leu
115 120 125

Lys Thr Pro Leu Thr Pro Glu Asn Ala Arg Ile Leu Glu Asp Ile Arg
130 135 140

Ser Cys Cys Ser Ile Ser Leu His Ile Arg Arg Thr Asp Tyr Leu Ser
145 150 155 160

Asn Pro Tyr Leu Ser Pro Pro Pro Leu Glu Tyr Tyr Leu Arg Ser Met
165 170 175

Ala Glu Met Glu Gly Arg Leu Arg Ala Ala Gly Ala Pro Gln Glu Ser
180 185 190

Leu Arg Tyr Phe Ile Phe Ser Asp Asp Ile Glu Trp Ala Arg Gln Asn
195 200 205

Leu Arg Pro Ala Leu Pro His Val His Val Asp Ile Asn Asp Gly Gly
210 215 220

Thr Gly Tyr Phe Asp Leu Glu Leu Met Arg Asn Cys Arg His His Ile
225 230 235 240

Ile Ala Asn Ser Thr Phe Ser Trp Trp Ala Ala Trp Leu Asn Glu His
245 250 255

Ala Glu Lys Ile Val Ile Ala Pro Arg Ile Trp Phe Asn Arg Glu Glu
260 265 270

Gly Asp Arg Tyr His Thr Asp Asp Ala Leu Ile Pro Gly Ser Trp Leu
275 280 285

Arg Ile
290

<210> 20
<211> 298
<212> PRT
<213> Salmonella enterica

<400> 20

Met Tyr Ser Cys Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr

```
1               5                   10                  15

Ala Ala Ala Tyr Ile Leu Lys Gln Tyr Phe Gln Ser Thr Thr Leu Val
            20                  25                  30

Leu Asp Asp Ser Tyr Tyr Tyr Ser Gln Pro Lys Arg Asp Thr Val Arg
        35                  40                  45

Ser Leu Glu Leu Asn Gln Phe Asn Ile Ser Tyr Asp Arg Phe Ser Phe
    50                  55                  60

Ala Asp Glu Lys Glu Lys Ile Lys Leu Leu Arg Lys Phe Lys Arg Asn
65                  70                  75                  80

Pro Phe Pro Lys Gln Ile Ser Glu Ile Leu Ser Ile Ala Leu Phe Gly
                85                  90                  95

Lys Tyr Ala Leu Ser Asp Arg Ala Phe Tyr Thr Phe Glu Thr Ile Lys
            100                 105                 110

Asn Ile Asp Lys Ala Cys Leu Phe Ser Phe Tyr Gln Asp Ala Asp Leu
        115                 120                 125

Leu Asn Lys Tyr Lys Gln Leu Ile Leu Pro Leu Phe Glu Leu Arg Asp
    130                 135                 140

Asp Leu Leu Asp Ile Cys Lys Asn Leu Glu Leu Tyr Ser Leu Ile Gln
145                 150                 155                 160

Arg Ser Asn Asn Thr Thr Ala Leu His Ile Arg Arg Gly Asp Tyr Val
                165                 170                 175

Thr Asn Gln His Ala Ala Lys Tyr His Gly Val Leu Asp Ile Ser Tyr
            180                 185                 190

Tyr Asn His Ala Met Glu Tyr Val Glu Arg Glu Arg Gly Lys Gln Asn
        195                 200                 205

Phe Ile Ile Phe Ser Asp Asp Val Arg Trp Ala Gln Lys Ala Phe Leu
    210                 215                 220

Glu Asn Asp Asn Cys Tyr Val Ile Asn Asn Ser Asp Tyr Asp Phe Ser
225                 230                 235                 240

Ala Ile Asp Met Tyr Leu Met Ser Leu Cys Lys Asn Asn Ile Ile Ala
                245                 250                 255

Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn Lys Tyr Glu Asp
            260                 265                 270

Lys Leu Val Ile Ser Pro Lys Gln Trp Phe Leu Gly Asn Asn Glu Thr
```

275 280 285

Ser Leu Arg Asn Ala Ser Trp Ile Thr Leu
290 295

<210> 21
<211> 281
<212> PRT
<213> Bacteroides sp. CAG:633

<400> 21

Met Arg Leu Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Phe Tyr Leu Arg Met Lys Lys Arg Tyr Pro Lys Val Arg Ile
20 25 30

Asp Leu Ser Asp Met Val His Tyr His Val His His Gly Tyr Glu Met
35 40 45

His Arg Val Phe Asn Leu Pro His Thr Glu Phe Cys Ile Asn Gln Pro
50 55 60

Leu Lys Lys Val Ile Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65 70 75 80

Lys Gln Asp Pro Asn Ser Leu Arg Ala Phe Glu Lys Lys Tyr Leu Trp
85 90 95

Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
100 105 110

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

Val Asn Ala Arg Ser Ala Glu Leu Leu Arg Arg Leu Asp Ala Asp Ala
130 135 140

Asn Ala Val Ser Leu His Ile Arg Arg Gly Asp Tyr Leu Gln Pro Gln
145 150 155 160

His Trp Ala Thr Thr Gly Ser Val Cys Gln Leu Pro Tyr Tyr Gln Asn
165 170 175

Ala Ile Ala Glu Met Asn Arg Arg Val Ala Ala Pro Ser Tyr Tyr Val
180 185 190

Phe Ser Asp Asp Ile Ala Trp Val Lys Glu Asn Ile Pro Leu Gln Asn
195 200 205

Ala Val Tyr Ile Asp Trp Asn Lys Gly Glu Glu Ser Trp Gln Asp Met
210 215 220

```
Met Leu Met Ser His Cys Arg His His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asp Pro His Glu Asp Lys Ile Val Ile
                245                 250                 255

Val Pro Asn Arg Trp Phe Gln His Cys Glu Thr Pro Asn Ile Tyr Pro
            260                 265                 270

Ala Gly Trp Val Lys Val Ala Ile Asn
        275                 280
```

<210> 22
<211> 318
<212> PRT
<213> Clostridium sp. CAG:306

<400> 22

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

Met Phe Gln Tyr Ala Phe Gly Lys Gly Leu Glu Ser Lys Phe Gly Cys
            20                  25                  30

Lys Val Leu Phe Asp Lys Ile Asn Tyr Asp Glu Leu Gln Lys Thr Ile
        35                  40                  45

Ile Asn Asn Thr Gly Lys Asn Ala Glu Gly Ile Cys Val Arg Lys Tyr
    50                  55                  60

Glu Leu Gly Ile Phe Asn Leu Asn Ile Asp Phe Ala Thr Ala Glu Gln
65                  70                  75                  80

Ile Gln Glu Cys Ile Gly Glu Lys Leu Asn Lys Ala Cys Tyr Leu Pro
                85                  90                  95

Gly Phe Ile Arg Lys Ile Phe Asn Leu Ser Lys Asn Lys Thr Val Ser
            100                 105                 110

Asn Arg Ile Phe Glu Lys Lys Tyr Gly Glu Tyr Asp Glu Glu Ile Leu
        115                 120                 125

Lys Asp Tyr Ser Leu Ala Tyr Tyr Asp Gly Tyr Phe Gln Asn Pro Lys
    130                 135                 140

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

Glu Ile Lys Asn His Asp Ile Tyr Asn Lys Lys Leu Leu Glu Lys Ile
                165                 170                 175
```

Thr Gln Phe Glu Asn Ser Val Phe Ile His Val Arg Arg Asp Asp Tyr
180 185 190

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

Lys Tyr Ile Leu Lys His Ile Glu Asn Pro Lys Phe Phe Val Phe Cys
210 215 220

Ala Glu Asp Pro Asp Tyr Ile Lys Asn His Phe Asp Ile Gly Tyr Asp
225 230 235 240

Phe Glu Leu Val Gly Glu Asn Asn Lys Thr Gln Asp Thr Tyr Tyr Glu
245 250 255

Asn Met Arg Leu Met Met Ala Cys Lys His Ala Ile Ile Ala Asn Ser
260 265 270

Ser Tyr Ser Trp Trp Ala Ala Trp Leu Ser Asp Tyr Asp Asn Lys Ile
275 280 285

Val Ile Ala Pro Thr Pro Trp Leu Pro Gly Ile Ser Asn Glu Ile Ile
290 295 300

Cys Lys Asn Trp Ile Gln Ile Lys Arg Gly Ile Ser Asn Glu
305 310 315

<210> 23
<211> 288
<212> PRT
<213> Prevotella sp. oral taxon 306

<400> 23

Met Lys Ile Val Lys Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Leu Ser Leu Gln Glu Ser Phe Pro Lys Glu Arg Val
20 25 30

Ala Leu Asp Leu Ser Cys Phe Asn Gly Tyr His Leu His Asn Gly Phe
35 40 45

Glu Leu Glu Arg Ile Phe Ser Leu Thr Ala Gln Lys Ala Ser Ala Ala
50 55 60

Thr Ile Met Arg Ile Ala Tyr Tyr Tyr Pro Asn Tyr Leu Leu Trp Arg
65 70 75 80

Ile Gly Lys Arg Leu Leu Pro Arg Arg Lys Thr Met Cys Leu Glu Ser
85 90 95

```
Ser Thr Phe Arg Tyr Asp Glu Ser Val Leu Thr Arg Glu Gly Asn Arg
            100                 105                 110

Tyr Phe Asp Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Val Ala Cys Arg
        115                 120                 125

Glu Lys Val Leu Lys Ala Phe Thr Phe Pro Ala Phe Lys Arg Thr Glu
    130                 135                 140

Asn Leu Ser Leu Leu Arg Lys Leu Asp Lys Asn Ser Val Ala Ile His
145                 150                 155                 160

Val Arg Arg Gly Asp Tyr Ile Gly Asn Gln Leu Tyr Gln Gly Ile Cys
                165                 170                 175

Asp Leu Asp Tyr Tyr Arg Ala Ala Ile Asp Lys Ile Ser Thr Tyr Val
            180                 185                 190

Thr Pro Ser Val Phe Cys Ile Phe Ser Asn Asp Ile Ala Trp Cys Gln
        195                 200                 205

Thr His Leu Gln Pro Tyr Leu Lys Ala Pro Val Val Tyr Val Thr Trp
    210                 215                 220

Asn Thr Gly Thr Glu Ser Tyr Arg Asp Met Gln Leu Met Ser Cys Cys
225                 230                 235                 240

Ala His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp
                245                 250                 255

Leu Asn Gln Asn Asn Glu Lys Val Val Ile Ala Pro Lys Arg Trp Leu
            260                 265                 270

Asn Met Asp Asp Cys Gln Phe Pro Leu Pro Ala Ser Trp Val Lys Ile
        275                 280                 285


<210>  24
<211>  268
<212>  PRT
<213>  Brachyspira sp. CAG:484

<400>  24

Met Gln Leu Val Lys Leu Met Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Phe Ala Lys Ala Leu Gly Asp Lys Asn Ile Leu Phe Tyr Gly
            20                  25                  30

Asp Tyr Lys Lys His Ser Leu Arg Lys Val Glu Leu Asn Arg Phe Lys
        35                  40                  45

Cys Lys Ala Val Tyr Ile Pro Arg Glu Leu Phe Lys Tyr Leu Lys Phe
```

50 55 60

Val Phe Thr Lys Phe Asp Lys Ile Glu Tyr Met Arg Ser Gly Ile Tyr
65 70 75 80

Val Pro Glu Tyr Leu Asn Arg Asp Gly Asn His Ile Tyr Ile Gly Phe
85 90 95

Trp Gln Thr Glu Lys Tyr Phe Lys Gln Ile Arg Pro Arg Leu Leu Lys
100 105 110

Asp Phe Thr Pro Arg Lys Lys Leu Asp Arg Glu Asn Ala Gly Ile Ile
115 120 125

Ser Lys Met Gln Gln Ile Asn Ser Val Ser Val His Ile Arg Arg Thr
130 135 140

Asp Tyr Val Asp Glu Ser His Ile Tyr Gly Asp Thr Asn Leu Asp Tyr
145 150 155 160

Tyr Lys Arg Ala Ile Glu Tyr Ile Ser Ser Lys Ile Glu Asn Pro Glu
165 170 175

Phe Phe Phe Phe Ser Asp Asp Met Ala Tyr Val Lys Glu Lys Phe Ala
180 185 190

Gly Leu Lys Phe Pro His Ser Phe Ile Asp Ile Asn Ser Gly Asn Asn
195 200 205

Ser Tyr Lys Asp Leu Ile Leu Met Lys Asn Cys Lys His Asn Ile Ile
210 215 220

Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn Glu Asn Glu
225 230 235 240

Glu Lys Ile Val Ile Ala Pro Ala Lys Trp Phe Val Thr Gly Glu Asn
245 250 255

Asp Lys Asp Ile Val Pro Asp Glu Trp Ile Lys Leu
260 265

<210> 25
<211> 292
<212> PRT
<213> Thalassospira profundimaris

<400> 25

Met Val Ile Val Lys Leu Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Thr Gly Arg Ala Val Ala Ser Arg Leu Asp Val Glu Leu Leu
20 25 30

```
Leu Asp Val Ser Ala Phe Ala His Tyr Asp Leu Arg Arg Tyr Glu Leu
        35                  40                  45

Asp Asp Trp Asn Ile Thr Ala Arg Leu Ala Thr Ser Glu Glu Leu Ala
    50                  55                  60

Arg Ser Gly Val Thr Ala Ala Pro Pro Ser Phe Phe Asp Arg Ile Ala
65                  70                  75                  80

Arg Phe Leu Arg Ile Asp Leu Pro Val Asn Cys Phe Arg Glu Ala Ser
                85                  90                  95

Phe Thr Tyr Asp Pro Arg Ile Leu Glu Val Ser Ser Pro Val Tyr Leu
            100                 105                 110

Asp Gly Tyr Trp Gln Ser Glu Arg Tyr Phe Leu Asp Ile Glu Lys Lys
        115                 120                 125

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

Ser Phe Lys Lys Lys Ile Asp Gly Leu Gly Lys Gln Ala Val Ser Leu
145                 150                 155                 160

His Val Arg Arg Gly Asp Tyr Val Thr Asn Pro Gln Thr Ala Ser Tyr
                165                 170                 175

His Gly Val Cys Ser Leu Asp Tyr Tyr Arg Ala Ala Val Asp Tyr Ile
            180                 185                 190

Ala Glu His Val Ser Asp Pro Cys Phe Phe Val Phe Ser Asp Asp Leu
        195                 200                 205

Glu Trp Val Gln Thr Asn Leu Asn Ile Lys Gln Pro Ile Val Leu Val
    210                 215                 220

Asp Ala Asn Gly Pro Asp Asn Gly Ala Ala Asp Met Ala Leu Met Met
225                 230                 235                 240

Ala Cys Arg His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ser Trp Leu Asn Pro Leu Asn Asp Lys Ile Ile Val Ala Pro Lys Lys
            260                 265                 270

Trp Phe Gly Arg Ala Asn His Asp Thr Thr Asp Leu Val Pro Asp Ser
        275                 280                 285

Trp Val Arg Leu
    290
```

<210> 26
<211> 308
<212> PRT
<213> Acetobacter sp. CAG:267

<400> 26

```
Met Ala Val Ser Pro Gln Glu Ser Lys Tyr Ser Ala His Val Ser Pro
1               5                  10                  15

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

Met Phe Gln Tyr Ala Phe Gly Leu Ala Ala Gly Asp Val Leu Trp Asp
        35                  40                  45

Asn Thr Ser Phe Leu Thr Asn His Tyr Arg Ser Phe Asp Leu Gly Leu
    50                  55                  60

Tyr Asn Ile Ser Gly Asp Phe Ala Ser Asn Glu Gln Ile Lys Lys Cys
65                  70                  75                  80

Lys Asn Glu Ile Arg Phe Lys Asn Ile Leu Pro Arg Ser Ile Arg Lys
                85                  90                  95

Lys Phe Asn Leu Gly Lys Phe Ile Tyr Leu Lys Thr Asn Arg Val Cys
            100                 105                 110

Glu Arg Gln Ile Asn Arg Tyr Glu Pro Glu Leu Leu Ser Lys Asp Gly
        115                 120                 125

Asp Val Tyr Tyr Asp Gly Val Phe Gln Thr Glu Lys Tyr Phe Lys Pro
    130                 135                 140

Leu Arg Glu Arg Leu Leu His Asp Phe Thr Leu Thr Lys Pro Leu Asp
145                 150                 155                 160

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

Ala Val His Ile Arg Arg Gly Asp Tyr Leu Asn Pro Arg Ser Pro Phe
            180                 185                 190

Thr Tyr Leu Asp Lys Asp Tyr Phe Leu Asn Ala Met Asp Tyr Ile Gly
        195                 200                 205

Lys Arg Val Asp Lys Pro His Phe Phe Ile Phe Ser Ser Asp Thr Asp
    210                 215                 220

Trp Val Arg Thr Asn Ile Gln Thr Ala Tyr Pro Gln Thr Ile Val Glu
225                 230                 235                 240
```

```
Ile Asn Asp Glu Lys His Gly Tyr Phe Asp Leu Glu Leu Met Arg Asn
                245                 250                 255

Cys Arg His Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala
            260                 265                 270

Trp Leu Asn Thr Asn Pro Asp Lys Ile Val Val Ala Pro Lys Gln Trp
        275                 280                 285

Phe Arg Pro Asp Ala Ala Glu Tyr Ser Gly Asp Ile Val Pro Asn Asp
    290                 295                 300

Trp Ile Lys Leu
305
```

<210> 27
<211> 291
<212> PRT
<213> Dysgonomonas mossii

<400> 27

```
Met Val Thr Val Leu Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Ala Lys Ser Leu Ala Ile Arg Leu Asn Thr Ala Leu Ser
            20                  25                  30

Val Asp Leu Tyr Thr Phe Ser Lys Lys Thr Gln Ala Thr Val Arg Pro
        35                  40                  45

Tyr Glu Leu Gly Ile Phe Asn Ile Glu Asp Val Val Glu Thr Ser Ser
    50                  55                  60

Leu Lys Ala Lys Ala Val Ile Lys Ala Arg Pro Phe Ile Gln Arg His
65                  70                  75                  80

Arg Ser Phe Phe Gln Arg Phe Gly Val Phe Thr Asp Thr Tyr Ala Ile
                85                  90                  95

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

Gly Tyr Phe Gln Asn Glu Ser Tyr Phe Lys Asn Ile Ser Glu Leu Leu
        115                 120                 125

Arg Lys Asp Phe Ser Phe Lys Tyr Pro Leu Ile Gly Glu Asn Lys Asp
    130                 135                 140

Val Ala Gly Gln Ile Ser Glu Asn Gln Ser Val Ala Val His Ile Arg
145                 150                 155                 160
```

```
Arg Gly Asp Tyr Leu Asn Lys Asn Ser Gln Ser Asn Phe Ala Ile Leu
                165                 170                 175

Glu Lys Asp Tyr Tyr Glu Lys Ala Ile Asn Tyr Ile Ser Ala His Val
            180                 185                 190

Lys Asn Pro Glu Phe Tyr Val Phe Ser Glu Asp Phe Asp Trp Ile Lys
        195                 200                 205

Asp Asn Leu Asn Phe Lys Glu Phe Pro Val Thr Phe Ile Asp Trp Asn
    210                 215                 220

Lys Gly Lys Asp Ser Tyr Ile Asp Met Gln Leu Met Ser Leu Cys Lys
225                 230                 235                 240

His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ser Ala Trp Leu
                245                 250                 255

Asn Asn Ser Glu Glu Arg Lys Ile Val Ala Pro Glu Arg Trp Phe Val
            260                 265                 270

Asp Glu Gln Lys Asn Glu Leu Leu Asp Cys Phe Tyr Pro Gln Gly Trp
        275                 280                 285

Ile Lys Ile
    290
```

<210> 28
<211> 287
<212> PRT
<213> Clostridium sp. KLE 1755

<400> 28

```
Met Ile Ile Ile Glu Ile Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

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

Asp Leu Ser Phe Tyr Asn Asp Arg Val Gln Thr Leu Arg Gln Phe Glu
        35                  40                  45

Leu Asp Ile Phe Asp Leu Asp Cys Pro Val Ala Ser Asn Ser Glu Leu
    50                  55                  60

Ser Arg Phe Gly Lys Gly Asn Ser Leu Lys Ser Arg Leu Lys Gln Lys
65                  70                  75                  80

Leu Gly Trp Asp Lys Glu Lys Ile Tyr Glu Glu Asn Leu Asp Leu Gly
                85                  90                  95

Tyr Gln Pro Arg Ile Phe Glu Leu Asp Asp Ile Tyr Leu Ser Gly Tyr
```

100 105 110

Trp Gln Ser Glu Leu Tyr Phe Lys Asp Ile Arg Glu Gln Ile Leu Arg
115 120 125

Leu Tyr Thr Phe Pro Ile Gln Leu Asp Tyr Met Asn Gly Val Phe Leu
130 135 140

Arg Lys Ile Glu Asn Ser Asn Ser Val Ser Ile His Ile Arg Arg Gly
145 150 155 160

Asp Tyr Leu Asn Glu Asn Asn Leu Lys Ile Tyr Gly Asn Ile Cys Thr
165 170 175

Leu Asn Tyr Tyr Asn Lys Ala Leu Gln Ile Ile Ala Lys Lys Ile Thr
180 185 190

Asn Pro Ile Ile Phe Val Phe Thr Asn Asp Ile Glu Trp Val Arg Lys
195 200 205

Glu Leu Glu Ile Pro Asn Met Val Ile Val Asp Cys Asn Ser Gly Lys
210 215 220

Leu Ser Tyr Trp Asp Met Tyr Leu Met Ser Lys Cys Lys Ala Asn Ile
225 230 235 240

Val Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Lys Asn
245 250 255

Glu Asn Arg Ile Ile Ile Ser Pro Lys Arg Trp Leu Asn Asn His Glu
260 265 270

Gln Thr Ser Thr Leu Cys Asp Asn Trp Ile Arg Cys Gly Asp Asp
275 280 285

<210> 29
<211> 301
<212> PRT
<213> Gillisia limnaea

<400> 29

Met Phe Ile Ser Lys Asn Thr Val Ile Ile Lys Leu Val Gly Gly Leu
1 5 10 15

Gly Asn Gln Met Phe Gln Phe Ala Ile Ala Lys Ile Ile Ala Glu Lys
20 25 30

Glu Lys Ser Glu Val Leu Val Asp Ile Thr Phe Tyr Thr Glu Leu Thr
35 40 45

Glu Asn Thr Lys Lys Phe Pro Arg His Phe Ser Leu Gly Ile Phe Asn
50 55 60

```
Ser Ser Phe Ala Ile Ala Ser Lys Lys Glu Ile Asp Tyr Phe Thr Lys
65                  70                  75                  80

Leu Ser Asn Phe Asn Lys Phe Lys Lys Lys Leu Gly Leu Asn Tyr Pro
                85                  90                  95

Thr Ile Phe His Glu Ser Ser Phe Asn Phe Lys Ala Gln Val Leu Glu
            100                 105                 110

Leu Lys Ala Pro Ile Tyr Leu Asn Gly Tyr Phe Gln Ser Phe Arg Tyr
        115                 120                 125

Phe Leu Gly Lys Glu Tyr Val Ile Arg Lys Ile Phe Lys Phe Pro Asp
    130                 135                 140

Glu Ala Leu Asp Lys Asp Asn Asp Asn Ile Lys Arg Lys Ile Ile Gly
145                 150                 155                 160

Lys Thr Ser Val Ser Leu His Ile Arg Arg Gly Asp Tyr Val Asn Asn
                165                 170                 175

Lys Lys Thr Gln Gln Phe His Gly Asn Cys Thr Ile Asp Tyr Tyr Gln
            180                 185                 190

Ser Ala Ile Ala Tyr Leu Ser Ser Lys Leu Thr Asp Phe Asn Leu Ile
        195                 200                 205

Phe Phe Ser Asp Asp Ile His Trp Val Arg Gln Gln Phe Lys Asn Ile
    210                 215                 220

Ser Asn Gln Lys Ile Tyr Val Ser Gly Asn Leu Asn His Asn Ser Trp
225                 230                 235                 240

Lys Asp Met Tyr Leu Met Ser Leu Cys Asp His Asn Ile Ile Ala Asn
                245                 250                 255

Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Lys Asn Pro Glu Lys
            260                 265                 270

Ile Ile Ile Ala Pro Lys Arg Trp Phe Ala Asp Thr Glu Gln Asp Lys
        275                 280                 285

Asn Ser Ile Asp Leu Ile Pro Ser Glu Trp Tyr Arg Ile
    290                 295                 300
```

<210> 30
<211> 288
<212> PRT
<213> Methylotenera mobilis

<400> 30

```
Met Leu Val Ser Arg Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                  10                  15

Tyr Ala Ala Ala Arg Ala Ala Ser Leu Arg Ile Ser Val Gln Leu Lys
            20                  25                  30

Leu Asp Leu Ser Gly Phe Glu Thr Tyr Asp Leu His Ala Tyr Gly Leu
        35                  40                  45

Asn Asn Phe Asn Ile Val Glu Asp Val Ala Lys Lys Asp Asp Tyr Phe
    50                  55                  60

Ile Gly Ala Pro Glu Ser Leu Leu Lys Lys Ile Lys Lys Tyr Leu Arg
65                  70                  75                  80

Gly Leu Ile Gln Leu Glu Ser Phe Arg Glu Ser Asp Leu Ser Phe Asp
                85                  90                  95

Ser Lys Val Leu Glu Leu Asn Asp Asn Thr Tyr Leu Asp Gly Tyr Trp
            100                 105                 110

Gln Cys Glu Arg Tyr Phe Ile Asp Phe Asp Lys Gln Ile Arg Gln Asp
        115                 120                 125

Phe Ser Phe Lys Phe Ala Pro Asp Ala Leu Asn Gln Arg Tyr Leu Glu
    130                 135                 140

Leu Ile Asp Ser Val Asn Ala Val Ser Val His Ile Arg Arg Gly Asp
145                 150                 155                 160

Tyr Val Ser Asn Ser Thr Thr Asn Glu Ile His Gly Val Cys Asp Leu
                165                 170                 175

Asp Tyr Tyr Gln Arg Ala Ala Glu Phe Met Arg Ala Arg Ile Gly Pro
            180                 185                 190

Glu Asn Leu His Phe Phe Val Phe Ser Asp Asp Thr Asp Trp Val Lys
        195                 200                 205

Glu Asn Ile Ser Phe Gly Ser Asp Thr Thr Phe Ile Ser His Asn Asp
    210                 215                 220

Ala Ala Lys Asn Tyr Glu Asp Met Arg Leu Met Ser Ala Cys Lys His
225                 230                 235                 240

His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn
                245                 250                 255

Pro Ser Lys Gln Lys Val Val Ile Ala Pro Arg Gln Trp Phe Lys Ser
            260                 265                 270
```

Thr Leu Leu Asn Ser Asp Asp Ile Val Pro Ala Ser Trp Val Arg Leu
275 280 285

<210> 31
<211> 287
<212> PRT
<213> Runella slithyformis

<400> 31

Met Ile Ile Val Lys Leu Ser Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Phe Gly Arg His Leu Ala Thr Val Asn Gln Lys Glu Leu Lys
20 25 30

Leu Asp Thr Ser Ala Leu Thr Lys Thr Ser Asp Trp Thr Asn Arg Ser
35 40 45

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

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

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

Phe His Phe Tyr Ser Ser Ala Leu Ser Ile Lys Ser Ser His Tyr Leu
100 105 110

Glu Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Glu Ala Ile Thr Pro Ile
115 120 125

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

Thr Ile Lys Glu Lys Ile Ser Asn Gly Thr Ser Val Ser Ile His Leu
145 150 155 160

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

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

Arg Val Lys Asn Pro Asn Phe Phe Leu Phe Ser Asp Asp Ile Lys Trp
195 200 205

Ala Lys Ser Gln Val Thr Phe Pro Pro Thr Thr His Phe Ser Thr Gly
210 215 220

Thr Ser Ala His Glu Asp Leu Trp Leu Met Thr His Cys Arg His His
225 230 235 240

Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn Gln
245 250 255

Gln Pro Asp Lys Ile Val Ile Ala Pro Gln Lys Trp Phe Ser Thr Glu
260 265 270

Arg Phe Asp Thr Lys Asp Leu Leu Pro Glu Pro Trp Ile Gln Leu
275 280 285

<210> 32
<211> 288
<212> PRT
<213> Pseudoalteromonas haloplanktis

<400> 32

Met Ile Lys Val Lys Ala Ile Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Thr Ala Arg Ala Ile Ala Glu Lys Arg Gly Asp Gly Val Val
20 25 30

Val Asp Met Ser Asp Phe Ser Ser Tyr Lys Thr His Pro Phe Cys Leu
35 40 45

Asn Lys Phe Arg Cys Lys Ala Thr Tyr Glu Ser Lys Pro Lys Leu Ile
50 55 60

Asn Lys Leu Leu Ser Asn Glu Lys Ile Arg Asn Leu Leu Gln Lys Leu
65 70 75 80

Gly Phe Ile Lys Lys Tyr Tyr Phe Glu Thr Gln Leu Pro Phe Asn Glu
85 90 95

Asp Val Leu Leu Asn Asn Ser Ile Asn Tyr Leu Thr Gly Tyr Phe Gln
100 105 110

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

Thr Leu Ile Glu Asp Leu Asn Ile Ala Glu Thr Ala Val Ser Lys Ala
130 135 140

Ile Lys Asn Ala Lys Asn Ser Ile Ser Ile His Ile Arg Arg Gly Asp
145 150 155 160

Tyr Val Ser Asn Glu Gly Ala Asn Lys Thr His Gly Val Cys Asp Ser
165 170 175

Asp Tyr Phe Lys Lys Ala Leu Asn Tyr Phe Ser Glu Arg Lys Leu Leu

180 185 190

Asp Glu His Thr Glu Leu Phe Ile Phe Ser Asp Asp Ile Glu Trp Cys
195 200 205

Arg Asn Asn Leu Ser Phe Asp Tyr Lys Met Asn Phe Val Asp Gly Ser
210 215 220

Ser Glu Arg Pro Glu Val Asp Met Val Leu Met Ser Gln Cys Lys His
225 230 235 240

Gln Val Ile Ser Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn
245 250 255

Lys Asn Asp Glu Lys Val Val Val Ala Pro Lys Glu Trp Phe Lys Ser
260 265 270

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

<210> 33
<211> 277
<212> PRT
<213> Unknown

<220>
<223> uncultured bacterium

<400> 33

Met Leu Thr Leu Lys Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Ser His Asn Leu Ala Lys Asn Lys Lys Thr Lys Ile Asn
20 25 30

Phe Asp Leu Ser Phe Phe Ser Asp Ile Glu Val Arg Asp Ile Lys Arg
35 40 45

Asp Tyr Leu Leu Asp Lys Phe Asn Ile Ser Ala Asp Ile Ser Phe Asp
50 55 60

Gln Lys Asn Ser Ile Ser Gly Phe Arg Lys Phe Leu Val Lys Val Ile
65 70 75 80

Ser Lys Phe Phe Gly Glu Val Phe Tyr Tyr Arg Leu Lys Phe Leu Ser
85 90 95

Ser Lys Tyr Leu Asp Gly Tyr Phe Gln Ser Glu Lys Tyr Phe Lys Asn
100 105 110

Val Glu Glu Asp Ile Arg Lys Asp Phe Thr Leu Lys Asp Glu Met Gly
115 120 125

```
Val Glu Ala Lys Lys Ile Glu Gln Gln Ile Val Asn Ser Lys Asn Ser
    130                 135                 140

Val Ser Leu His Ile Arg Arg Gly Asp Tyr Val Asp Asp Leu Lys Thr
145                 150                 155                 160

Asn Ile Tyr His Gly Val Cys Asn Leu Asp Tyr Tyr Lys Arg Ser Ile
                165                 170                 175

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

Asp Asp Ile Ala Trp Val Lys Glu Asn Leu Ala Phe Glu Asn Leu Gln
        195                 200                 205

Phe Val Ser Arg Pro Asp Ile Lys Asp Tyr Glu Glu Leu Met Leu Met
    210                 215                 220

Ser Lys Cys Glu His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp
225                 230                 235                 240

Gly Ala Trp Leu Asn Glu Asn Lys Asn Lys Ile Ile Ile Ala Pro Lys
                245                 250                 255

Glu Trp Phe Gln Lys Phe Asn Ile Asn Glu Lys His Ile Val Pro Lys
            260                 265                 270

Ser Trp Ile Arg Leu
        275
```

<210> 34
<211> 289
<212> PRT
<213> Clostridium sp. KLE 1755

<400> 34

```
Met Val Ile Val Gln Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Ala Leu Tyr Leu Ser Leu Lys Ala Lys Gly Lys Val Val Lys Ile
            20                  25                  30

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

Asp Val Phe Gly Val Ser Tyr Glu Arg Ala Thr Lys Gln Glu Leu Thr
    50                  55                  60

Glu Met Thr Asp Ser Ser Leu Asp Pro Val Ser Arg Ile Arg Arg Lys
65                  70                  75                  80
```

```
Leu Thr Gly Arg Lys Thr Lys Ala Tyr Arg Glu Lys Asp Ile Asn Phe
                85                  90                  95

Asp Pro Gln Val Met Glu Arg Asp Pro Ala Leu Leu Glu Gly Cys Phe
            100                 105                 110

Gln Ser Glu Lys Tyr Phe Gln Asp Cys Arg Glu Gln Val Arg Glu Ala
        115                 120                 125

Tyr Arg Phe Arg Gly Ile Glu Ser Gly Ala Tyr Pro Leu Pro Glu Ala
    130                 135                 140

Tyr Arg Arg Leu Glu Lys Glu Ile Ala Asp Cys Lys Ser Val Ser Val
145                 150                 155                 160

His Ile Arg Arg Gly Asp Tyr Leu Glu Glu Ser His Gly Gly Leu Tyr
                165                 170                 175

Thr Gly Ile Cys Thr Glu Gln Tyr Tyr Gln Glu Ala Phe Ala Arg Met
            180                 185                 190

Glu Lys Glu Val Pro Gly Ala Lys Phe Phe Leu Phe Ser Asn Asp Pro
        195                 200                 205

Asp Trp Thr Arg Glu His Phe Lys Gly Glu Asn Arg Ile Leu Val Glu
    210                 215                 220

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

Cys Lys His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
                245                 250                 255

Trp Leu Asn Asp Asn Pro Glu Lys Lys Val Thr Ala Pro Ala Arg Trp
            260                 265                 270

Leu Asn Gly Arg Glu Cys Arg Asp Ile Tyr Thr Glu Arg Met Ile Arg
        275                 280                 285

Ile
```

<210> 35
<211> 281
<212> PRT
<213> Francisella philomiragia

<400> 35

```
Met Lys Ile Ile Lys Ile Gln Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Phe Tyr Lys Ser Leu Lys Asn Asn Cys Ile Asp Cys Tyr Val
```

20 25 30

Asp Ile Lys Asn Tyr Asp Thr Tyr Lys Leu His Tyr Gly Phe Glu Leu
35 40 45

Asn Arg Ile Phe Lys Asn Ile Asp Leu Ser Phe Ala Arg Lys Tyr His
50 55 60

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

Ile Val Lys Phe Asn Lys Asn Tyr Ile Leu Gln Lys Asn Phe Ala Phe
85 90 95

Asp Lys Ala Tyr Phe Glu Ile Asp Asn Cys Tyr Leu Asp Gly Tyr Trp
100 105 110

Gln Ser Glu Lys Tyr Phe Lys Lys Ile Thr Lys Asp Ile Tyr Asp Ala
115 120 125

Phe Thr Phe Glu Pro Leu Asp Ser Ile Asn Phe Glu Phe Leu Lys Asn
130 135 140

Ile Gln Asp Tyr Asn Leu Val Ser Ile His Val Arg Arg Gly Asp Tyr
145 150 155 160

Val Asn His Pro Leu His Gly Gly Ile Cys Asp Leu Glu Tyr Tyr Asn
165 170 175

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

Val Phe Ser Asn Asp Ile Leu Trp Cys Lys Asp Asn Leu Lys Leu Asp
195 200 205

Arg Val Thr Tyr Ile Asp His Asn Arg Trp Met Asp Ser Tyr Lys Asp
210 215 220

Met His Leu Met Ser Leu Cys Lys His Asn Ile Ile Ala Asn Ser Ser
225 230 235 240

Phe Ser Trp Trp Gly Ala Trp Leu Asn Gln Asn Asp Asp Lys Ile Val
245 250 255

Ile Ala Pro Ser Lys Trp Phe Asn Asp Asp Lys Ile Asn Gln Lys Asp
260 265 270

Ile Cys Pro Asn Ser Trp Val Arg Ile
275 280

<210> 36

<211> 288
<212> PRT
<213> Pseudomonas fluorescens

<400> 36

```
Met Val Ile Ala His Leu Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                  10                  15

Tyr Ala Ala Ala Arg Ala Leu Ser Ser Ala Lys Lys Glu Pro Leu Leu
            20                  25                  30

Leu Asp Thr Ser Ser Phe Glu Ser Tyr Thr Leu His Gln Gly Phe Glu
        35                  40                  45

Leu Ser Lys Leu Phe Ala Gly Glu Met Cys Ile Ala Arg Asp Lys Asp
    50                  55                  60

Ile Asn His Val Leu Ser Trp Gln Ala Phe Pro Arg Ile Arg Asn Phe
65                  70                  75                  80

Leu His Arg Pro Lys Leu Ala Phe Leu Arg Lys Ala Ser Leu Ile Ile
                85                  90                  95

Glu Pro Ser Phe His Tyr Trp Asn Gly Ile Gln Lys Ala Pro Ala Asp
            100                 105                 110

Cys Tyr Leu Met Gly Tyr Trp Gln Ser Glu Arg Tyr Phe Gln Asp Ala
        115                 120                 125

Ala Glu Glu Ile Arg Lys Asp Phe Thr Phe Lys Leu Asn Met Ser Pro
    130                 135                 140

Gln Asn Ile Ala Thr Ala Asp Gln Ile Leu Asn Thr Asn Ala Ile Ser
145                 150                 155                 160

Leu His Val Arg Arg Gly Asp Tyr Val Asn Asn Ser Val Tyr Ala Ala
                165                 170                 175

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

Val Asp Ala Pro Thr Phe Phe Val Phe Ser Asp Asp Ile Asp Trp Val
        195                 200                 205

Lys Asn Asn Leu Asn Ile Gly Phe Pro His Cys Tyr Val Asn His Asn
    210                 215                 220

Lys Gly Ser Glu Ser Tyr Asn Asp Met Arg Leu Met Ser Met Cys Gln
225                 230                 235                 240

His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu
                245                 250                 255
```

```
Asn Ser Asn Ala Asp Lys Ile Val Val Ala Pro Lys Gln Trp Phe Ile
            260                 265                 270

Asn Asn Thr Asn Val Asn Asp Leu Phe Pro Pro Ala Trp Val Thr Leu
        275                 280                 285
```

<210> 37
<211> 293
<212> PRT
<213> Herbaspirillum sp. YR522

<400> 37

```
Met Ile Ala Thr Arg Leu Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Arg Ala Leu Ala Leu Arg Val Gly Ser Pro Leu Leu
            20                  25                  30

Leu Asp Val Ser Gly Phe Ala Asn Tyr Glu Leu Arg Arg Tyr Glu Leu
        35                  40                  45

Asp Gly Phe Arg Ile Asp Ala Thr Ala Ala Ser Ala Gln Gln Leu Ala
    50                  55                  60

Arg Leu Gly Val Asn Ala Thr Pro Gly Thr Ser Leu Leu Ala Arg Val
65                  70                  75                  80

Leu Arg Lys Val Trp Pro Gln Pro Ala Asp Arg Ile Leu Arg Glu Ala
                85                  90                  95

Ser Phe Thr Tyr Asp Ala Arg Ile Glu Gln Ala Ser Ala Pro Val Tyr
            100                 105                 110

Leu Asp Gly Tyr Trp Gln Ser Glu Arg Tyr Phe Ala Arg Ile Arg Gln
        115                 120                 125

His Leu Leu Asp Glu Phe Thr Leu Lys Gly Asp Trp Gly Ser Asp Asn
    130                 135                 140

Ala Ala Met Ala Ala Gln Ile Ala Thr Ala Gly Ala Gly Ala Val Ser
145                 150                 155                 160

Leu His Val Arg Arg Gly Asp Tyr Val Ser Asn Ala His Thr Ala Gln
                165                 170                 175

Tyr His Gly Val Cys Ser Leu Asp Tyr Tyr Arg Asp Ala Val Ala His
            180                 185                 190

Ile Gly Gly Arg Val Glu Ala Pro His Phe Phe Val Phe Ser Asp Asp
        195                 200                 205
```

```
His Glu Trp Val Arg Glu Asn Leu Gln Ile Gly His Pro Ala Thr Phe
    210                 215                 220

Val Gln Ile Asn Ser Ala Asp His Gly Ile Tyr Asp Met Met Leu Met
225                 230                 235                 240

Lys Ser Cys Arg His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp
                245                 250                 255

Gly Ala Trp Leu Asn Pro Ala Glu Asp Lys Ile Val Val Ala Pro Gln
            260                 265                 270

Arg Trp Phe Lys Asp Ala Thr Asn Asp Thr Arg Asp Leu Ile Pro Ala
        275                 280                 285

Ala Trp Val Arg Leu
    290
```

<210> 38
<211> 288
<212> PRT
<213> Prevotella histicola

<400> 38

```
Met Lys Ile Val Lys Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Tyr Leu Ser Leu Lys Glu Thr Phe Pro Gln Glu Asn Val
            20                  25                  30

Thr Val Asp Leu Ser Cys Phe His Gly Tyr His Leu His Asn Gly Phe
        35                  40                  45

Glu Ile Ala Arg Ile Phe Ser Leu His Pro Asp Lys Ala Thr Val Met
    50                  55                  60

Glu Ile Leu Arg Ile Ala Tyr Tyr Tyr Pro Asn Tyr Phe Phe Trp Gln
65                  70                  75                  80

Ile Gly Lys Arg Val Leu Pro Gln Arg Lys Thr Met Cys Thr Glu Ser
                85                  90                  95

Thr Lys Leu Leu Phe Asp Lys Ser Val Leu Gln Arg Glu Gly Asp Arg
            100                 105                 110

Tyr Phe Asp Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Ile Asp Cys Arg
        115                 120                 125

Arg Thr Ile Leu Asn Thr Phe Lys Phe Pro Pro Phe Thr Asp Asp Asn
    130                 135                 140
```

```
Asn Leu Ala Leu Leu Lys Lys Met Asp Thr Asn Ser Val Ser Ile His
145                 150                 155                 160

Val Arg Arg Gly Asp Tyr Val Gly Asn Lys Leu Tyr Gln Gly Ile Cys
                165                 170                 175

Asp Leu Asn Tyr Tyr Arg Glu Ala Ile Met Lys Ile Ser Ser Tyr Ile
            180                 185                 190

Ser Pro Ser Met Phe Cys Val Phe Ser Asn Asp Ile Glu Trp Cys Arg
        195                 200                 205

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

Asn Ser Gly Thr Glu Ser Tyr Arg Asp Met Gln Leu Met Ser Cys Cys
225                 230                 235                 240

Gly His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp
                245                 250                 255

Leu Asn Gln Asn Ser Ser Lys Ile Val Ile Ala Pro Lys Arg Trp Ile
            260                 265                 270

Asn Leu Lys Asn Cys Gly Phe Met Leu Pro Ser Arg Trp Val Lys Ile
        275                 280                 285
```

<210> 39
<211> 273
<212> PRT
<213> Flavobacterium sp. WG21

<400> 39

```
Met Ile Val Val Gln Leu Ile Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Ala Ala Lys Ala Leu Ala Leu Gln Thr Lys Gln Lys Phe Ser
            20                  25                  30

Leu Asp Val Ser Gln Phe Glu Ser Tyr Lys Leu His Asn Tyr Ala Leu
        35                  40                  45

Asn His Phe Asn Val Ile Ser Lys Asn Tyr Lys Lys Pro Asn Arg Tyr
    50                  55                  60

Leu Arg Lys Ile Lys Ser Phe Tyr Gln Lys Asn Val Phe Tyr Lys Glu
65                  70                  75                  80

Val Asp Phe Gly Tyr Asn Pro Asp Leu Ile His Leu Lys Gly Gly Ile
                85                  90                  95

Ile Phe Leu Glu Gly Tyr Phe Gln Ser Glu Lys Tyr Phe Ile Lys Tyr
```

100 105 110

Glu Lys Glu Ile Arg Glu Asp Phe Glu Leu Arg Thr Pro Leu Lys Lys
115 120 125

Glu Thr Lys Ala Ala Ile Ala Lys Ile Glu Ser Val Asn Ser Val Ser
130 135 140

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

Ser Lys Glu Glu Tyr Tyr Asn Lys Ala Leu Glu Ile Val Glu Asn Lys
165 170 175

Ile Asn Asn Pro Val Tyr Phe Val Phe Ser Asp Asp Met Glu Trp Val
180 185 190

Lys Ala Asn Phe Ser Thr Lys Gln Glu Thr Ile Phe Ile Asp Phe Asn
195 200 205

Asp Ala Ser Thr Asn Phe Glu Asp Leu Lys Leu Met Thr Ser Cys Lys
210 215 220

His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Gly Trp Leu
225 230 235 240

Asn Lys Asn Pro Asp Lys Ile Val Ile Ala Pro Lys Arg Trp Phe Asn
245 250 255

Asp Asp Ser Ile Asn Thr Asn Asp Ile Ile Pro Thr Asn Trp Val Lys
260 265 270

Ile

<210> 40
<211> 267
<212> PRT
<213> Polaribacter franzmannii

<400> 40

Met Ile Ile Val Arg Ile Val Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Tyr Ala Lys Ala Leu Gln Gln Lys Gly Tyr Gln Val Lys Ile
20 25 30

Asp Ile Thr Lys Phe Lys Lys Tyr Asn Leu His Gly Gly Tyr Gln Leu
35 40 45

Asp Gln Phe Lys Ile Asp Leu Glu Thr Ser Ser Pro Ile Ala Asn Val
50 55 60

```
Leu Cys Arg Ile Gly Leu Arg Arg Ser Val Lys Glu Lys Ser Leu Leu
65                  70                  75                  80

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

Tyr Phe Gln Thr Glu Lys Tyr Phe Ser Ser Ile Thr Pro Ile Leu Arg
            100                 105                 110

Lys Gln Phe Ile Val Gln Lys Glu Leu Cys Asn Thr Thr Leu Arg Tyr
        115                 120                 125

Leu Lys Glu Ile Thr Ile Gln Lys Asn Ala Cys Ser Leu His Ile Arg
    130                 135                 140

Arg Gly Asp Tyr Ile Ser Asp Glu Lys Ala Asn Ser Val His Gly Thr
145                 150                 155                 160

Cys Asp Leu Pro Tyr Tyr Lys Lys Ser Ile Lys Arg Ile Gln Asp Glu
                165                 170                 175

Tyr Lys Asp Ala His Phe Phe Ile Phe Ser Asp Asp Ile Ser Trp Ala
            180                 185                 190

Lys Lys Asn Leu Thr Asn Lys Asn Thr Thr Phe Ile Glu His Ile Val
        195                 200                 205

Met Pro His Glu Asp Met His Leu Met Ser Leu Cys Lys His Asn Ile
    210                 215                 220

Thr Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Gln His
225                 230                 235                 240

Glu Asn Lys Thr Val Ile Ala Pro Lys Asn Trp Phe Val Asn Arg Glu
                245                 250                 255

Asn Glu Val Ala Cys Ala Asn Trp Ile Gln Leu
            260                 265
```

<210> 41
<211> 267
<212> PRT
<213> Polaribacter sp. MED152

<400> 41

```
Met Val Val Val Arg Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Tyr Ala Lys Ser Leu Ala Glu Lys Gly Tyr Glu Val Gln Ile
            20                  25                  30
```

```
Asp Ile Ser Lys Phe Lys Ser Tyr Lys Leu His Gly Gly Tyr His Leu
        35                  40                  45

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

Leu Ser Lys Ile Gly Leu Lys Lys Thr Ile Lys Glu Pro Asn Leu Leu
65                  70                  75                  80

Phe His Lys Asp Leu Leu Lys Val Asn Asn Asn Ala Phe Ile Lys Gly
                85                  90                  95

Tyr Phe Gln Ala Glu Gln Tyr Phe Ser Asp Ile Arg Glu Ile Leu Ile
            100                 105                 110

Asn Gln Phe Lys Ile Lys Lys Glu Leu Ala Lys Ser Thr Leu Ala Ile
        115                 120                 125

Lys Asn Gln Ile Glu Leu Leu Lys Thr Thr Cys Ser Leu His Val Arg
    130                 135                 140

Arg Gly Asp Tyr Ile Ser Asp Lys Lys Ala Asn Lys Val His Gly Thr
145                 150                 155                 160

Cys Asp Leu Asp Tyr Tyr Ser Ser Ala Ile Glu His Ile Ser Lys Gln
                165                 170                 175

Asn Ser Asn Val His Phe Phe Val Phe Ser Asp Asp Ile Ala Trp Val
            180                 185                 190

Lys Asp Asn Leu Asn Ile Thr Asn Ala Thr Tyr Ile Asp His Asn Val
        195                 200                 205

Ile Pro His Glu Asp Met Tyr Leu Met Thr Leu Cys Asn His Asn Ile
    210                 215                 220

Thr Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Gln Asn
225                 230                 235                 240

Pro Asp Lys Ile Val Ile Ala Pro Lys Asn Trp Phe Val Asp Lys Glu
                245                 250                 255

Asn Glu Val Ala Cys Lys Ser Trp Ile Thr Leu
            260                 265
```

<210> 42
<211> 285
<212> PRT
<213> Methanococcus maripaludis

<400> 42

```
Met Lys Ile Ile Gln Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                  10                  15

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

Asp Ile Ser Trp Tyr Leu Lys Asn Asn Ala His Asn Gly Tyr Glu Leu
        35                  40                  45

Glu Trp Val Phe Gly Leu Ser Pro Glu Tyr Ala Ser Ile Arg Gln Cys
    50                  55                  60

Phe Lys Leu Gly Asp Ile Pro Ile Asn Leu Ile Tyr Asn Val Lys Arg
65                  70                  75                  80

Lys Val Phe Pro Lys Lys Thr His Phe Phe Glu Lys Ser Asn Phe Asn
                85                  90                  95

Tyr Asp Asn Asn Val Phe Glu Val Thr Asn Gly Tyr Phe Glu Gly Tyr
            100                 105                 110

Trp Gln Asn Glu Asn Tyr Phe Lys Asn Phe Arg Ser Glu Ile Leu Asn
        115                 120                 125

Asp Phe Ser Phe Lys Asn Ile Asp Lys Arg Asn Ala Glu Phe Ser Glu
    130                 135                 140

Tyr Leu Lys Ser Ile Asn Ser Val Ser Val His Val Arg Arg Gly Asp
145                 150                 155                 160

Tyr Val Thr Asn Gln Lys Ala Leu Asn Val His Gly Asn Ile Cys Asn
                165                 170                 175

Leu Glu Tyr Tyr Asn Lys Ala Ile Asn Leu Ala Asn Asn Asn Leu Lys
            180                 185                 190

Asn Pro Lys Phe Val Ile Phe Ser Asp Asp Ile Thr Trp Cys Lys Ser
        195                 200                 205

Asn Leu Gly Ile Asp Asp Pro Val Tyr Val Asp Trp Asn Thr Gly Pro
    210                 215                 220

Tyr Ser Tyr Gln Asp Met Tyr Leu Met Ser Asn Cys Lys Asn Asn Ile
225                 230                 235                 240

Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Gln Asn
                245                 250                 255

Thr Glu Lys Lys Val Phe Ser Pro Lys Lys Trp Val Asn Asp Arg Asn
            260                 265                 270
```

```
Asn Val Asn Ile Val Pro Asn Gly Trp Ile Lys Ile Lys
        275                 280                 285


<210>  43
<211>  292
<212>  PRT
<213>  Gallionella sp. SCGC AAA018-N21

<400>  43

Met Ile Ile Ala His Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15


Tyr Ala Ala Gly Arg Ala Leu Ser Leu Ala Arg Gly Val Pro Phe Lys
            20                  25                  30


Leu Asp Ile Ser Gly Phe Glu Gly Tyr Asp Leu His Gln Gly Phe Glu
        35                  40                  45


Leu Gln Arg Val Phe Asn Cys Ala Ala Gly Ile Ala Ser Glu Ala Glu
    50                  55                  60


Val Arg Asp Ser Leu Gly Trp Gln Phe Ser Ser Pro Ile Arg Arg Ile
65                  70                  75                  80


Val Ala Arg Pro Ser Leu Ala Val Leu Arg Arg Ser Thr Phe Val Val
                85                  90                  95


Glu Pro His Phe His Tyr Trp Ala Gly Ile Lys Gln Val Pro Asp Asn
            100                 105                 110


Cys Tyr Leu Ala Gly Tyr Trp Gln Ser Glu Gln Tyr Phe Gln Ser His
        115                 120                 125


Ala Ala Val Ile Arg Thr Asp Phe Ala Phe Lys Pro Pro Leu Ser Gly
    130                 135                 140


Gln Asn Ser Lys Leu Ala Met Gln Ile Ala Gln Gly Asn Ala Val Ser
145                 150                 155                 160


Leu His Ile Arg Arg Gly Asp Tyr Ala Asn Asn Pro Lys Thr Thr Ala
                165                 170                 175


Thr His Gly Leu Cys Ser Leu Asp Tyr Tyr Arg Ala Ala Ile Gln His
            180                 185                 190


Ile Ala Glu Arg Val Gln Ser Pro His Phe Phe Ile Phe Ser Asp Asp
        195                 200                 205


Ile Ala Trp Val Lys Ser Asn Leu Ala Ile Asn Phe Pro His Gln Tyr
    210                 215                 220


Val Asp His Asn Gln Gly Thr Glu Ser Tyr Asn Asp Met Arg Leu Met
```

225 230 235 240

Ser Leu Cys Gln His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp
245 250 255

Gly Ala Trp Leu Asn Thr Asn Ala His Lys Ile Val Ile Ala Pro Lys
260 265 270

Gln Trp Phe Ala Asn Thr Thr His Val Ala Asp Leu Ile Pro Ser Ser
275 280 285

Trp Glu Arg Leu
290

<210> 44
<211> 311
<212> PRT
<213> Azospira oryzae

<400> 44

Met Gln Ser Pro Ala Cys Ile Ala Gly Ala Arg Ala Trp Trp Val Gly
1 5 10 15

Tyr Gly Met Ala Glu Ala Met Gln Pro Val Val Val Gly Leu Ser Gly
20 25 30

Gly Leu Gly Asn Gln Met Phe Gln Tyr Ala Ala Gly Arg Ala Leu Ala
35 40 45

His Arg Leu Gly His Pro Leu Ser Leu Asp Leu Ser Trp Phe Gln Gly
50 55 60

Arg Gly Asp Arg His Phe Ala Leu Ala Pro Phe His Ile Ala Ala Ser
65 70 75 80

Leu Glu Arg Ala Trp Pro Arg Leu Pro Pro Ala Met Gln Ala Gln Leu
85 90 95

Ser Arg Leu Ser Arg Arg Trp Ala Pro Arg Ile Met Gly Ala Pro Val
100 105 110

Phe Arg Glu Pro His Phe His Tyr Val Pro Ala Phe Ala Ala Leu Ala
115 120 125

Ala Pro Val Phe Leu Glu Gly Tyr Trp Gln Ser Glu Arg Tyr Phe Arg
130 135 140

Glu Leu Arg Glu Pro Leu Leu Gln Asp Phe Ser Leu Arg Gln Pro Leu
145 150 155 160

Pro Ala Ser Cys Gln Pro Ile Leu Ala Ala Ile Gly Asn Ser Asp Ala
165 170 175

```
Ile Cys Val His Val Arg Arg Gly Asp Tyr Leu Ser Asn Pro Val Ala
            180                 185                 190

Ala Lys Val His Gly Val Cys Pro Val Asp Tyr Tyr Gln Gln Gly Val
        195                 200                 205

Ala Glu Leu Ser Ala Ser Leu Ala Arg Pro His Cys Phe Val Phe Ser
    210                 215                 220

Asp Asp Pro Glu Trp Val Arg Gly Ser Leu Ala Phe Pro Cys Pro Met
225                 230                 235                 240

Thr Val Val Asp Val Asn Gly Pro Ala Glu Ala His Phe Asp Leu Ala
                245                 250                 255

Leu Met Ala Ala Cys Gln His Phe Val Ile Ala Asn Ser Ser Leu Ser
            260                 265                 270

Trp Trp Gly Ala Trp Leu Gly Gln Ala Ala Gly Lys Arg Val Ile Ala
        275                 280                 285

Pro Ser Arg Trp Phe Leu Thr Ser Asp Lys Asp Ala Arg Asp Leu Leu
    290                 295                 300

Pro Pro Ser Trp Glu Arg Arg
305                 310
```

<210> 45
<211> 290
<212> PRT
<213> Prevotella paludivivens

<400> 45

```
Met Lys Ile Val Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Ala Met Ala Leu Asn Lys Asn Phe Thr Asp Glu Glu Val
            20                  25                  30

Lys Leu Asp Ile His Cys Phe Asn Gly Tyr Thr Lys His Gln Gly Phe
        35                  40                  45

Glu Ile Asp Arg Val Phe Gly Asn Glu Phe Glu Leu Ala Ser Tyr Arg
    50                  55                  60

Asp Val Ala Lys Val Ala Tyr Pro Tyr Phe Asn Phe Gln Leu Trp Arg
65                  70                  75                  80

Ile Gly Ser Arg Ile Phe Pro Asp Arg Arg His Met Ile Ser Glu Asp
                85                  90                  95
```

```
Thr Ser Phe Lys Ile Met Pro Glu Val Ile Thr Ser His Asn Tyr Lys
            100                 105                 110

Tyr Tyr Asp Gly Tyr Trp Gln His Glu Glu Tyr Phe Lys Asn Ile His
        115                 120                 125

Asp Glu Ile Leu Asp Ala Phe Lys Phe Pro Lys Phe Gln Asp Glu Arg
    130                 135                 140

Asn Lys Ala Leu Ala Glu Arg Leu Ser Asp Ser Asn Ser Ile Ser Ile
145                 150                 155                 160

His Ile Arg Arg Gly Asp Tyr Leu Asn Asp Glu Leu Phe Lys Gly Thr
                165                 170                 175

Cys Gly Ile Glu Tyr Tyr Lys Lys Ala Ile Glu Glu Ile Asn Glu Arg
            180                 185                 190

Thr Val Pro Thr Leu Phe Cys Val Phe Ser Asn Asp Ile His Trp Cys
        195                 200                 205

Lys Glu Asn Ile Glu Pro Leu Leu Asn Gly Lys Glu Thr Ile Tyr Val
    210                 215                 220

Asp Trp Asn Thr Gly Ser Asp Asn Tyr Arg Asp Met Gln Leu Met Thr
225                 230                 235                 240

Lys Cys Lys His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ala Trp Leu Asn Asn Thr Lys Asp Lys Ile Val Ile Ala Pro Arg Ile
            260                 265                 270

Trp Tyr Asn Thr Lys Glu Lys Val Ser Pro Val Ala Asn Ser Trp Ile
        275                 280                 285

Lys Leu
    290
```

<210> 46
<211> 300
<212> PRT
<213> Gramella forsetii

<400> 46

```
Met Ser Asn Lys Asn Pro Val Ile Val Glu Ile Met Gly Gly Leu Gly
1               5                   10                  15

Asn Gln Met Phe Gln Phe Ala Val Ala Lys Leu Leu Ala Glu Lys Asn
            20                  25                  30
```

```
Ser Ser Val Leu Leu Val Asp Thr Asn Phe Tyr Lys Glu Ile Ser Gln
        35                  40                  45

Asn Leu Lys Asp Phe Pro Arg Tyr Phe Ser Leu Gly Ile Phe Asp Ile
    50                  55                  60

Ser Tyr Lys Met Gly Thr Glu Asn Gly Met Val Asn Phe Lys Asn Leu
65                  70                  75                  80

Ser Phe Lys Asn Arg Val Ser Arg Lys Leu Gly Leu Asn Tyr Pro Lys
                85                  90                  95

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

Lys Thr Pro Ile Tyr Leu Lys Gly Tyr Phe Gln Ser Tyr Lys Tyr Phe
        115                 120                 125

Ile Gly Val Glu Ser Lys Ile Arg Gln Trp Phe Glu Phe Pro Tyr Glu
    130                 135                 140

Asn Leu Gly Val Gly Asn Glu Glu Ile Lys Ser Lys Ile Leu Glu Lys
145                 150                 155                 160

Thr Ser Val Ser Val His Ile Arg Arg Gly Asp Tyr Val Glu Asn Lys
                165                 170                 175

Lys Thr Lys Glu Phe His Gly Asn Cys Ser Leu Glu Tyr Tyr Lys Asn
            180                 185                 190

Ala Ile Thr Tyr Phe Leu Asp Ile Val Lys Glu Phe Asn Ile Val Phe
        195                 200                 205

Phe Ser Asp Asp Ile Ser Trp Val Arg Asp Glu Phe Lys Asp Leu Pro
    210                 215                 220

Asn Glu Lys Val Phe Val Thr Gly Asn Leu His Glu Asn Ser Trp Lys
225                 230                 235                 240

Asp Met Tyr Leu Met Ser Leu Cys Asp His Asn Ile Ile Ala Asn Ser
                245                 250                 255

Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Asn Asn Ser Glu Lys Asn
            260                 265                 270

Val Ile Ala Pro Lys Lys Trp Phe Ala Asp Ile Asp Gln Glu Gln Lys
        275                 280                 285

Ser Leu Asp Leu Leu Pro Pro Ser Trp Ile Arg Met
    290                 295                 300
```

<210> 47
<211> 298
<212> PRT
<213> Mariprofundus ferrooxydans

<400> 47

Met Ile Ile Val Gln Phe Thr Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Gly Arg Arg Leu Ser Leu Leu His Asp Val Glu Leu Lys
20 25 30

Phe Asp Leu Ser Phe Tyr Gln His Asp Ile Leu Arg Asp Phe Met Leu
35 40 45

Asp Arg Phe Gln Val Asn Gly Gln Val Ala Thr Glu Lys Glu Ile Glu
50 55 60

Ala Tyr Thr Asn Thr Pro Ile Phe Ala Leu Asp Arg Pro Leu Leu Asp
65 70 75 80

Arg Leu Val Arg Trp Gly Leu Tyr Arg Gly Ile Val Ser Val Ser Asp
85 90 95

Glu Pro Pro Gly Lys Gln Ala Leu Met Val Tyr Asn Ser Arg Val Leu
100 105 110

Gln Ala Pro Arg Asn Thr Tyr Val Gln Gly Tyr Trp Gln Ser Glu Lys
115 120 125

Tyr Phe Met Pro Ile Arg Gln Lys Leu Leu Asp Asp Phe Ser Leu Val
130 135 140

Asp Lys Ala Asp Gln Ala Asn Gly Ala Met Leu Glu Lys Ile Arg Gln
145 150 155 160

Cys His Ser Val Ser Leu His Val Arg Arg Gly Asp Tyr Val Ser Asn
165 170 175

Pro Leu Thr Asn His Ser His Gly Thr Cys Gly Leu Glu Tyr Tyr Glu
180 185 190

Lys Ala Ile Ala Leu Ile Gly Ser Lys Val Asp Asp Pro His Phe Phe
195 200 205

Val Phe Ser Asp Asp Pro Glu Trp Thr Arg Asp His Leu Lys Cys Arg
210 215 220

Phe Pro Met Thr Tyr Val Thr Cys Asn Ser Ala Asp Ser Cys Glu Trp
225 230 235 240

Asp Met Glu Leu Met Arg His Cys Arg Asp His Ile Ile Ala Asn Ser

245 250 255

Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Met Asn Pro Asp Lys Val
260 265 270

Val Val Ala Pro Ala Ala Trp Phe Asn Asn Phe Ser Ala Asp Thr Ser
275 280 285

Asp Leu Ile Pro Asp Ser Trp Val Arg Ile
290 295

<210> 48
<211> 291
<212> PRT
<213> Bacillus cereus

<400> 48

Met Lys Ile Ile Gln Val Ser Ser Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Lys Lys Ile Ser Leu Asn Asp Asn Asp Val Phe Leu
20 25 30

Asp Ser Ser Thr Ser Tyr Met Met Tyr Lys Asn Gln His Asn Gly Tyr
35 40 45

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

Ile Ile Asp Asn Leu Ser Asp Leu Asp Ser Glu Leu Ile Ser Arg Ile
65 70 75 80

Arg Arg Lys Leu Phe Gly Ala Lys Lys Ser Met Tyr Val Glu Leu Lys
85 90 95

Glu Phe Glu Tyr Asp Pro Ile Ile Phe Glu Lys Lys Glu Thr Tyr Phe
100 105 110

Lys Gly Tyr Trp Gln Asn Tyr Asn Tyr Phe Lys Asp Ile Glu Gln Glu
115 120 125

Leu Arg Lys Asp Phe Val Phe Thr Glu Lys Leu Asp Lys Arg Asn Glu
130 135 140

Lys Leu Ala Asn Glu Ile Arg Asn Lys Asn Ser Val Ser Ile His Ile
145 150 155 160

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

Asn Ile Ala Asn Leu Glu Tyr Tyr Leu Lys Ala Ile Asn Leu Val Lys
180 185 190

```
Lys Lys Ile Glu Asp Pro Lys Phe Tyr Ile Phe Ser Asp Asp Ile Asp
        195                 200                 205

Trp Ala Gln Lys Asn Ile Asn Leu Thr Asn Asp Val Val Tyr Ile Ser
    210                 215                 220

His Asn Gln Gly Asn Glu Ser Tyr Lys Asp Met Gln Leu Met Ser Leu
225                 230                 235                 240

Cys Lys His Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala
                245                 250                 255

Phe Leu Asn Asn Asn Asp Asp Lys Ile Val Val Ala Pro Lys Lys Trp
            260                 265                 270

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

Ile Thr Tyr
    290
```

<210> 49
<211> 300
<212> PRT
<213> Firmicutes bacterium CAG:534

<400> 49

```
Met Ile Ile Ile Arg Met Thr Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Tyr Leu Lys Leu Arg Ala Met Gly Lys Glu Val Lys Met
            20                  25                  30

Asp Asp Phe Thr Glu Tyr Glu Gly Arg Glu Ala Arg Pro Leu Ser Leu
        35                  40                  45

Trp Ala Phe Gly Ile Glu Tyr Asp Arg Ala Ser Arg Glu Glu Leu Cys
    50                  55                  60

Arg Met Thr Asp Gly Phe Leu Asp Pro Val Ser Arg Ile Arg Arg Lys
65                  70                  75                  80

Leu Phe Gly Arg Lys Ser Leu Glu Tyr Met Glu Lys Asp Cys Asn Phe
                85                  90                  95

Asp Pro Glu Ile Leu Asn Arg Asp Pro Ala Tyr Leu Thr Gly Tyr Phe
            100                 105                 110

Gln Ser Glu Lys Tyr Phe Ala Asp Ile Glu Glu Glu Val Arg Gln Ala
        115                 120                 125
```

```
Phe Arg Phe Ser Glu Arg Ile Trp Glu Gly Ile Pro Ser Gln Leu Leu
    130                 135                 140

Glu Arg Ile Arg Ser Tyr Glu Gln Gln Ile Lys Thr Thr Met Ala Val
145                 150                 155                 160

Ser Val His Ile Arg Arg Gly Asp Tyr Leu Gln Asn Glu Glu Ala Tyr
                165                 170                 175

Gly Gly Ile Cys Thr Glu Arg Tyr Tyr Lys Thr Ala Ile Glu Tyr Val
            180                 185                 190

Lys Lys Arg Gln Gln Asp Ala Ser Phe Phe Val Phe Thr Asn Asp Pro
        195                 200                 205

Asp Tyr Ala Gly Glu Trp Ile Leu Lys Asn Phe Gly Gln Glu Lys Glu
    210                 215                 220

Arg Phe Val Leu Ile Glu Gly Thr Gln Glu Glu Asn Gly Tyr Leu Asp
225                 230                 235                 240

Leu Tyr Leu Met Ser Leu Cys Arg His His Ile Leu Ala Asn Ser Ser
                245                 250                 255

Phe Ser Trp Trp Gly Ala Tyr Leu Asn Pro Ser Arg Glu Lys Met Val
            260                 265                 270

Ile Val Pro His Lys Trp Phe Gly Asn Gln Glu Cys Arg Asp Ile Tyr
        275                 280                 285

Met Glu Asn Met Ile Arg Ile Ala Lys Glu Gln Ser
    290                 295                 300


<210>  50
<211>  292
<212>  PRT
<213>  Sideroxydans lithotrophicus

<400>  50

Met Val Ile Ser Asn Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Ala Arg Ala Leu Ser Leu Lys Leu Glu Val Pro Leu Lys
            20                  25                  30

Leu Asp Ile Ser Gly Phe Thr Asn Tyr Ala Leu His Gln Gly Phe Glu
        35                  40                  45

Leu Asp Arg Ile Phe Gly Cys Lys Ile Glu Ile Ala Ser Glu Ala Asp
    50                  55                  60
```

```
Val His Glu Ile Leu Gly Trp Gln Ser Ala Ser Gly Ile Arg Arg Val
65                  70                  75                  80

Val Ser Arg Pro Gly Met Ser Ile Phe Arg Arg Lys Gly Phe Val Val
                85                  90                  95

Glu Pro His Phe Ser Tyr Trp Asn Gly Ile Arg Lys Ile Thr Gly Asp
            100                 105                 110

Cys Tyr Leu Ala Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Leu Asp Ala
        115                 120                 125

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

His Asn Ala Glu Leu Ala Glu Lys Ile Asp Gln Glu Asn Ala Val Ser
145                 150                 155                 160

Leu His Ile Arg Arg Gly Asp Tyr Ala Asn Asn Pro Leu Thr Ala Ala
                165                 170                 175

Thr His Gly Leu Cys Ser Leu Asp Tyr Tyr Arg Lys Ser Ile Lys His
            180                 185                 190

Ile Ala Gly Gln Val Arg Asn Pro Tyr Phe Phe Val Phe Ser Asp Asp
        195                 200                 205

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

Val Asp Tyr Asn His Gly Ser Met Ser Phe Asn Asp Met Arg Leu Met
225                 230                 235                 240

Ser Leu Cys Lys His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp
                245                 250                 255

Gly Ala Trp Leu Asn Pro Asn Pro Glu Lys Val Val Ile Ala Pro Glu
            260                 265                 270

Arg Trp Phe Ala Asn Arg Thr Asp Val Gln Asp Leu Leu Pro Pro Gly
        275                 280                 285

Trp Val Lys Leu
    290
```

<210> 51
<211> 292
<212> PRT
<213> zeta proteobacterium SCGC AB-137-C09

<400> 51

```
Met Ile Val Ser Gln Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
```

```
1               5                   10                  15

Tyr Ala Thr Gly Arg Ala Leu Ser His Arg Leu His Asp Thr Phe Phe
            20                  25                  30

Leu Asp Leu Asp Gly Phe Ser Gly Tyr Gln Leu His Gln Gly Phe Glu
        35                  40                  45

Leu Ser Asn Val Phe Gln Cys Glu Val Asn Val Ala Thr Arg Ser Gln
    50                  55                  60

Met Gln Ala Leu Leu Gly Trp Arg Ser Phe Ser Ser Val Arg Arg Leu
65                  70                  75                  80

Leu Met Lys Arg Ser Leu Lys Trp Ala Arg Gly His Arg Val Met Ile
                85                  90                  95

Glu Pro His Phe His Tyr Trp Ser Arg Phe Ala Glu Ile Asn Glu Gly
            100                 105                 110

Cys Tyr Leu Ser Gly Tyr Trp Gln Ser Glu Arg Tyr Phe Lys Pro Ile
        115                 120                 125

Glu Asn Ile Ile Arg Gln Asp Phe Lys Phe Asn His Leu Leu Lys Gly
    130                 135                 140

Val Asn Leu Asp Leu Ala Gln Gln Met Thr Glu Val Asn Ser Val Ser
145                 150                 155                 160

Leu His Val Arg Arg Gly Asp Tyr Ala Ser Asp Ala Asn Thr Asn His
                165                 170                 175

Thr His Gly Leu Cys Pro Leu Asp Tyr Tyr Arg Asp Ala Ile Leu Tyr
            180                 185                 190

Ile Ala Gln Asn Thr Val Ala Pro Ser Phe Phe Ile Phe Ser Asp Asp
        195                 200                 205

Ile Glu Trp Cys Arg Glu His Leu Lys Leu Ser Phe Pro Ala Thr Tyr
    210                 215                 220

Ile Asp His Asn Lys Gly Ser Asn Ser Tyr Cys Asp Met Gln Leu Met
225                 230                 235                 240

Ser Leu Cys His His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp
                245                 250                 255

Gly Ala Trp Leu Asn Thr Arg Leu Asp Lys Ile Val Ile Ala Pro Lys
            260                 265                 270

Gln Trp Phe Ala Asn Gly Asn Arg Thr Asp Asp Leu Ile Pro Ala Glu
```

275 280 285

Trp Leu Val Met
290

<210> 52
<211> 283
<212> PRT
<213> Pedobacter heparinus

<400> 52

Met Lys Ile Ile Arg Phe Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Phe Tyr Lys Ser Leu Gln His Arg Phe Pro His Val Lys Ala
20 25 30

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

Glu His Ile Phe Asn Ile Lys Val Asn Ser Val Ser Ser Phe Thr Ser
50 55 60

Asp Leu Phe Tyr Asn Lys Lys Trp Leu Tyr Arg Lys Leu Arg Arg Ile
65 70 75 80

Leu Asn Leu Arg Asn Thr Tyr Ile Glu Glu Lys Lys Leu Phe Ser Phe
85 90 95

Asp Pro Ser Leu Leu Asn Asn Pro Lys Ser Ala Tyr Tyr Trp Gly Tyr
100 105 110

Trp Gln Asn Phe Gln Tyr Phe Glu His Ile Ala Asp Asp Leu Arg Lys
115 120 125

Asp Phe Gln Phe Arg Ala Pro Leu Ser Ala Gln Asn Gln Glu Val Leu
130 135 140

Asp Gln Thr Lys Leu Ser Asn Ser Ile Ser Leu His Ile Arg Arg Gly
145 150 155 160

Asp Tyr Ile Lys Asp Pro Leu Leu Gly Gly Leu Cys Gly Pro Glu Tyr
165 170 175

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

Phe Phe Ile Phe Ser Asp Asp Ile Asp Trp Cys Ile Ala Asn Leu Lys
195 200 205

Leu Gln Asp Cys Ser Phe Ile Ser Trp Asn Lys Gly Thr Ser Ser Tyr
210 215 220

```
Ile Asp Met Gln Leu Met Ser Ser Cys Lys His His Ile Val Ala Asn
225                 230                 235                 240

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

Ile Val Ile Ala Pro Glu Lys Trp Thr Asn Asp Lys Asp Ile Asn Val
            260                 265                 270

Arg Met Ser Phe Pro Gln Gly Trp Ile Ser Leu
        275                 280
```

<210> 53
<211> 278
<212> PRT
<213> Methylophilus methylotrophus

<400> 53

```
Met Phe Gln Tyr Ala Met Gly Leu Ser Leu Ala Glu Asn Asn Gln Thr
1               5                   10                  15

Pro Leu Lys Leu Asp Leu Ser Gln Phe Thr Asp Tyr Lys Leu His Asn
            20                  25                  30

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

Val Thr Gln Ile Glu Thr Leu Leu Gly Ile Cys Lys Tyr Ser Phe Ile
    50                  55                  60

Arg Arg Ile Leu Lys Asn Thr Tyr Leu Lys Asn Leu Arg Pro Ala Gln
65                  70                  75                  80

Tyr Val Val Glu Pro Phe Phe Gly Tyr Trp Asp Gly Val Asn Phe Leu
                85                  90                  95

Gly Asp Asn Val Tyr Leu Glu Gly Tyr Trp Gln Ser Gln Lys Tyr Phe
            100                 105                 110

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

Leu Ser Gly Glu Asn Leu Lys Leu Ser Asp Arg Ile Lys Gly Ser Asn
    130                 135                 140

Ser Val Ser Leu His Ile Arg Arg Gly Asp Tyr Val Thr Asn Lys Asn
145                 150                 155                 160

Asn Ala Phe Ile Gly Thr Cys Ser Leu Ile Tyr Tyr Gln Asn Ala Ile
                165                 170                 175
```

```
Glu Tyr Phe Ser Thr Lys Ile Ala Asp Pro Ile Phe Phe Ile Phe Ser
            180                 185                 190

Asp Asp Ile Thr Trp Ala Lys Ser Asn Leu Arg Leu Ala Asn Glu His
        195                 200                 205

Tyr Phe Val Gly His Asn Gln Gly Glu Asp Ser His Phe Asp Met Gln
    210                 215                 220

Leu Met Ser Leu Cys Lys His His Ile Ile Ala Asn Ser Ser Phe Ser
225                 230                 235                 240

Trp Trp Gly Ala Trp Leu Asn Pro Ser Lys Asp Lys Ile Ile Ile Ala
                245                 250                 255

Pro Lys Lys Trp Phe Ala Ser Gly Leu Asn Asp Gln Asp Leu Val Pro
            260                 265                 270

Lys Asp Trp Leu Arg Ile
        275
```

<210> 54
<211> 285
<212> PRT
<213> Rhodobacterales bacterium HTCC2255

<400> 54

```
Met Ile Tyr Thr Arg Ile Arg Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ser Ala Ala Arg Ser Leu Ala Asp Tyr Leu Asn Val Ser Leu Gly
            20                  25                  30

Leu Asp Thr Arg Glu Phe Asp Glu Asn Ser Pro Tyr Lys Met Ser Leu
        35                  40                  45

Asn His Phe Asn Ile Arg Ala Asp Leu Asn Pro Pro Asp Leu Ile Lys
    50                  55                  60

His Lys Lys Asp Gly Lys Ile Ala Tyr Ile Ile Asp His Ile Lys Gly
65                  70                  75                  80

Asn Gln Lys Lys Val Tyr Lys Glu Pro Phe Leu Ser Phe Asp Lys Asn
                85                  90                  95

Leu Phe Ser Asn Val Asp Gly Thr Tyr Leu Lys Gly Tyr Trp Gln Ser
            100                 105                 110

Glu Lys Tyr Phe Leu Arg Asn Arg Lys Asn Ile Leu Ser Asp Ile Asn
        115                 120                 125
```

```
Leu Ile Lys Lys Thr Asp Lys Phe Asn Thr Ile Asn Leu Lys Glu Ile
    130                 135                 140

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

Ser Asn Glu Ser Tyr Asn Glu Thr His Gly Ile Cys Ser Leu Ser Tyr
                165                 170                 175

Tyr Thr Asp Ala Val Glu Tyr Ile Lys Asn Arg Leu Gly Glu Asn Ile
            180                 185                 190

Lys Val Phe Ala Phe Ser Asp Asp Pro Asp Trp Val Leu Glu Asn Leu
        195                 200                 205

Lys Leu Ser Val Asp Ile Lys Ile Ile Asn Asn Asn Thr Ser Ala Asn
    210                 215                 220

Ser Phe Glu Asp Leu Arg Leu Met Leu Asn Cys Asp His Asn Ile Ile
225                 230                 235                 240

Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Gln Asn Pro
                245                 250                 255

Glu Lys Ile Val Ile Ser Pro Lys Lys Trp Tyr Asn Lys Lys Gln Leu
            260                 265                 270

Gln Asn Ala Asp Ile Val Pro Ser Ser Trp Leu Lys Tyr
        275                 280                 285
```

<210> 55
<211> 295
<212> PRT
<213> Spirulina subsalsa

<400> 55

```
Met Ala Lys Ile Ile Ala Arg Ile Arg Gly Gly Ile Gly Asn Gln Ile
1               5                   10                  15

Phe Ile Tyr Ala Ala Ala Arg Arg Leu Glu Leu Ile Asn Asn Ala Glu
            20                  25                  30

Leu Val Leu Asp Ser Val Ser Gly Phe Val His Asp Leu Gln Tyr Arg
        35                  40                  45

Gln His Tyr Gln Leu Asp His Phe His Ile Pro Cys Arg Lys Ala Thr
    50                  55                  60

Pro Ala Glu Arg Phe Glu Pro Phe Ser Arg Val Arg Arg Tyr Leu Lys
65                  70                  75                  80

Arg Gln Leu Asn Gln Arg Leu Pro Phe Glu Gln Arg Arg Tyr Val Ile
```

85 90 95

Gln Glu Ser Ile Asp Phe Asp Pro Arg Leu Ile Glu Phe Lys Pro Arg
100 105 110

Gly Thr Val His Leu Glu Gly Tyr Trp Gln Ser Glu Asp Tyr Phe Lys
115 120 125

Asp Ile Glu Ala Thr Ile Arg Gln Asp Leu Gln Ile Gln Pro Pro Thr
130 135 140

Asp Pro Thr Asn Leu Ala Ile Val Gln His Ile His Gln His Thr Ser
145 150 155 160

Val Ala Val His Ile Arg Phe Phe Asp Gln Pro Asn Ala Asp Thr Met
165 170 175

Asn Asn Ala Pro Ser Asp Tyr Tyr His Arg Ala Val Glu Ala Met Glu
180 185 190

Thr Phe Val Pro Gly Ala His Tyr Tyr Leu Phe Ser Asp Gln Pro Glu
195 200 205

Ala Ala Lys Ser Arg Ile Pro Leu Pro Asp Glu Arg Val Thr Leu Val
210 215 220

Asn His Asn Arg Gly Asn Lys Leu Ala Tyr Ala Asp Leu Trp Leu Met
225 230 235 240

Thr Gln Cys Gln His Phe Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp
245 250 255

Gly Ala Trp Leu Ala Glu Asn Gln Lys Lys Gln Val Ile Ala Pro Gly
260 265 270

Phe Glu Lys Arg Glu Gly Val Ser Trp Trp Gly Phe Lys Gly Leu Leu
275 280 285

Pro Lys Gln Trp Ile Lys Leu
290 295

<210> 56
<211> 287
<212> PRT
<213> Vibrio cyclitrophicus

<400> 56

Met Val Ile Val Lys Ile Thr Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Thr Gly Ser Ala Leu Ala Asn Lys Leu Ser Cys Glu Leu Val
20 25 30

```
Leu Asp Leu Ser Phe Tyr Pro Thr Gln Thr Leu Arg Lys Tyr Glu Leu
        35                  40                  45

Ala Lys Phe Asn Ile Asn Ala Arg Val Ala Thr Asp Arg Glu Ile Phe
    50                  55                  60

Leu Ala Gly Gly Gly Asn Asp Phe Phe Ser Lys Ala Leu Lys Lys Leu
65                  70                  75                  80

Gly Leu Thr Ser Ile Ile Phe Pro Glu Tyr Ile Lys Glu Gln Glu Ser
                85                  90                  95

Ile Lys Tyr Val Gly Lys Ile Asp Leu Cys Lys Ser Gly Ala Tyr Leu
            100                 105                 110

Asp Gly Tyr Trp Gln Asn Pro Leu Tyr Phe Ser Gln Asn Lys Ile Glu
        115                 120                 125

Leu Thr Arg Glu Phe Leu Pro Arg Ala Gln Leu Ser Pro Ser Ala Leu
    130                 135                 140

Ala Trp Lys Asp His Ile Ser Gln Ala Ser Asn Ser Val Ser Leu His
145                 150                 155                 160

Val Arg Arg Gly Asp Tyr Val Glu Asn Ala His Thr Asn Asn Ile His
                165                 170                 175

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

Ser Glu Val His Asn Pro Val Phe Phe Val Phe Ser Asp Asp Ile Glu
        195                 200                 205

Trp Cys Lys Leu Asn Leu Ser Ser Leu Ala Glu Val Glu Phe Val Asp
    210                 215                 220

Asn Thr Thr Ser Ala Ile Asp Asp Leu Met Leu Met Arg Gln Cys Lys
225                 230                 235                 240

His Ser Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu
                245                 250                 255

Lys Leu Asp Gly Leu Val Ile Ala Pro Arg Asn Trp Phe Ser Ser Ala
            260                 265                 270

Ser Arg Asn Leu Lys Gly Ile Tyr Pro Lys Glu Trp His Ile Leu
        275                 280                 285
```

<210> 57
<211> 288

<212> PRT
<213> Lachnospiraceae bacterium NK4A179

<400> 57

```
Met Arg Ser Val Val Asp Ile Lys Gly Gly Tyr Gly Asn Gln Leu Phe
1               5                  10                  15

Cys Tyr Ser Phe Gly Tyr Ala Val Ser Lys Glu Thr Gly Ser Glu Leu
            20                  25                  30

Ile Ile Asp Thr Ser Met Leu Asp Met Asn Asn Val Lys Asp Arg Asn
        35                  40                  45

Tyr Gln Leu Gly Val Leu Gly Ile Thr Tyr Asp Ser His Ile Ser Tyr
    50                  55                  60

Lys Tyr Gly Lys Asp Phe Leu Ser Arg Lys Thr Gly Leu Asn Arg Leu
65                  70                  75                  80

Arg Lys Lys Ser Ala Ile Gly Phe Gly Thr Val Val Phe Lys Glu Lys
                85                  90                  95

Glu Gln Tyr Val Tyr Asp Pro Ser Val Phe Glu Ile Lys Arg Asp Thr
            100                 105                 110

Tyr Phe Asp Gly Phe Trp Gln Ser Ser Arg Tyr Phe Glu Lys Tyr Ser
        115                 120                 125

Asp Asp Leu Arg Lys Met Leu Lys Pro Lys Lys Ile Ser Asn Ala Ala
    130                 135                 140

Glu Lys Leu Ala Glu Asp Ala Arg Asp Cys Leu Ser Val Ser Val His
145                 150                 155                 160

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

Tyr Tyr Ile Lys Ala Leu Asp Ile Ile Lys Glu Arg Tyr Gly Ser Glu
            180                 185                 190

Pro Val Phe Phe Val Phe Ser Asp Asn Lys Lys Tyr Ala Asp Asp Phe
        195                 200                 205

Phe Ser Ala Ala Gly Leu Lys Tyr Arg Leu Met Asp Tyr Glu Thr Asp
    210                 215                 220

Asp Ala Val Arg Asp Asp Met Phe Leu Met Ser Arg Cys Ser His Asn
225                 230                 235                 240

Ile Met Ala Asn Ser Ser Tyr Ser Trp Trp Gly Ala Phe Leu Asn Asp
                245                 250                 255
```

Asn Lys Asp Lys Thr Val Ile Cys Pro Glu Thr Gly Val Trp Gly Gly
260 265 270

Asp Phe Tyr Pro Glu Gly Trp Met Lys Val Thr Ala Ser Ser Gly Lys
275 280 285

<210> 58
<211> 291
<212> PRT
<213> Unknown

<220>
<223> uncultured bacterium

<400> 58

Met Ile Ile Val Asn Leu Tyr Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Gly Arg His Leu Ala Glu Lys Asn Asn Thr Glu Leu Lys
20 25 30

Leu Asp Ile Ser Ala Phe Glu Ser Tyr Lys Leu Arg Lys Tyr Glu Leu
35 40 45

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

Arg Leu Ser Thr Leu Pro Thr Gly Lys Ile Glu Arg Phe Ile Arg Lys
65 70 75 80

Thr Leu Arg Lys Pro Val Lys Lys Pro Glu Ser Tyr Ile Lys Glu Asn
85 90 95

Ile Thr Gly Gly Phe Asn Pro Lys Ile Leu Asp Leu Gln Asn Asn Ile
100 105 110

Tyr Leu Glu Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Ile Glu Ile Glu
115 120 125

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

Asn Lys Glu Ile Leu Glu Asn Ile Leu Asn Ile Asn Ser Val Ser Leu
145 150 155 160

His Ile Arg Arg Gly Asp Tyr Val Thr Asn Pro Glu Val Asn Gln Val
165 170 175

His Gly Val Cys Ser Leu Asp Tyr Tyr Lys Ser Cys Val Asp Phe Ile
180 185 190

Glu Lys Lys Leu Glu Ser Pro Tyr Phe Tyr Ile Phe Ser Asp Asp Ile

195 200 205

Glu Trp Val Lys Asn Asn Leu Gln Ile Gln Ser Gln Val Tyr Tyr Val
210 215 220

Asp His Asn Thr Val Asp Asn Ala Ile Glu Asp Met Arg Leu Met Phe
225 230 235 240

Ser Cys Lys His Asn Ile Leu Ala Asn Ser Ser Phe Ser Trp Trp Gly
245 250 255

Ala Trp Leu Asn Ser Asn Pro Asp Lys Met Val Ile Thr Pro Arg Lys
260 265 270

Trp Phe Asn Thr Thr Tyr Asp Ser Asn Asp Leu Ile Pro Glu Arg Trp
275 280 285

Ile Lys Leu
290

<210> 59
<211> 760
<212> PRT
<213> Bacteroides fragilis

<400> 59

Met Lys Ile Gly Ile Ile Tyr Ile Val Thr Gly Pro Tyr Ile Lys Phe
1 5 10 15

Trp Asn Glu Phe Tyr Ser Ser Ser Gln Leu Tyr Phe Cys Val Glu Ala
20 25 30

Glu Lys Asn Tyr Glu Val Phe Thr Asp Ser Ser Glu Leu Ala Ser Gln
35 40 45

Arg Leu Pro Asn Val His Met His Leu Ile Glu Asp Lys Gly Trp Ile
50 55 60

Val Asn Val Ser Ser Lys Ser Lys Phe Ile Cys Glu Ile Arg Asn Gln
65 70 75 80

Leu Thr Ser Tyr Asp Tyr Ile Phe Tyr Leu Asn Gly Asn Phe Lys Phe
85 90 95

Ile Ser Pro Ile Tyr Cys Asp Glu Ile Leu Pro Gln Ala Glu His Asn
100 105 110

Tyr Leu Thr Ala Leu Ser Phe Ser His Tyr Leu Thr Ile His Pro Asp
115 120 125

His Tyr Pro Tyr Asp Arg Asn Lys Asn Cys Asn Ala Phe Ile Pro Tyr
130 135 140

```
Gly Gln Gly Lys Tyr Tyr Phe Gln Gly Gly Phe Tyr Gly Gly Arg Thr
145                 150                 155                 160

Gln Glu Val Leu Ser Leu Ser Glu Trp Cys Arg Asp Ala Ile Glu Ala
                165                 170                 175

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

Asn Arg Tyr Leu Leu Thr Gln His Pro Lys Val Leu Asn Asp Lys Tyr
        195                 200                 205

Ala Phe Gln Asp Ile Trp Pro Tyr Glu Gly Glu Tyr Lys Ala Ile Val
    210                 215                 220

Leu Asn Lys Glu Glu Val Pro Glu Asp Asn Asn Leu Gln Glu Met Lys
225                 230                 235                 240

Gln Asn Tyr Ile Asp Pro Ser Leu Ser Phe Leu Leu Asn Asp Glu Leu
                245                 250                 255

Lys Phe Ile Pro Ile Ser Ile Val Gln Leu Tyr Gly Gly Leu Gly Asn
            260                 265                 270

Gln Met Phe Gly Tyr Ala Phe Tyr Leu Tyr Ile Arg His Ile Ser Thr
        275                 280                 285

Gln Glu Arg Lys Leu Leu Ile Asp Pro Ala Pro Cys Lys Arg Tyr Gly
    290                 295                 300

Asn His Asn Gly Tyr Glu Leu Pro Ser Ile Phe Ser Lys Ile Cys Gln
305                 310                 315                 320

Asp Ile His Ile Ser Asp Glu Thr Lys Asn Asn Ile Arg Lys Leu Arg
                325                 330                 335

Lys Gly Thr Ser Leu Ser Ile Glu Glu Val Arg Ala Ser Met Pro Gln
            340                 345                 350

Ser Phe Lys Glu Lys Lys Gln Pro Ile Ile Phe Tyr Ser Gly Cys Trp
        355                 360                 365

Gln Cys Val Thr Tyr Val Glu Thr Val Lys Asp Glu Ile Lys Lys Asp
    370                 375                 380

Phe Ile Phe Asp Glu Ser Lys Leu Asn Glu Pro Ser Ala Gln Met Leu
385                 390                 395                 400

Arg Ile Ile Arg Arg Ser Asn Ser Val Ser Val His Ile Arg Arg Asn
                405                 410                 415
```

Asp Tyr Leu Ile Gly Asn Asn Glu Phe Leu Tyr Gly Gly Ile Cys Thr
420 425 430

Lys Ser Tyr Tyr Glu Lys Ala Ile Ser Gln Met Tyr Thr Leu Leu Lys
435 440 445

Asp Glu Pro Ile Phe Ile Tyr Phe Thr Asp Asp Pro Glu Trp Val Arg
450 455 460

Ser Asn Phe Ala Leu Asp Lys Ser Tyr Leu Val Asp Trp Asn Lys Asn
465 470 475 480

Lys Asp Asn Trp Gln Asp Met Tyr Leu Met Ser Ala Cys Arg His His
485 490 495

Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Gly Gly
500 505 510

Phe Pro Glu Lys Lys Val Ile Ala Pro Ser Thr Trp Leu Asn Gly Met
515 520 525

Gln Thr Pro Asp Ile Leu Pro Thr Glu Trp Ile Lys Ile Pro Ile Thr
530 535 540

Pro Asp Lys Lys Ile Leu Asp Arg Ile Cys Asn His Leu Ile Leu His
545 550 555 560

Ser Ser Tyr Met Lys Gln Leu Gly Leu Asn Ser Gly Lys Met Gly Val
565 570 575

Val Ile Phe Phe Phe His Tyr Ala Arg Tyr Thr Gln Asn Pro Leu Tyr
580 585 590

Glu Asn Tyr Ala Gly Asp Leu Phe Asp Glu Leu Tyr Glu Glu Ile His
595 600 605

Lys Gly Ile Ser Phe Ser Phe Leu Asp Gly Leu Cys Gly Ile Ala Trp
610 615 620

Ala Val Glu Tyr Leu Val His Glu Gln Phe Ile Glu Gly Asn Thr Asp
625 630 635 640

Asp Ser Leu Ala Glu Ile Asp Phe Lys Val Met Gln Ile Asp Pro Arg
645 650 655

Arg Phe Thr Asp Tyr Ser Phe Glu Thr Gly Leu Glu Gly Ile Ala Cys
660 665 670

Tyr Val Leu Ser Arg Leu Leu Ser Pro Arg Val Cys Ser Ser Ser Leu
675 680 685

```
Thr Leu Asp Ser Val Tyr Leu Lys Asp Leu Thr Glu Ala Cys Arg Lys
    690                 695                 700

Val Pro Val Asp Lys Ala Asn Tyr Thr Arg Leu Phe Leu Asn Tyr Ile
705                 710                 715                 720

Glu Ser Lys Glu Val Gly Tyr Ser Phe Lys Asp Val Leu Met Gln Val
                725                 730                 735

Leu Asn His Ser Glu Lys Ala Phe Gly Ser Asp Gly Leu Thr Trp Gln
            740                 745                 750

Thr Gly Leu Thr Met Ile Met Arg
        755                 760
```

<210> 60
<211> 290
<212> PRT
<213> Butyrivibrio sp. AE3009

<400> 60

```
Met Ile Ile Ile Gln Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

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

Asp Asp Val Thr Gly Phe Val Asp Asp Glu Leu Arg Thr Pro Val Leu
        35                  40                  45

Gln Arg Phe Gly Ile Glu Tyr Asp Arg Ala Thr Arg Glu Glu Val Val
    50                  55                  60

Lys Leu Thr Asp Ser Lys Met Asp Ile Phe Ser Arg Ile Arg Arg Lys
65                  70                  75                  80

Leu Thr Gly Arg Lys Thr Cys Arg Ile Asp Glu Glu Ser Gly Thr Phe
                85                  90                  95

Asn Pro Asp Ile Leu Glu Leu Asp Glu Ala Tyr Leu Val Gly Tyr Trp
            100                 105                 110

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

Gln Glu Phe Gln Lys Arg Pro Gln Glu Ile Met Thr Asp Ser Ala Ser
    130                 135                 140

Trp Ala Thr Leu Gln Gln Ile Glu Cys Cys Gln Ser Val Ser Leu His
145                 150                 155                 160
```

```
Ile Arg Arg Thr Asp Tyr Ile Asp Glu Glu His Asn His Ile His Asn
                165                 170                 175

Leu Cys Thr Glu Lys Tyr Tyr Lys Gly Ala Ile Asp Arg Ile Arg Ser
            180                 185                 190

Gln Tyr Pro Ser Ala Val Phe Phe Ile Phe Thr Asp Asp Lys Glu Trp
        195                 200                 205

Cys Arg Asn His Phe Arg Gly Pro Asn Phe Phe Val Val Glu Leu Ala
    210                 215                 220

Glu Lys Glu Asn Thr Asp Ile Ala Glu Met Leu Leu Met Ser Ser Cys
225                 230                 235                 240

Lys His His Ile Cys Ala Asn Ser Ser Phe Ser Trp Trp Ser Ala Trp
                245                 250                 255

Leu Asn Asp Ser Pro Glu Lys Met Val Ile Val Pro Asn Lys Trp Ile
            260                 265                 270

Asn Asn Arg Asp Met Asp Asp Ile Tyr Thr Asp Arg Met Thr Lys Met
        275                 280                 285

Ala Ile
    290
```

<210> 61
<211> 277
<212> PRT
<213> Bacteroides ovatus

<400> 61

```
Met Lys Gln Thr Ile Ile Leu Ser Gly Gly Leu Gly Asn Gln Met Phe
1               5                   10                  15

Gln Tyr Ala Phe Phe Leu Ser Met Lys Ala Lys Gly Lys Ser Cys Ser
            20                  25                  30

Leu Asp Thr Thr Leu Phe Gln Thr Asn Lys Met His Asn Gly Phe Glu
        35                  40                  45

Leu Lys Ser Val Phe Asp Ile Pro Asp Ser Pro Asn Gln Ala Ser Ala
    50                  55                  60

Leu His Ser Leu Leu Ile Lys Met Leu Arg Arg Tyr Lys Pro Lys Ser
65                  70                  75                  80

Ile Leu Thr Ile Asp Glu Pro Tyr Thr Phe Cys Pro Asp Ala Leu Glu
                85                  90                  95
```

```
Ser Lys Lys Ser Phe Leu Met Gly Asp Trp Leu Ser Pro Lys Tyr Phe
            100                 105                 110

Glu Ser Ile Lys Asp Val Val Val Asn Ala Tyr Arg Phe His Asn Ile
        115                 120                 125

Gly Asn Lys Asn Val Asp Thr Ala Asn Glu Met His Gly Asn Asn Ser
    130                 135                 140

Val Ser Ile His Ile Arg Arg Gly Asp Tyr Leu Lys Leu Pro Tyr Tyr
145                 150                 155                 160

Cys Val Cys Asn Glu Asn Tyr Tyr Arg Gln Ala Ile Glu Gln Ile Lys
                165                 170                 175

Asp Arg Val Asp Asn Pro Ile Phe Tyr Val Phe Ser Asn Glu Pro Ser
            180                 185                 190

Trp Cys Asp Ser Phe Met Lys Glu Phe Arg Val Asn Phe Lys Ile Val
        195                 200                 205

Asn Trp Asn Gln Gly Lys Asp Ser Tyr Gln Asp Met Tyr Leu Met Thr
    210                 215                 220

Gln Cys Lys His Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly
225                 230                 235                 240

Ala Trp Leu Asn Asn Asn Thr Asp Lys Ile Ile Val Ala Pro Ser Lys
                245                 250                 255

Trp Phe Lys Asn Ser Glu His Asn Ile Asn Cys Lys Glu Trp Leu Leu
            260                 265                 270

Ile Asp Thr Ser Lys
        275


<210>  62
<211>  291
<212>  PRT
<213>  Desulfospira joergensenii

<400>  62

Met Gly Lys Lys Tyr Val Glu Thr Val Val Asn Gly Gly Leu Gly Asn
1               5                   10                  15

Gln Ile Phe Gln Phe Ser Ala Gly Phe Ala Leu Ser Lys Arg Leu Asn
            20                  25                  30

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

Asn Phe Glu Leu Tyr Thr Phe Pro Lys Ile Lys Asn Ser Phe Ala Cys
```

50 55 60

Ile Lys Asp Asp Asp Pro Gly Val Phe Ser Arg Leu Arg Ile Pro Phe
65 70 75 80

Leu Asn Phe Lys Glu Lys Ile Lys Gln Phe His Glu Ser His Phe Phe
85 90 95

Phe Asp Pro Ala Phe Phe Asp Ile Arg Glu Pro Val Arg Ile Glu Gly
100 105 110

Tyr Phe Gln Ser Tyr Lys Tyr Phe Glu Lys Tyr Ser Asp Gln Leu Lys
115 120 125

Asp Ile Leu Leu Asp Ile Pro Leu Thr Ser Arg Leu Lys Thr Val Leu
130 135 140

Lys Val Ile Ser Ser Lys Lys Glu Ser Val Ser Val His Ile Arg Arg
145 150 155 160

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

Asn Glu Ala Tyr Tyr Leu Asn Ser Ile Lys Leu Met Glu Lys Met Phe
180 185 190

Pro Glu Ser Phe Phe Phe Leu Phe Thr Asp Asp Pro His Tyr Val Glu
195 200 205

Glu Asn Phe Lys Phe Leu Glu Asp Thr Ser Cys Ile Ile Ser Asp Asn
210 215 220

Asp Cys Leu Pro Tyr Glu Asp Met Tyr Leu Met Ala Asn Cys His His
225 230 235 240

Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn
245 250 255

Gln Asn Pro Glu Lys Ile Val Ile Ala Pro Arg Lys Trp Phe Ser Arg
260 265 270

Lys Ile Leu Met Glu Lys Pro Val Met Asp Leu Leu Pro Asp Asp Trp
275 280 285

Ile Leu Leu
290

<210> 63
<211> 303
<212> PRT
<213> Lachnospiraceae bacterium 10-1

<400> 63

```
Met Asn Ile Ile Arg Met Thr Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                  10                  15

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

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

Trp Ala Phe Gly Ile Asp Tyr Pro Ala Ala Gly Glu Glu Glu Val Asn
    50                  55                  60

Glu Leu Thr Asp Gly Val Met Lys Phe Ser His Arg Leu Arg Arg Lys
65                  70                  75                  80

Leu Phe Gly Arg Lys Ser Lys Glu Tyr Arg Glu Lys Ser Cys Asn Phe
                85                  90                  95

Asp Gln Gln Ile Leu Glu Lys Glu Pro Ala Tyr Phe Thr Gly Tyr Phe
            100                 105                 110

Gln Ser Glu Arg Tyr Phe Glu Glu Val Lys Glu Gln Val Arg Lys Ala
        115                 120                 125

Phe Gln Phe Ser Gly Lys Ile Trp Gly Ser Val Ser Lys Glu Leu Glu
    130                 135                 140

Glu Arg Ile Arg Glu Tyr Gln Thr Lys Ile Glu Asn Lys Ser Gln Met
145                 150                 155                 160

Pro Val Ser Val His Ile Arg Arg Gly Asp Tyr Leu Glu Asn Asp Glu
                165                 170                 175

Ala Tyr Gly Gly Ile Cys Thr Asp Ala Tyr Tyr Arg Lys Ala Ile Glu
            180                 185                 190

Met Met Glu Glu Lys Phe Pro Asn Thr Val Phe Tyr Ile Phe Ser Asn
        195                 200                 205

Asp Thr Gly Trp Ala Lys Gln Trp Ile Asp His Phe Tyr Lys Glu Lys
    210                 215                 220

Ser Arg Phe Ile Val Ile Glu Gly Thr Thr Glu Asp Thr Gly Tyr Leu
225                 230                 235                 240

Asp Leu Phe Leu Met Ser Lys Cys Arg Ala His Ile Ile Ala Asn Ser
                245                 250                 255

Ser Phe Ser Trp Trp Gly Ala Trp Leu Asp Pro Asp Gln Glu Lys Ile
            260                 265                 270
```

Val Ile Ala Pro Ser Lys Trp Val Asn Asn Gln Asp Met Lys Asp Ile
275 280 285

Tyr Thr Arg Glu Met Ile Lys Ile Ser Pro Lys Gly Glu Val Arg
290 295 300

<210> 64
<211> 289
<212> PRT
<213> Bacteroides dorei

<400> 64

Met Val Val Val Tyr Val Gly Ala Gly Leu Ala Asn Arg Met Phe Gln
1 5 10 15

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

Asp Glu Asp Ser Phe Ile Pro Arg Phe Asp Phe Glu Arg Thr Lys Leu
35 40 45

Asp Ser Val Phe Val Asn Val Asn Ile Gln Arg Cys Asp Lys Asn Ser
50 55 60

Phe Pro Leu Val Leu Arg Glu Asp Arg Phe Tyr Lys Leu Leu Lys Arg
65 70 75 80

Ile Ser Glu Tyr Met Ser Asp Asn Arg Tyr Ile Glu Arg Trp Asn Leu
85 90 95

Asp Tyr Leu Pro Tyr Ile His Lys Lys Ala Ser Thr Asn Cys Ile Phe
100 105 110

Ile Gly Phe Trp Ile Ser Tyr Lys Tyr Phe Gln Ser Ser Glu Asp Ala
115 120 125

Val Arg Lys Ala Phe Thr Phe Lys Pro Leu Asp Ser Ile Arg Asn Val
130 135 140

Glu Leu Ala Thr Lys Leu Val Thr Glu Asn Ser Val Ala Val His Phe
145 150 155 160

Arg Lys Asn Ile Asp Tyr Leu Lys Asn Leu Pro Asn Thr Cys Pro Pro
165 170 175

Ser Tyr Tyr Tyr Glu Ala Ile Asn Tyr Ile Lys Lys Tyr Val Pro Asn
180 185 190

Pro Lys Phe Tyr Phe Phe Ser Asp Asn Trp Asp Trp Val Arg Glu Asn
195 200 205

Ile Arg Gly Val Glu Phe Thr Ala Val Asp Trp Asn Pro Ser Ser Gly
210 215 220

Ile His Ser His Cys Asp Met Gln Leu Met Ser Leu Cys Lys His Asn
225 230 235 240

Ile Ile Ala Asn Ser Thr Tyr Ser Trp Trp Ser Ala Tyr Leu Asn Glu
245 250 255

Asn Asn Asn Lys Ile Val Val Cys Pro Lys Asp Trp Tyr Gly Gly Met
260 265 270

Val Lys Lys Leu Asp Thr Ile Ile Pro Glu Ser Trp Ile Ile Ile Asn
275 280 285

Gly

<210> 65
<211> 292
<212> PRT
<213> Firmicutes bacterium CAG:24

<400> 65

Met Val Ile Val Lys Met Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Arg Lys Ile Gln Gln Thr Gly Lys Asp Val Lys Leu
20 25 30

Asp Leu Phe Ser Phe Gln Asp Lys Asn Ala Phe Arg Arg Phe Ser Leu
35 40 45

Asp Ile Phe Pro Ile Glu Tyr Gln Thr Ala Asn Leu Glu Glu Cys Arg
50 55 60

Lys Leu Gly Glu Cys Ser Tyr Arg Pro Val Asp Lys Ile Arg Arg Lys
65 70 75 80

Met Phe Gly Leu Lys Glu Ser Tyr Tyr Gln Glu Asp Leu Asp Lys Gly
85 90 95

Tyr Gln Pro Glu Ile Leu Glu Met Asn Pro Val Tyr Leu Asp Gly Tyr
100 105 110

Trp Gln Cys Glu Arg Tyr Phe Gln Asp Ile Arg Glu Lys Ile Leu Glu
115 120 125

Asp Tyr Thr Phe Pro Lys Lys Ile Ser Ile Glu Ser Ser Arg Leu Gln
130 135 140

```
Glu Arg Ile Lys Asn Thr Glu Ser Val Ser Ile His Ile Arg Arg Gly
145                 150                 155                 160

Asp Tyr Leu Asp Ala Ala Asn Tyr Lys Ile Tyr Gly Asn Ile Cys Thr
                165                 170                 175

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

Lys Pro Asn Phe Tyr Leu Phe Ser Asn Asp Pro Glu Trp Ala Lys Glu
        195                 200                 205

Ile Phe Gly Asp Thr Glu Asp Ile Thr Ile Val Glu Glu Asp Lys Glu
    210                 215                 220

Arg Pro Asp Tyr Glu Asp Met Phe Leu Met Ser Arg Cys Lys His Asn
225                 230                 235                 240

Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Gln
                245                 250                 255

Asn Glu Asn Lys Arg Val Ile Ala Pro Val Lys Trp Phe Asn Asn His
            260                 265                 270

Ser Val Thr Asp Val Ile Cys Asp Asp Trp Ile Arg Ile Asp Gly Asp
        275                 280                 285

His Lys Gly Ala
    290
```

<210> 66
<211> 294
<212> PRT
<213> Clostridium hathewayi CAG:224

<400> 66

```
Met Ile Tyr Val Asn Ile Arg Gly Arg Leu Gly Asn Gln Leu Phe Ile
1               5                   10                  15

Tyr Ala Phe Ala Arg Ala Leu Gln Lys Ser Thr Asn Gln Gln Ile Thr
            20                  25                  30

Leu Asn Tyr Thr Ser Phe Arg Lys His Tyr Asn Asn Thr Ala Met Asp
        35                  40                  45

Leu Glu Gln Phe Asn Ile Pro Glu Asp Ile Met Phe Glu Asn Ser Lys
    50                  55                  60

Glu Leu Pro Trp Phe Ala Asn Thr Asp Gly Lys Val Ile Arg Ile Leu
65                  70                  75                  80

Arg His Tyr Phe Pro Lys Leu Ile Arg Ser Ile Leu Gln Lys Met Asn
```

85 90 95

Val Leu Met Trp Leu Gly Asp Glu Tyr Val Glu Val Lys Val Asn Lys
100 105 110

Arg Arg Asp Ile Tyr Ile Asp Gly Phe Trp Gln Ser Ser Arg Tyr Phe
115 120 125

Lys Ser Val Tyr Lys Glu Leu Lys Asn Glu Leu Ile Pro Lys Met Glu
130 135 140

Met Ser Lys Glu Ile Lys Thr Met Gly Asp Leu Ile Asn Gln Lys Glu
145 150 155 160

Ser Val Cys Val Ser Val Arg Arg Gly Asp Tyr Val Thr Val Lys Lys
165 170 175

Asn Arg Asp Val Tyr Tyr Ile Cys Asp Glu Lys Tyr Leu Asn Thr Ser
180 185 190

Ile Met Arg Met Val Glu Leu Val Pro Asn Val Thr Trp Phe Ile Phe
195 200 205

Ser Asp Asp Ala Asp Trp Val Lys Asp Asn Ile Val Phe Pro Gly Glu
210 215 220

Val Phe Tyr Gln Pro Pro Arg Val Thr Pro Leu Glu Thr Leu Tyr Leu
225 230 235 240

Met Lys Ala Cys Lys His Phe Ile Ile Ser Asn Ser Ser Phe Ser Trp
245 250 255

Trp Gly Gln Tyr Leu Ser Asn Asn Asp Asn Lys Ile Val Ile Gly Pro
260 265 270

Ala Lys Trp Tyr Val Asp Gly Arg Lys Thr Asp Ile Ile Glu Glu Glu
275 280 285

Trp Ile Lys Ile Glu Val
290

<210> 67
<211> 294
<212> PRT
<213> Syntrophus acidotrophicus

<400> 67

Met Val Ile Val Arg Leu Thr Gly Gly Ile Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Ala Arg Arg Val Ser Leu Val Asn Asn Ala Pro Leu Phe
20 25 30

```
Leu Asp Leu Gly Trp Phe Gln Glu Thr Gly Ser Trp Thr Pro Arg Lys
        35                  40                  45

Tyr Glu Leu Asp Ala Phe Arg Ile Ala Gly Glu Ser Ala Ser Val Gly
    50                  55                  60

Asp Ile Lys Asp Phe Lys Ser Arg Arg Gln Asn Ala Phe Phe Arg Arg
65                  70                  75                  80

Leu Pro Leu Phe Leu Lys Lys Arg Ile Phe His Thr Arg Gln Thr His
                85                  90                  95

Ile Ile Glu Lys Ser Tyr Asn Phe Asp Pro Glu Ile Leu Asn Leu Gln
            100                 105                 110

Gly Asn Val Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Ser
        115                 120                 125

Asp Val Asp Ser Glu Ile Arg Arg Glu Phe Ser Phe Gln Thr Asp Pro
    130                 135                 140

Ala Glu Arg Asn Arg Lys Ile Leu Glu Arg Ile Ala Ser Cys Glu Ser
145                 150                 155                 160

Val Ser Ile His Ile Arg Arg Gly Asp Tyr Val Thr Leu Pro Asp Ala
                165                 170                 175

Asn Ala Phe His Gly Leu Cys Thr Pro Ala Tyr Tyr Arg Leu Ala Val
            180                 185                 190

Glu Gln Ile Ser Arg Lys Val Val Glu Pro Val Phe Phe Val Phe Ser
        195                 200                 205

Asp Asp Ile Ala Trp Ala Arg Gly Asn Leu Lys Leu Gly Phe Glu Thr
    210                 215                 220

Cys Phe Met Asp Gln Asn Gly Pro Asp Arg Gly Asp Glu Asp Leu Arg
225                 230                 235                 240

Leu Met Ile Ala Cys Arg His His Ile Ile Ala Asn Ser Ser Phe Ser
                245                 250                 255

Trp Trp Gly Ala Trp Leu Cys Ser Asn Pro Glu Lys Ile Val Tyr Ala
            260                 265                 270

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

Ala Ser Trp Ile Arg Ile
    290
```

<210> 68
<211> 290
<212> PRT
<213> Bacteroides caccae

<400> 68

Met Lys Ile Val Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Leu Ser Leu Lys Lys Lys Tyr Pro Lys Glu Lys Ile
20 25 30

Lys Ile Asp Ile Ser Met Phe Glu Thr Tyr Gly Leu His Asn Gly Phe
35 40 45

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

Glu Ile Arg Glu Leu Ser Phe Tyr Ile Lys Ile Tyr Lys Leu Gln Arg
65 70 75 80

Ile Phe Arg Lys Ile Phe Pro Val Arg Lys Thr Glu Cys Val Glu Lys
85 90 95

Tyr Asp Phe Lys Phe Met Ser Glu Val Trp Ser Asn Cys Asp Arg Tyr
100 105 110

Tyr Glu Gly Tyr Trp Gln Asn Trp Glu Tyr Phe Ile Glu Ala Gln Thr
115 120 125

Glu Val Arg Ser Thr Phe Thr Phe Lys Lys Glu Leu Val Gly Arg Asn
130 135 140

Ala Lys Val Ile Arg Glu Ile Gln Tyr Ala Lys Met Pro Val Ser Leu
145 150 155 160

His Ile Arg Arg Gly Asp Tyr Leu His His Lys Leu Phe Gly Gly Leu
165 170 175

Cys Asp Leu Asn Tyr Tyr Lys Lys Ala Ile Asp Tyr Val Leu Asn Asn
180 185 190

Tyr Asp Thr Pro Gln Phe Tyr Leu Phe Ser Asn Asp Ile Glu Trp Cys
195 200 205

Lys Thr Tyr Ile Leu Pro Leu Val Gln Gly Tyr Pro Phe Ile Leu Val
210 215 220

Asp Trp Asn Ser Gly Val Glu Ser Tyr Ile Asp Met Gln Leu Met Ser
225 230 235 240

```
Cys Cys Arg Ile Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala
                245                 250                 255

Ala Trp Leu Asn Asp Ser Ser Glu Lys Ile Val Ile Ala Pro Lys Leu
            260                 265                 270

Trp Ala His Ser Pro Tyr Gly Lys Glu Ile Gln Leu Lys Ser Trp Leu
        275                 280                 285

Leu Phe
    290
```

<210> 69
<211> 291
<212> PRT
<213> Butyrivibrio fibrisolvens

<400> 69

```
Met Ile Ile Ile Glu Met Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Tyr Lys Ser Met Leu His Lys Gly Leu Asp Val Thr Ile
            20                  25                  30

Asp Lys Ser Ile Tyr Arg Asp Val Asp His Lys Glu Gln Val Asp Leu
        35                  40                  45

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

Ser Thr Leu Arg Gly Tyr Gly Tyr Asn Asp Ser Ile Ile Asp Lys Ile
65                  70                  75                  80

Arg Asn Lys Leu Asn Lys Ser Lys Arg Asn Leu Tyr His Glu Asp Leu
                85                  90                  95

Asp Lys Gly Tyr Gln Pro Glu Ile Phe Glu Phe Asp Asn Val Tyr Leu
            100                 105                 110

Asn Gly Tyr Trp Gln Cys Glu Arg Tyr Phe Lys Asp Ile Lys Asn Glu
        115                 120                 125

Ile Lys Lys Asp Phe Ile Phe Pro Cys Thr Gln Ser Gly Asp Asp Lys
    130                 135                 140

Ile Lys Ala Leu Thr Ile Glu Met Glu Ser Cys Asn Ser Val Ser Leu
145                 150                 155                 160

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

```
Gly Asn Ile Cys Thr Glu Glu Tyr Tyr Lys Lys Ser Ile Glu Tyr Ile
            180                 185                 190

Lys Glu Arg Val Asp Asn Pro Val Phe Tyr Ile Phe Ser Asn Asp Met
        195                 200                 205

Ala Trp Val Arg Asp Asn Phe Lys Ser Asp Asp Phe Arg Tyr Val Asn
    210                 215                 220

Glu Asp Gly Ala Phe Asp Gly Met Thr Asp Met Tyr Leu Met Thr Arg
225                 230                 235                 240

Cys Arg His Asn Ile Val Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
                245                 250                 255

Trp Leu Asn Lys His Asp Asp Asn Ile Val Ile Cys Pro Asn Arg Trp
            260                 265                 270

Val Asn Thr His Thr Val Thr Asp Ile Ile Cys Glu Asp Trp Ile Arg
        275                 280                 285

Ile Asp Val
    290
```

<210> 70
<211> 309
<212> PRT
<213> Parabacteroides distasonis

<400> 70

```
Met Ile Val Gly Gly Asn Asp Tyr Cys Lys Val Lys Val Val Asn Ile
1               5                   10                  15

Ile Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr Ala Phe Ala Leu Ser
            20                  25                  30

Leu Lys Glu His Phe Pro Lys Glu Glu Ile Arg Ile Asp Ile Ser His
        35                  40                  45

Phe Asn Tyr Leu Phe Val Asn Lys Val Gly Ala Ala Asn Leu His Asn
    50                  55                  60

Gly Tyr Glu Leu Asp Lys Ile Phe Phe Asn Ile Glu Leu Lys Lys Ala
65                  70                  75                  80

Asn Ala Trp Gln Leu Met Lys Leu Thr Trp Phe Ile Pro Asn Tyr Leu
                85                  90                  95

Ile Ser Arg Ile Ala Arg Lys Ile Leu Pro Val Arg Asn Ser Glu Tyr
            100                 105                 110

Ile Gln Asn Ser Ser Asp Cys Phe Phe Tyr Asp Pro Met Val Tyr Asn
```

115 120 125

Lys Gln Gly Ser Cys Tyr Tyr Glu Gly Tyr Trp Gln Ala Ile Gly Tyr
130 135 140

Tyr Glu Ser Met Arg Asp Lys Leu Cys Lys Ile Phe Gln His Pro Ser
145 150 155 160

Pro Glu Gly Lys Asn Lys Gln Tyr Ile Glu Asn Met Glu Ser Ser Asn
165 170 175

Ser Val Gly Ile His Ile Arg Arg Gly Asp Tyr Leu Leu Ser Asp Asn
180 185 190

Phe Arg Gly Ile Cys Glu Val Asp Tyr Tyr Lys Arg Ala Ile Asp Lys
195 200 205

Ile Leu Gln Asp Gly Glu Lys His Val Phe Tyr Leu Phe Ser Asn Asp
210 215 220

Gln Lys Trp Cys Glu Glu Tyr Ile Leu Pro Leu Leu Gly Asn Tyr Glu
225 230 235 240

Ile Ile Phe Val Thr Gly Asn Ile Gly Arg Asp Ser Cys Trp Asp Met
245 250 255

Phe Leu Met Thr His Cys Lys Asp Leu Ile Ile Ala Asn Ser Ser Phe
260 265 270

Ser Trp Trp Gly Ala Phe Leu Asn Lys Arg Gly Gly Arg Val Val Thr
275 280 285

Pro Lys Arg Trp Met Asn Arg Asn Ile Arg Tyr Asp Leu Trp Met Pro
290 295 300

Glu Trp Ile Arg Ile
305

<210> 71
<211> 295
<212> PRT
<213> Geobacter uraniireducens

<400> 71

Met Ile Ile Ala Arg Leu Gln Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Val Gly Leu His Leu Ala Leu Thr His Asn Val Glu Leu Lys
20 25 30

Ile Asp Ile Thr Met Phe Ser Asp Tyr Lys Trp His Thr Tyr Ser Leu
35 40 45

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

Ala Leu Thr Asp Val Lys Met Asp Arg Pro Tyr Lys Lys Ile Asp Asn
65                  70                  75                  80

Phe Leu Cys Arg Leu Leu Arg Lys Ser Gln Lys Ile Ser Ala Thr His
                85                  90                  95

Val Lys Glu Lys His Phe His Tyr Asp Pro Asp Ile Leu Lys Leu Pro
            100                 105                 110

Asp Asn Val Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Lys
        115                 120                 125

Glu Ile Glu Asn Ile Ile Arg Gln Thr Phe Ile Ile Lys Asn Pro Gln
    130                 135                 140

Leu Gly Arg Asp Lys Glu Leu Ala Cys Lys Ile Leu Ser Thr Glu Ser
145                 150                 155                 160

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

Asn Ser Val Leu Gly Pro Cys Asp Leu Ser Tyr Tyr Ser Asn Cys Ile
            180                 185                 190

Lys Ser Leu Ala Gly Asn Asn Lys Asp Pro His Phe Phe Val Phe Ser
        195                 200                 205

Asn Asp His Glu Trp Val Ser Lys Asn Leu Lys Leu Asp Tyr Pro Thr
    210                 215                 220

Ile Tyr Val Asp His Asn Asn Glu Asp Lys Asp Tyr Glu Asp Leu Arg
225                 230                 235                 240

Leu Met Ser Gln Cys Lys His His Ile Ile Ala Asn Ser Thr Phe Ser
                245                 250                 255

Trp Trp Ser Ala Trp Leu Cys Ser Asn Pro Asp Lys Val Ile Tyr Ala
            260                 265                 270

Pro Gln Lys Trp Phe Arg Val Asp Glu Tyr Asn Thr Lys Asp Leu Leu
        275                 280                 285

Pro Ser Asn Trp Leu Ile Leu
    290                 295
```

<210> 72
<211> 293

<212> PRT
<213> Lachnospiraceae bacterium A4

<400> 72

```
Met Ile Ile Val Lys Ile Tyr Glu Gly Leu Gly Asn Gln Leu Phe Gln
1               5                  10                  15

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

Asp Thr Ser Gly Tyr Thr Asp Gln Leu Phe Pro Leu Cys Arg Thr Ser
        35                  40                  45

Thr Arg Arg Arg Tyr Gln Leu Asn Cys Phe Asn Ile Arg Ile Lys Glu
    50                  55                  60

Val Glu Lys Lys Asn Ile Glu Lys Tyr Ser Phe Leu Ile Gln Glu Asp
65                  70                  75                  80

Met Phe Gly Lys Leu Ile Ser Lys Leu Ala Lys Leu His Leu Trp Met
                85                  90                  95

Tyr Lys Val Thr Ile Gln Gln Asn Ala Gln Glu Tyr Lys Glu Ser Tyr
            100                 105                 110

Leu Asn Thr Arg Gly Asn Val Tyr Tyr Lys Gly Trp Phe Gln Asn Pro
        115                 120                 125

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

Lys Tyr Lys Ile Arg Ile Pro Ala Glu Leu Arg Glu Leu Leu Gln Glu
145                 150                 155                 160

Asp Asn Ile Val Ala Val His Cys Arg Arg Gly Asp Tyr Gln Tyr Ile
                165                 170                 175

Arg Asn Cys Leu Pro Val Asn Tyr Tyr Lys Lys Ala Met Ala Tyr Met
            180                 185                 190

Glu Lys Lys Leu Gly Val Pro Arg Tyr Leu Phe Phe Ser Asp Asp Leu
        195                 200                 205

Ser Trp Val Lys Arg Gln Phe Gly Asn Lys Asp Asn Asn Tyr Tyr Ile
    210                 215                 220

Glu Asp Tyr Gly Lys Phe Glu Asp Tyr Gln Glu Leu Met Ile Met Ser
225                 230                 235                 240

Arg Cys Arg Asn Phe Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Ala
                245                 250                 255
```

```
Ala Trp Leu Cys Ser Tyr Glu Asn Lys Val Val Ile Met Pro Arg Val
            260                 265                 270

Trp Thr Tyr Val Gly Gly Gln Gly Val Glu Met Ser Asp Phe Pro Ala
        275                 280                 285

Asp Trp Ile Arg Ile
    290
```

<210> 73
<211> 294
<212> PRT
<213> Colwellia psychroerythrus

<400> 73

```
Met Lys Val Val Arg Val Cys Gly Gly Phe Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Phe Tyr Leu Ala Val Lys His Lys Phe Asn Glu Thr Thr Lys
            20                  25                  30

Leu Asp Ile His Asp Met Ala Ser Tyr Glu Leu His Asn Gly Tyr Glu
        35                  40                  45

Leu Glu Arg Ile Phe Asn Leu Asn Glu Asn Tyr Cys Ser Ala Glu Glu
    50                  55                  60

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

Glu Ile Lys Lys Tyr Thr Pro Phe Ile Pro Arg Thr Tyr Ile Lys Glu
                85                  90                  95

Lys Lys His Leu His Phe Ser Tyr Gln Glu Val Asp Leu Gly Thr Lys
            100                 105                 110

Asp Thr Ser Ile Tyr Tyr Arg Gly Ser Trp Gln Asn Pro Gln Tyr Phe
        115                 120                 125

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

Thr Glu Pro Lys Ser Leu Ala Leu His Gln Glu Ile Ser Glu His Glu
145                 150                 155                 160

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

Leu Gly Gly Ile Cys Asp Leu Pro Tyr Tyr Gln Asn Ala Ile Lys Glu
            180                 185                 190
```

Ile Glu Gly Leu Val Glu Lys Pro Leu Phe Val Ile Phe Ser Asp Asp
195 200 205

Ile Thr Trp Cys Arg Ala Asn Ile Asn Val Glu Lys Val Arg Phe Val
210 215 220

Asp Trp Asn Ser Gly Glu Gln Ser Phe Gln Asp Met His Leu Met Ser
225 230 235 240

Leu Cys Thr His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
245 250 255

Ala Trp Leu Asn Ala Asn Pro Asn Lys Ile Val Ile Ser Pro Asn Lys
260 265 270

Trp Ile His Tyr Thr Asp Ser Met Gly Ile Val Pro Ser Glu Trp Ile
275 280 285

Lys Val Glu Thr Ser Ile
290

<210> 74
<211> 282
<212> PRT
<213> Roseobacter sp. MED193

<400> 74

Met Ile Thr Ser Arg Leu His Gly Arg Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Ala Arg Ala Leu Ala His Arg Leu Gly Cys Gly Val Ala
20 25 30

Leu Asp Gly Arg Gly Ala Glu Leu Arg Gly Glu Gly Val Leu Thr Arg
35 40 45

Val Phe Asp Leu Pro Leu Ser Ala Ala Pro Lys Leu Pro Pro Leu Lys
50 55 60

Gln His Ala Pro Leu Arg Tyr Gly Leu Trp Arg Gly Leu Gly Leu Ala
65 70 75 80

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

Thr Trp Glu Asp Gly Cys Tyr Leu His Gly Tyr Trp Gln Ser Glu Arg
100 105 110

Tyr Phe Glu Glu Ile Ser Asp Leu Ile Arg Ala Asp Phe Thr Phe Pro
115 120 125

Asp Phe Ser Asn Arg Gln Asn Ala Glu Met Ala Ala Arg Ile Met Glu

130 135 140

Asp Asn Ala Ile Ser Leu His Val Arg Arg Gly Asp Tyr Val Ala Leu
145 150 155 160

Ser Ala His Val Leu Cys Asp Gln Ala Tyr Tyr Glu Ala Ala Leu Thr
165 170 175

Arg Leu Leu Glu Gly Leu Ser Gln Asp Ala Pro Thr Val Tyr Val Phe
180 185 190

Ser Asp Asp Pro Asp Trp Ala Lys Ala Asn Leu Pro Leu Pro Cys Lys
195 200 205

Lys Val Val Val Asp Phe Asn Gly Pro Glu Thr Asp Phe Glu Asp Met
210 215 220

Arg Leu Met Ser Leu Cys Lys His Asn Ile Ile Gly Asn Ser Ser Phe
225 230 235 240

Ser Trp Trp Ala Ala Trp Leu Asn Ala Asn Pro Gln Lys Arg Val Ala
245 250 255

Gly Pro Ala Asn Trp Phe Gly Asp Pro Lys Leu Ser Asn Pro Asp Ile
260 265 270

Leu Pro Ser Gln Trp Leu Lys Val Ala Pro
275 280

<210> 75
<211> 296
<212> PRT
<213> Cesiribacter andamanensis

<400> 75

Met Met Ile Val Arg Leu Cys Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Val Gly Lys Gln Leu Ser Val Lys Asn Asn Ile Pro Leu Lys
20 25 30

Ile Asp Asp Ser Trp Leu Arg Leu Pro Asp Ala Arg Lys Tyr Arg Leu
35 40 45

Gln Phe Phe Gln Ile Glu Glu Pro Leu Ala Ser Pro Gln Glu Val Glu
50 55 60

Arg Phe Val Gly Pro Tyr Glu Ser Gln Ser Leu Tyr Ala Arg Leu Tyr
65 70 75 80

Arg Lys Val Gln Asn Met Leu Pro Arg His Arg Arg Arg Tyr Phe Gln
85 90 95

```
Glu Ser Gly Phe Trp Ala Tyr Glu Pro Glu Leu Met Arg Ile Arg Ser
            100                 105                 110

Gln Val Phe Leu Glu Gly Phe Trp Gln His His Ala Tyr Phe Thr Arg
        115                 120                 125

Leu His Pro Gln Val Leu Glu Ala Leu Gln Leu Arg Glu Glu Tyr Arg
    130                 135                 140

Gln Glu Pro Tyr Ala Val Leu Asp Gln Ile Arg Glu Asp Ala Ala Ser
145                 150                 155                 160

Val Ser Leu His Ile Arg Arg Gly Asp Tyr Val Ser Asp Pro Tyr Asn
                165                 170                 175

Leu Gln Phe Phe Gly Val Met Pro Leu Ser Tyr Tyr Gln Gln Ala Val
            180                 185                 190

Ala Tyr Met Gln Glu Gln Leu His Ala Pro Thr Phe Tyr Ile Phe Ser
        195                 200                 205

Asp Asp Leu Asp Trp Ala Arg Ala His Leu Lys Leu Gln Ala Pro Met
    210                 215                 220

Val Phe Val Asp Ile Glu Gly Gly Arg Lys Glu Tyr Leu Glu Leu Glu
225                 230                 235                 240

Ala Met Arg Leu Cys Arg His Asn Ile Leu Ala Asn Ser Ser Phe Ser
                245                 250                 255

Trp Trp Gly Ala Tyr Leu Asn Thr Asn Pro His Lys Arg Val Ile Ala
            260                 265                 270

Pro Arg Gln Trp Val Ala Asp Pro Glu Leu Lys Asp Lys Val Gln Ile
        275                 280                 285

Gln Met Pro Asp Trp Ile Leu Leu
    290                 295


<210>  76
<211>  309
<212>  PRT
<213>  Rhodopirellula sallentina

<400>  76

Met Ile Ala Thr Arg Leu Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

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

```
Leu Asp Val Ser Ala Phe Glu Ser Tyr Asp Leu His Ala Leu Ala Ile
        35                  40                  45

Asp Gln Phe Asp Ile Ser Ala Ala Arg Met Thr Gln Ala Glu Phe Ala
    50                  55                  60

Arg Ile Pro Gly Arg Tyr Arg Gly Lys Ser Arg Trp Ala Glu Arg Val
65                  70                  75                  80

Ala Asn Phe Ala Gly Gly Leu Gln Ser Cys Asp Lys Arg Pro Leu Arg
                85                  90                  95

Leu Arg Arg Glu Lys Pro Phe Gly Phe Ala Glu Lys Tyr Leu Ala Glu
            100                 105                 110

Gly Ser Asp Leu Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Arg Tyr Phe
        115                 120                 125

Pro Gly Leu Gln Ala Glu Leu Lys Lys Glu Phe Gln Leu Lys Arg Gly
    130                 135                 140

Leu Ser Asp Glu Ser Ser Arg Val Leu Asp Glu Ile Gln Ser Ser Met
145                 150                 155                 160

Ser Val Ala Met His Val Arg Arg Gly Asp Tyr Val Thr Asn Ala Glu
                165                 170                 175

Thr Leu Arg Ile Tyr Arg Arg Leu Asp Ala Glu Tyr Tyr Arg Lys Cys
            180                 185                 190

Leu Asn Asp Leu Arg Gln Arg Phe Ser Asn Leu Asn Val Phe Val Phe
        195                 200                 205

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

Gln Arg Pro Val Thr His Asn Asp Ala Thr Thr Ala Ile Glu Asp Met
225                 230                 235                 240

Phe Leu Met Ser Gln Cys Asp His Ser Ile Ile Ala Asn Ser Ser Phe
                245                 250                 255

Ser Trp Trp Ala Ala Phe Leu Gly Arg Ser Asp Ala Gln Arg Arg Val
            260                 265                 270

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

Leu Gly Cys Ala Asn Trp Val Ser Glu Ser Ser Ile Ser Val Ser Arg
    290                 295                 300
```

Pro Ser Arg Ala Ala
305

<210> 77
<211> 289
<212> PRT
<213> Butyrivibrio sp. AD3002

<400> 77

Met Ile Ile Ile Arg Met Met Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Leu Gln Leu Lys Ala Leu Gly Lys Glu Val Lys Ile
20 25 30

Asp Asp Val Tyr Gly Phe Arg Asp Asp Pro Gln Arg Asp Pro Val Leu
35 40 45

Glu Lys Met Tyr Gly Ile Thr Tyr Thr Lys Ala Ser Asp Ala Glu Val
50 55 60

Val Asp Ile Thr Asp Ser His Leu Asp Ile Phe Ser Arg Ile Arg Arg
65 70 75 80

Lys Leu Phe Gly Arg Lys Ser His Glu Tyr Ile Glu Glu Thr Gly Leu
85 90 95

Phe Asp Pro Lys Val Phe Glu Phe Glu Thr Ala Tyr Leu Asn Gly Tyr
100 105 110

Phe Gln Ser Asp Lys Tyr Phe Pro Asp Lys Glu Val Leu Ala Gln Leu
115 120 125

Arg Arg Glu Phe Val Ile Lys Pro Asp Asp Val Phe Thr Ser Ala Asp
130 135 140

Ser Trp Glu Leu Tyr Arg Gln Ile Arg Glu Thr Glu Ser Val Ser Ile
145 150 155 160

His Val Arg Arg Gly Asp Tyr Leu Leu Pro Gly Thr Val Glu Thr Phe
165 170 175

Gly Gly Ile Cys Asp Asn Asp Tyr Tyr Lys Arg Ala Ile Asp Arg Met
180 185 190

Val Ser Glu His Pro Asp Ala Ile Phe Phe Val Phe Thr Ser Asp Lys
195 200 205

Glu Trp Cys Glu Gln Asn Val Ser Gly Lys Lys Phe Arg Ile Val Asp
210 215 220

```
Thr Lys Glu Glu Asn Asp Asp Ala Ala Asp Leu Leu Met Ser Leu
225                 230                 235                 240

Cys Lys His His Ile Leu Ala Asn Ser Ser Tyr Ser Trp Trp Ser Ala
                245                 250                 255

Trp Met Asn Asp Ser Pro Glu Lys Thr Val Ile Val Pro Ser Lys Trp
            260                 265                 270

Leu Asn Thr Lys Pro Met Asp Asp Ile Tyr Thr Ser Arg Met Thr Lys
        275                 280                 285

Ile
```

<210> 78
<211> 279
<212> PRT
<213> Segetibacter koreensis

<400> 78

```
Met Val Val Val Lys Leu Ile Gly Gly Met Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ile Gly Arg His Leu Ala Ile Lys Asn Lys Cys Pro Leu Tyr
            20                  25                  30

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

Asn Tyr Glu Leu Asp Ile Phe Asn Val Gln Tyr Gln Lys Asn Pro Phe
    50                  55                  60

Leu Gln Ser Asn Arg Phe Val Ala Lys Val Tyr His Lys Leu Phe Ser
65                  70                  75                  80

Val Gln Arg Ile Lys Glu Pro Asp Phe Thr Phe His Pro His Ile Leu
                85                  90                  95

Asn Val Gln Gly Asn Ile His Leu Asn Gly Tyr Trp Gln Asn Glu Asn
            100                 105                 110

Tyr Phe Lys Glu Ile Glu Glu Ile Ile Arg Gln Asp Phe Thr Phe Lys
        115                 120                 125

Thr Pro Ala Asn Glu Lys Ile Glu Ser Ile Leu Gln Gln Ile Ala Ala
    130                 135                 140

Thr Asn Ser Val Ser Leu His Val Arg Arg Gly Asp Tyr Ile Thr Leu
145                 150                 155                 160

Thr Glu Ala Asn Gln Phe His Gly Val Cys Ser Asp Thr Tyr Tyr Gln
```

165 170 175

Lys Ala Ile Ala Lys Ile Lys Glu Ala Ile Pro Ala Pro His Leu Phe
180 185 190

Val Phe Ser Asp Asp Ile His Trp Val Lys Gln Asn Met Pro Phe Thr
195 200 205

Glu Glu His Thr Phe Val Asp Gly Asn Thr Gly Lys Asn Ser Phe Glu
210 215 220

Asp Leu Arg Leu Met Ala Ala Cys Arg His Asn Ile Leu Ala Asn Ser
225 230 235 240

Ser Phe Ser Trp Trp Ala Gly Trp Leu Asn Lys Asn Pro Glu Lys Met
245 250 255

Val Ile Ala Pro Glu Lys Trp Phe Arg Ala Val His Thr Asp Ile Val
260 265 270

Pro Pro Ser Trp Ile Lys Met
275

<210> 79
<211> 288
<212> PRT
<213> Amphritea japonica

<400> 79

Met Val Ile Val Arg Leu Ile Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Tyr Ala Leu Ser Leu Leu Glu Gln Gly Tyr Asp Val Lys Leu
20 25 30

Asp Ala Ser Ala Phe Glu Ser Tyr Thr Leu His Gly Gly Phe Gly Leu
35 40 45

Gly Glu Tyr Ala Glu Arg Leu Glu Val Ala Thr Thr Glu Glu Val Asp
50 55 60

Met Val Ser Arg Val Gly Arg Ile Ser Thr Leu Leu Arg Lys Leu Gln
65 70 75 80

Gly Lys Lys Ser Arg Arg Val Ile Lys Glu Ser Asn Phe Ser Tyr Asp
85 90 95

Glu Lys Met Leu Thr Pro Glu Asp Ser His Tyr Leu Val Gly Tyr Phe
100 105 110

Gln Ser Glu Leu Tyr Phe Asn Lys Ile Arg Gly Glu Leu Leu Ser Ala
115 120 125

```
Leu Asp Leu Lys His Lys Leu Ser Pro Tyr Thr Glu Ala Ser Tyr Leu
    130                 135                 140

Ala Ile Ala Asp Ala Ser Val Ser Val Ser Met His Ile Arg Arg Gly
145                 150                 155                 160

Asp Tyr Val Ser Asp Lys Ala Ala His Asn Thr His Gly Val Cys Ser
                165                 170                 175

Leu Asp Tyr Tyr Tyr Ala Ala Val Thr Phe Phe Glu Glu Arg Tyr Pro
            180                 185                 190

Asp Val Asp Phe Tyr Ile Phe Ser Asp Asp Ile Glu Trp Val Lys Glu
        195                 200                 205

Asn Leu Asn Val Gln Arg Ala His Tyr Ile Ser Ser Glu Glu Lys Arg
    210                 215                 220

Phe Ala Gly Glu Asp Ile Tyr Leu Met Ser Gln Cys Asp His Asn Ile
225                 230                 235                 240

Val Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Ala Asn
                245                 250                 255

Glu Asp Lys Ile Val Val Ala Pro Arg Gln Trp Tyr Ala Asp Ser Asn
            260                 265                 270

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


<210>  80
<211>  280
<212>  PRT
<213>  Desulfovibrio vulgaris

<400>  80

Met Arg Pro Val Val Val Asp Ile Phe Gly Gly Leu Gly Asn Gln Met
1               5                   10                  15

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

Leu Glu Leu Asp Val Ser Met Phe Ser Gly Asp Pro Leu Arg Ala Phe
        35                  40                  45

Ser Leu Gly Glu Phe Ala Ile Thr Asp His Val Arg Gly Lys Ser Arg
    50                  55                  60

Ser Ser Leu Leu Val Arg Phe Ala Arg Ser Leu Gly Phe Gly Ser Ser
65                  70                  75                  80
```

```
Ser Lys Cys Val Glu Pro Phe Phe His Tyr Trp Glu Gly Ile Asn Glu
                85                  90                  95

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

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

Cys Glu Gly Val Ala Ser Ser Gly Lys Tyr Ala Gly Val Ser Ser Pro
    130                 135                 140

Met Ser Val Ser Val His Leu Arg Arg Gly Asp Tyr Lys Glu Gln Lys
145                 150                 155                 160

Asn Val Val Val His Gly Ile Leu Gly Arg Glu Tyr Tyr Asp Ala Ala
                165                 170                 175

Tyr Ser Ile Ile Lys Gln Gly Cys Pro Ser Ala Cys Phe Phe Val Phe
            180                 185                 190

Thr Asp Ala Ile Asn Glu Ala Val Asp Phe Phe Ser His Trp Asn Asp
        195                 200                 205

Val Leu Phe Val Asp Gly Asn Asn Gln Tyr Gln Asp Met Tyr Leu Met
    210                 215                 220

Ser Gln Cys Arg His His Ile Ile Ala Asn Ser Ser Tyr Ser Trp Trp
225                 230                 235                 240

Gly Ala Trp Leu Gly Ala Phe Ser Asp Gly Met Thr Val Ala Pro Lys
                245                 250                 255

Met Trp Phe Ala Tyr Asp Val Leu Lys Glu Lys Ser Ile Lys Asp Leu
            260                 265                 270

Phe Pro Glu Asp Trp Ile Val Leu
        275                 280
```

<210> 81
<211> 290
<212> PRT
<213> Spirosoma spitsbergense

<400> 81

```
Met Ile Ile Ser Arg Ile Thr Ser Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Val Ala Arg His Leu Ser Leu Lys Asn Lys Thr Ser Leu Tyr
            20                  25                  30
```

```
Val Asp Leu Ser Tyr Tyr Leu Tyr Gln Tyr His Asp Asp Thr Ser Arg
        35                  40                  45

Asn Phe Lys Leu Gly Asn Phe Ser Val Pro Tyr His Thr Leu Gln Gln
    50                  55                  60

Ser Pro Val Glu Tyr Val Ser Lys Ala Thr Lys Leu Leu Pro Asn Arg
65                  70                  75                  80

Ser Leu Arg Pro Phe Phe Leu Phe Gln Lys Glu Arg Gln Phe His Phe
                85                  90                  95

Asp Glu Gln Ile Leu Gln Ser Arg Ala Gly Cys Val Ile Leu Glu Gly
            100                 105                 110

Phe Trp Gln Ser Glu Ala Tyr Phe Arg Asp Asn Ala Asp Thr Ile Arg
        115                 120                 125

Arg Asp Leu Gln Leu Ser Gly Thr Pro Ser Pro Glu Phe Asn Gln Tyr
    130                 135                 140

Arg Glu Leu Ile Arg Glu Thr Pro Met Ser Val Ser Ile His Val Arg
145                 150                 155                 160

Arg Ser Asp Tyr Val Asn His Pro Glu Phe Ser Gln Thr Phe Gly Phe
                165                 170                 175

Val Gly Ile Asp Tyr Tyr Lys Arg Ala Ile Glu Leu Ala Arg Lys Glu
            180                 185                 190

Leu Ala Asn Pro Arg Phe Phe Val Phe Ser Asp Asp Lys Glu Trp Ser
        195                 200                 205

Lys Thr Asn Leu Pro Leu Gly Glu Asp Ser Val Phe Val Gln Asn Thr
    210                 215                 220

Gly Leu Asn Gly Asp Val Ala Asp Leu Val Leu Met Ser His Cys Gln
225                 230                 235                 240

His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu
                245                 250                 255

Asn Pro Asn Ala Gly Lys Leu Val Ile Thr Pro Lys Asn Trp Tyr Lys
            260                 265                 270

Asn Lys Pro Ala Trp Asn Thr Lys Asp Leu Leu Pro Pro Thr Trp Leu
        275                 280                 285

Ser Ile
    290
```

<210> 82
<211> 306
<212> PRT
<213> Lachnospiraceae bacterium 28-4

<400> 82

Met Asn Ile Ile Arg Met Ser Gly Gly Ile Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Leu Lys Leu Val Ser Leu Gly Lys Glu Val Lys Phe
20 25 30

Asp Asp Val Thr Glu Tyr Glu Leu Asp Asn Ala Arg Pro Ile Met Leu
35 40 45

Ser Val Phe Gly Ile Asp Tyr Pro Lys Ala Ser Arg Glu Glu Leu Val
50 55 60

Glu Leu Thr Asp Ala Ser Met Asp Phe Leu Ser Arg Val Arg Arg Lys
65 70 75 80

Ile Phe Gly Arg Lys Ser Gly Glu Tyr His Glu Ala Ser Ala Asp Tyr
85 90 95

Asp Glu Thr Val Leu Glu Lys Glu His Ala Tyr Leu Cys Gly Cys Phe
100 105 110

Gln Ser Glu Arg Tyr Phe Lys Asp Ile Glu Tyr Glu Val Arg Glu Ala
115 120 125

Tyr Arg Phe Arg Asn Val Val Val Pro Glu Glu Ile Arg Gly Gly Ile
130 135 140

Glu Thr Tyr Glu Arg Gln Ile Gly Glu Ser Leu Ser Val Ser Ile His
145 150 155 160

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

Cys Thr Asp Ala Tyr Tyr Asn Gln Ala Ile Arg Tyr Met Ile Lys Lys
180 185 190

Tyr Glu Asn Pro Ser Phe Phe Val Phe Thr Asn Asp Thr Phe Trp Ala
195 200 205

Glu Lys Trp Cys Glu Val Arg Glu Arg Glu Thr Gly Lys Arg Phe Thr
210 215 220

Val Ile Lys Gly Thr Asp Glu Glu Thr Gly Tyr Ile Asp Leu Met Leu
225 230 235 240

Met Ser Arg Cys Lys Ala His Ile Ile Ala Asn Ser Ser Phe Ser Trp

245 250 255

Trp Gly Ala Trp Leu Asp Ala Ser Pro Asp Lys Cys Val Val Ala Pro
260 265 270

Val Lys Trp Ile Asn Thr Arg Glu Cys Arg Asp Ile Tyr Thr Glu Asp
275 280 285

Met Val Arg Ile Gly Ser Asn Gly Lys Ile Ser Phe Ser Asn Cys Ser
290 295 300

Ser Leu
305

<210> 83
<211> 281
<212> PRT
<213> Lachnospiraceae bacterium COE1

<400> 83

Met Val Val Val Arg Ile Trp Glu Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Tyr Ala Arg Ala Leu Ser Leu Arg Thr Lys Asp Arg Val Tyr
20 25 30

Leu Asp Ile Ser Glu Tyr Glu Met Ser Pro Lys Pro Val Arg Lys Tyr
35 40 45

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

Ile Phe Pro Phe Val Asn Lys Asp Ser Phe Tyr Thr Lys Asn Asn Gln
65 70 75 80

Tyr Leu Arg Tyr Phe Pro Ala Gly Leu Ile Lys Glu Glu Asp Cys Tyr
85 90 95

Phe Lys Arg Asp Phe Cys Glu Leu Lys Gly Leu Leu Tyr Leu Lys Gly
100 105 110

Trp Phe Gln Ser Glu Lys Tyr Phe Lys Glu Phe Glu Ser His Ile Arg
115 120 125

Glu Glu Ile Tyr Pro Arg Asn Lys Ile Lys Ile Thr Arg Gly Leu Arg
130 135 140

Lys Ile Leu Asn Ser Asp Asn Thr Val Ser Val His Ile Arg Arg Gly
145 150 155 160

Asp Phe Gly Lys Asp His Asn Ile Leu Pro Ile Glu Tyr Tyr Glu Asn
165 170 175

```
Ser Lys Arg Val Ile Leu Glu Arg Val Asp Asn Pro Tyr Phe Ile Ile
            180                 185                 190

Phe Ser Asp Asp Ile Leu Trp Val Lys Glu Asn Met Asn Phe Gly Leu
        195                 200                 205

Asn Cys Phe Tyr Met Asp Lys Glu Tyr Ser Tyr Lys Asp Tyr Glu Glu
    210                 215                 220

Leu Met Ile Met Ser Arg Cys Lys His Asn Ile Ile Ala Asn Ser Thr
225                 230                 235                 240

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

Ile Ala Pro Lys Lys Trp Phe Leu Tyr Asn Pro Lys Lys Asp Phe Asp
            260                 265                 270

Ile Val Pro Asn Asp Trp Ile Arg Val
        275                 280
```

<210> 84
<211> 301
<212> PRT
<213> Parabacteroides distasonis CL09T03C24

<400> 84

```
Met Lys Ile Val Asn Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Phe Ala Val Ala Leu Lys Ala Lys Tyr Pro Asn Glu Glu Val
            20                  25                  30

Phe Ile Asp Thr Gln His Tyr Lys Asn Ala Phe Ile Lys Val Tyr His
        35                  40                  45

Gly Asn Asn Phe Tyr His Asn Gly Tyr Glu Ile Asp Lys Val Phe Pro
    50                  55                  60

Asn Ala Thr Leu Glu Pro Ala Arg Pro Lys Asp Leu Met Lys Val Ser
65                  70                  75                  80

Phe Tyr Ile Pro Asn Gln Val Leu Ala Arg Ala Val Arg Arg Ile Phe
                85                  90                  95

Pro Lys Arg Lys Thr Glu Phe Val Thr Asp Gln Gln Pro Tyr Val Phe
            100                 105                 110

Ile Pro Glu Ala Leu Ser Val Ile Asp Asp Cys Tyr Phe Asp Gly Tyr
        115                 120                 125
```

```
Trp Met Thr Pro Leu Tyr Phe Asp Lys Tyr Arg Asp Arg Ile Leu Lys
    130                 135                 140

Glu Phe Thr Phe Arg Pro Phe Asp Thr Lys Glu Asn Leu Glu Leu Glu
145                 150                 155                 160

Pro Leu Leu Lys Gln Asp Asn Ser Val Thr Val His Ile Arg Arg Gly
                165                 170                 175

Asp Tyr Val Gly Ser Ser Ser Phe Gly Gly Ile Cys Thr Leu Asp Tyr
            180                 185                 190

Tyr Arg Asn Ala Ile Arg Glu Ala Tyr Asn Leu Ile Thr Ser Pro Glu
        195                 200                 205

Phe Phe Ile Phe Ser Asn Asp Gln Lys Trp Cys Met Glu Asn Met Arg
    210                 215                 220

Asn Glu Phe Gly Asp Ala Lys Val His Phe Ile Ala His Asn Arg Gly
225                 230                 235                 240

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

Ile Leu Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Tyr Leu Asn Gln
            260                 265                 270

Arg Lys Asn Cys Phe Ile Ile Cys Pro His Lys Trp His Asn Thr Leu
        275                 280                 285

Glu Tyr Ser Asp Leu Tyr Leu Pro Thr Trp Ile Lys Ile
    290                 295                 300


<210>  85
<211>  283
<212>  PRT
<213>  Bacteroides sp. HPS0048

<400>  85

Met Phe Val Ile Arg Leu Ile Gly Gly Val Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Thr Phe Gly Gln Phe Leu Arg His Lys Phe Gly Val Glu Val Cys
            20                  25                  30

Tyr Asp Ile Val Ala Phe Asp Thr Val Asp Lys Gly Arg Asn Leu Glu
        35                  40                  45

Leu Gln Leu Leu Asp Glu Ser Leu Pro Leu Phe Glu Thr Ser Asn Phe
    50                  55                  60
```

```
Phe Phe Ser Lys Tyr Lys Ser Trp Lys Lys Arg Leu Phe Leu Tyr Gly
65                  70                  75                  80

Phe Leu Leu Lys Lys Asn Asn Lys Tyr Tyr Thr Lys Tyr Ala Pro Glu
                85                  90                  95

Glu Ile Ser Leu Phe Thr Glu Lys Gly Leu Ser Tyr Phe Asp Gly Trp
            100                 105                 110

Trp Gln Tyr Pro Ala Leu Leu Arg Asp Thr Ile Asn Asn Met Glu Asp
        115                 120                 125

Phe Phe Ile Pro Lys Gln Pro Ile Pro Val Gln Ile Gln Lys Tyr Tyr
    130                 135                 140

Asn Glu Ile Leu Leu Asn Asn Phe Ala Val Ala Leu His Val Arg Arg
145                 150                 155                 160

Gly Asp Tyr Phe Thr Ser Lys Tyr Ala Lys Thr Tyr Ala Val Cys Asn
                165                 170                 175

Val Glu Tyr Tyr Thr Ser Ala Val Asn Leu Met Cys Glu Lys Leu Arg
            180                 185                 190

Ser Cys Lys Phe Tyr Val Phe Ser Asp Asp Leu Asp Trp Val Lys Ser
        195                 200                 205

Asn Leu Ile Leu Pro Ser Asn Thr Val Tyr Val Lys Asn Tyr Asp Ile
    210                 215                 220

Asn Ser Tyr Trp Tyr Ile Tyr Leu Met Ser Leu Cys Arg His Ile Ile
225                 230                 235                 240

Ile Ser Asn Ser Ser Phe Ser Trp Trp Gly Ala Thr Leu Asn Arg Asn
                245                 250                 255

Phe His Lys Ile Val Ile Ala Pro Lys Tyr Trp Ser Thr Lys Lys Asn
            260                 265                 270

Asn Thr Leu Cys Asp Asn Ser Trp Ile Lys Ile
        275                 280
```

<210> 86
<211> 291
<212> PRT
<213> Bacteroides thetaiotaomicron

<400> 86

```
Met Lys Ile Ile Asn Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Ala Met Tyr Leu Ala Leu Lys Asn Ala His Ser Glu Glu Glu Ile
```

```
            20                  25                  30

Leu Cys Ser Thr Arg Ser Phe Cys Gly Tyr Gly Leu His Asn Gly Tyr
        35                  40                  45

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

Gln Leu Thr Lys Leu Ala Tyr Pro Phe Phe Asn Tyr Lys Ser Trp Gln
65                  70                  75                  80

Val Met Arg His Trp Leu Pro Val Arg Lys Thr Met Thr Arg Gly Ala
                85                  90                  95

Ile Asn Ile Pro Phe Asp Tyr Ser Gln Val Met Arg Glu Asp Ser Val
            100                 105                 110

Tyr Tyr Asp Gly Tyr Trp Gln Asn Glu Lys Asn Phe Leu His Ile Arg
        115                 120                 125

Glu Glu Ile Leu Thr Ala Tyr Thr Phe Pro Lys Phe Asp Asp Glu Lys
    130                 135                 140

Asn Gln Glu Leu Ala Asp Ile Ile Val Lys Ser Asn Ala Val Ser Cys
145                 150                 155                 160

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

Thr Ser Ser Tyr Tyr Ala His Ala Ile Ser Tyr Met Asn Glu Glu Ile
            180                 185                 190

Asn Pro Asn Leu Tyr Cys Val Phe Ser Asp Asp Ile Glu Trp Cys Arg
        195                 200                 205

Asn Asn Ile Cys Glu Leu Met Gly Glu Asp Lys Lys Ile Ile Phe Ile
    210                 215                 220

Asp Trp Asn Lys Gly Glu Lys Ser Phe Arg Asp Met Gln Leu Met Ser
225                 230                 235                 240

Leu Cys Lys His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ala Trp Leu Asn Arg Asn Asp Lys Lys Ile Val Val Ala Pro Thr Arg
            260                 265                 270

Trp Ile Ala Ser Glu Val Lys Asn Asp Pro Leu Cys Asp Ser Trp Lys
        275                 280                 285

Arg Ile Glu
```

290

<210> 87
<211> 292
<212> PRT
<213> Desulfovibrio alaskensis

<400> 87

Met Lys Phe Val Gly Val Trp Ile Leu Gly Gly Leu Gly Asn Gln Met
1 5 10 15

Phe Gln Phe Ala Ala Ala Tyr Ala Leu Ala Lys Arg Met Gly Gly Glu
20 25 30

Leu Arg Leu Asp Leu Ser Gly Phe Lys Lys Tyr Pro Leu Arg Ser Tyr
35 40 45

Ser Leu Asp Leu Phe Thr Val Asp Thr Pro Leu Trp His Gly Leu Pro
50 55 60

Met Ser Gln Arg Arg Phe Arg Ile Pro Met Asp Ala Trp Thr Arg Gly
65 70 75 80

Ser Arg Leu Pro Leu Val Pro Ser Pro Pro Phe Val Met Ala Lys Glu
85 90 95

Lys Asn Phe Ala Phe Ser Pro Ile Val Tyr Glu Leu Gln Gln Ser Cys
100 105 110

Tyr Leu Tyr Gly Tyr Trp Gln Ser Tyr Arg Tyr Phe Gln Asp Val Glu
115 120 125

Asp Asp Ile Arg Thr Leu Phe Ser Leu Ser Arg Phe Ala Thr Leu Glu
130 135 140

Leu Ala Pro Val Val Ala Gln Leu Asn Glu Val Glu Ser Val Ala Val
145 150 155 160

His Leu Arg Arg Gly Asp Tyr Ile Thr Asp Ala Ala Ser Asn Ala Val
165 170 175

His Gly Val Cys Gly Ile Asp Tyr Tyr Gln Arg Ser Met Ser Leu Val
180 185 190

Arg Arg Ser Thr Thr Lys Pro Ile Phe Tyr Ile Phe Ser Asp Glu Pro
195 200 205

Glu Val Ala Lys Lys Leu Phe Ala Thr Glu Asp Asp Val Val Val Met
210 215 220

Pro Ser Arg Arg Gln Glu Glu Asp Leu Leu Leu Met Ser Arg Cys Lys
225 230 235 240

```
His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu
                245                 250                 255

Gly Lys Arg Ala Ser Gly Leu Cys Ile Ala Pro Arg Tyr Trp Phe Ala
            260                 265                 270

Arg Pro Lys Leu Glu Ser Thr Tyr Leu Phe Asp Leu Ile Pro Asp Glu
        275                 280                 285

Trp Leu Leu Leu
    290
```

<210> 88
<211> 296
<212> PRT
<213> Prevotella oralis CC98A

<400> 88

```
Met Asp Ile Val Val Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                   10                  15

Tyr Ala Phe Tyr Leu Ala Lys Arg Lys Ser Gly Ser Arg Cys His Cys
            20                  25                  30

Ile Phe His Asn Val Ser Thr Gly Phe His Asn Gly Ser Glu Leu Asp
        35                  40                  45

Lys Val Phe Gly Ile Lys Tyr Glu Lys Gly Ile Phe Ser Lys Leu Leu
    50                  55                  60

Ser Lys Ile Tyr Asp Ile Phe Asp Gly Ile Pro Lys Leu Arg Lys Lys
65                  70                  75                  80

Leu Asn Ser Leu Gly Ile His Ile Ile Arg Glu Pro Arg Asn Tyr Asp
                85                  90                  95

Tyr Thr Ala Ser Leu Leu Pro Arg Val Ser Arg Trp Gly Leu Asn Tyr
            100                 105                 110

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

Glu Ile Lys Asn Thr Phe Ser Phe Lys Ile Asp Asp Glu Ile Lys Asp
    130                 135                 140

Ile Asp Phe Tyr Glu Phe Tyr Ser Leu Ile His Asn Asp Ile Asn Ser
145                 150                 155                 160

Val Ser Leu His Ile Arg Arg Gly Asp Tyr Val Gly Ala Asn Glu Tyr
                165                 170                 175
```

Ser Tyr Phe Gln Phe Gly Gly Val Ala Thr Leu Glu Tyr Tyr His Lys
180 185 190

Ala Ile Asp Glu Ile Tyr Gln Arg Ile Glu Asn Pro Thr Phe Tyr Val
195 200 205

Phe Ser Asp Asp Ile Gly Trp Cys Lys Thr Thr Phe Leu Lys Asn Asn
210 215 220

Phe Ile Phe Val Asp Cys Asn Cys Gly Glu Lys Ser Trp Arg Asp Met
225 230 235 240

Phe Leu Ile Ser Gln Cys Lys His His Ile Ile Ala Asn Ser Thr Phe
245 250 255

Ser Trp Trp Gly Ala Trp Leu Ser Ile Phe His Asn Ser Ile Thr Ile
260 265 270

Cys Pro Lys Glu Phe Ile Lys Gly Val Val Ile Arg Asp Val Tyr Pro
275 280 285

Asp Thr Trp Ile Lys Leu Ser Ser
290 295

<210> 89
<211> 303
<212> PRT
<213> Comamonadaceae bacterium CR

<400> 89

Met Ala Ser Lys Ile Ser Lys Ile Ile Pro Arg Ile Phe Gly Gly Leu
1 5 10 15

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

Asn Gly Ala Glu Leu Ala Leu Asp Asp Val Ser Gly Phe Val Arg Asp
35 40 45

His Glu Tyr Asn Arg His Tyr Gln Leu Asp His Phe Asn Ile Pro Cys
50 55 60

Arg Lys Ala Thr Ala Ala Glu Arg Leu Glu Pro Phe Ala Arg Val Arg
65 70 75 80

Arg Tyr Leu Lys Arg Lys Trp Asn Gln Arg Leu Pro Phe Glu Gln Arg
85 90 95

Lys Tyr Leu Val Gln Glu Ser Val Asp Phe Asp Glu Arg Leu Leu Thr
100 105 110

```
Phe Lys Pro Arg Gly Thr Val Tyr Leu Glu Gly Tyr Trp Gln Ser Glu
        115                 120                 125

Asp Tyr Phe Lys Asp Ile Glu Pro Gln Ile Arg Ala Asp Leu Arg Ile
    130                 135                 140

His Pro Pro Thr Asp Thr Val Asn Gln Gln Met Ala Glu Arg Ile Arg
145                 150                 155                 160

Ala Thr Asn Ala Val Ala Val His Val Arg Phe Phe Asp Ala Pro Ala
                165                 170                 175

Gln Ser Ala Leu Gly Val Gly Gly Asn Asn Ala Pro Gly Asp Tyr Tyr
            180                 185                 190

Gln Arg Ala Ile Lys Val Met Gln Glu Gln Ala Pro Asp Ala Gln Tyr
        195                 200                 205

Tyr Ile Phe Ser Asp Gln Pro Gln Ala Ala Arg Ala Arg Ile Pro Leu
    210                 215                 220

Arg Asp Asp His Val Thr Leu Val Asn His Asn Gln Cys Asp Ala Val
225                 230                 235                 240

Ala Tyr Ala Asp Leu Trp Leu Ile Ser Gln Cys Gln His Phe Ile Ile
                245                 250                 255

Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Gly Lys Thr Pro
            260                 265                 270

Glu Ser Ile Val Ile Ala Pro Gly Phe Glu Lys Arg Glu Gly Ala Met
        275                 280                 285

Phe Trp Gly Phe Arg Gly Leu Leu Pro Asp Arg Trp Val Lys Leu
    290                 295                 300
```

<210> 90
<211> 292
<212> PRT
<213> Vibrio nigripulchritudo

<400> 90

```
Met Lys Asp Ser Arg Ile Val Lys Leu Asn Gly Gly Leu Gly Asn Gln
1               5                   10                  15

Met Phe Gln Phe Ala Leu Ala Phe Ala Leu Lys Lys Lys Leu Asn Val
            20                  25                  30

Ala Val Lys Phe Asp Thr Glu Leu Leu Asp Thr Asn Arg Thr Glu Phe
        35                  40                  45

Lys Leu Ser Leu Glu Arg Phe Gly Leu Ile Val Asp Lys Leu Thr Ile
```

50 55 60

Thr Glu Lys Phe Lys Tyr Lys Gly Leu Glu Ser Cys Lys Tyr Arg Lys
65 70 75 80

Ile Cys Asn Trp Ile Ser Asn Phe Thr Thr Ile Asn Ile His Lys Gly
85 90 95

Tyr Tyr Lys Glu Lys Glu Arg Gly Val Tyr Asp Arg Gly Ile Phe Asp
100 105 110

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

Asn Asp Phe Arg Ser Glu Leu Leu Asn Lys Phe Asn Leu Asn Gly Lys
130 135 140

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

Asn Ser Val Ser Ile His Val Arg Arg Gly Asp Tyr Leu Leu Leu Asp
165 170 175

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

Val Arg Ile Thr Asn Pro Asp Ser Lys Phe Phe Ile Phe Ser Asn Asp
195 200 205

Ile Asn Trp Cys Lys Ser Asn Phe Lys Ser Val Asp Asn Ala Ile Phe
210 215 220

Val Asp Ser Thr Val Asp Glu Phe Asp Asp Met Phe Leu Met Ser Lys
225 230 235 240

Cys Lys Thr Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Ala Ala
245 250 255

Trp Leu Asn Asn Asn Ser Gly Lys Ile Val Tyr Cys Pro Lys Lys Trp
260 265 270

Arg Asn Asp Thr Thr Glu Val His Lys Gly Leu Pro Glu Gly Trp Asn
275 280 285

Ile Ile Asp Lys
290

<210> 91
<211> 295
<212> PRT
<213> Sulfurospirillum deleyianum

<400> 91

```
Met Ile Ile Ile Lys Ile Met Gly Gly Leu Thr Ser Gln Met His Lys
1               5                  10                  15

Tyr Ala Leu Gly Arg Val Leu Ser Leu Lys Tyr Asn Val Pro Leu Lys
            20                  25                  30

Leu Asp Leu Thr Trp Phe Asp Asn Pro Lys Ser Asp Thr Pro Trp Glu
        35                  40                  45

Tyr Gln Leu Asp Tyr Phe Asn Ile Asn Ala Thr Ile Ala Thr Val Ser
    50                  55                  60

Glu Ile Lys Lys Leu Lys Gly Asn Asn Leu Phe Asn Arg Ile Ala Arg
65                  70                  75                  80

Lys Ile Glu Lys Phe Phe Ser Ile Arg Ile Tyr Lys Lys Ser Tyr Ile
                85                  90                  95

Asn Lys Ser Phe Ile Ser Ile Ser Asp Phe His Lys Leu Lys Ser Asp
            100                 105                 110

Ile Tyr Leu Asp Gly Glu Trp Asn Gly Phe Lys Tyr Phe Glu Asp Tyr
        115                 120                 125

Gln Asp Thr Ile Lys Asn Glu Leu Thr Leu Lys Arg Gly Ser Ser Ile
    130                 135                 140

Asn Ile Gln Asn Thr Ile Lys Glu Leu Lys Ser Ser Asp Asn Ser Val
145                 150                 155                 160

Phe Leu His Ile Arg Arg Gly Asp Tyr Leu Ser Asn Lys Asn Ala Ala
                165                 170                 175

Ala Phe His Ala Lys Cys Ser Leu Asp Tyr Tyr Tyr Lys Ala Ile Gln
            180                 185                 190

Ile Val Lys Glu Lys Ile Asp Asn Pro Ile Phe Tyr Ile Phe Ser Asp
        195                 200                 205

Asp Ile Leu Trp Val Lys Lys Asn Phe Val Ile Asn Glu Ser Cys Arg
    210                 215                 220

Phe Met Glu Lys Asn Gln Asn Phe Glu Asp Leu Leu Leu Met Ser Tyr
225                 230                 235                 240

Cys Lys His Gly Ile Thr Ala Asn Ser Gly Phe Ser Leu Met Ala Gly
                245                 250                 255

Trp Leu Asn Gln Asn Lys Asp Lys Met Ile Ile Val Pro Gln Thr Trp
            260                 265                 270
```

Val Asn Asp Asp Arg Ile Asn Ile Asn Ile Leu Asn Ser Leu Glu Gln
275 280 285

Asp Asn Phe Thr Ile Ile Arg
290 295

<210> 92
<211> 298
<212> PRT
<213> Escherichia coli

<400> 92

Met Thr Phe Ile Val Arg Leu Thr Gly Gly Leu Gly Asn Gln Met Phe
1 5 10 15

Gln Tyr Ala Leu Ala Arg Ser Leu Ala Lys Lys Tyr Asn Ala Arg Leu
20 25 30

Lys Leu Asp Ile Ser Tyr Tyr His Asn Gln Pro His Lys Asp Thr Pro
35 40 45

Arg Thr Phe Glu Leu Asn Gln Leu Cys Ile Val Asp Asn Ile Leu Asn
50 55 60

Ser Ser Ser Phe Ser Glu Lys Phe Leu Tyr Ile Tyr Asp Lys Leu Arg
65 70 75 80

Val Lys Leu Ser Lys Lys Ile Ser Leu Pro Tyr Phe Arg Asn Ile Val
85 90 95

Thr Pro Val Asn Phe Asn Cys Ile Asp Phe Ala Glu Asp Lys Asp Tyr
100 105 110

Tyr Phe Leu Gly His Phe Gln Glu Leu Ser Asn Ile Tyr Ser Ile Asp
115 120 125

Glu Ser Leu Arg Ser Glu Phe Lys Pro Asn Gln Glu Ile Met Asn Leu
130 135 140

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

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

Ala Glu His His Gly Val Ile Gly Leu Ser Tyr Tyr Val Asn Ala Leu
180 185 190

Ser Tyr Leu Glu Asn Val Ser Glu Phe Phe Asp Val Phe Val Phe Ser
195 200 205

```
Asp Asp Pro Glu Trp Ala Arg Lys Asn Ile Lys Asn Ser Arg Asn Leu
    210                 215                 220

Phe Phe Cys Asp Glu Gly Asn Cys Arg Tyr Ser Lys Lys Tyr Ser Thr
225                 230                 235                 240

Ile Asp Met Tyr Leu Met Ser Gln Cys Asp His Phe Ile Ile Ala Asn
                245                 250                 255

Ser Thr Tyr Ser Trp Trp Ala Ala Trp Leu Gly Asn Tyr Pro Ser Lys
            260                 265                 270

His Val Val Ala Pro Ala Arg Trp Asn Ala Asn Asn Ser Pro Tyr Pro
        275                 280                 285

Ile Leu Gln Asn Trp Lys Ala Ile His Glu
    290                 295

<210>  93
<211>  285
<212>  PRT
<213>  Firmicutes bacterium CAG:24

<400>  93

Met Val Gly Val Gln Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Ala Leu Tyr Leu Lys Leu Lys Ser Met Gly Lys Asp Val Arg Ile
            20                  25                  30

Asp Asp Val Thr Cys Tyr Gly Ala Gln Glu Lys Gln Arg Val Asn Gln
        35                  40                  45

Leu Ser Val Phe Gly Val Ser Tyr Glu His Met Thr Lys Gln Glu Tyr
    50                  55                  60

Glu Gln Ile Thr Asp Ser Ser Met Ser Pro Leu His Arg Ala Arg Arg
65                  70                  75                  80

Leu Leu Cys Gly Arg Lys Asp Leu Ser Tyr Arg Glu Ala Ser Cys Asn
                85                  90                  95

Tyr Asp Pro Glu Ile Leu Arg Arg Glu Pro Ala Leu Leu Leu Gly Tyr
            100                 105                 110

Phe Gln Thr Glu Arg Tyr Phe Ala Asp Ile Lys Asp Gln Val Arg Glu
        115                 120                 125

Ala Phe Thr Phe Arg Asn Leu Thr Leu Thr Lys Glu Ser Ala Ala Met
    130                 135                 140
```

```
Glu Gln Gln Met Lys Glu Cys Glu Ser Val Ser Val His Ile Arg Arg
145                 150                 155                 160

Gly Asp Tyr Leu Thr Pro Ala Asn Gln Ala Leu Phe Gly Gly Ile Cys
                165                 170                 175

Asp Leu Asp Tyr Tyr His Arg Ala Val Ala Glu Ile Arg Lys Arg Lys
            180                 185                 190

Pro Asp Val Lys Phe Phe Leu Phe Ser Asn Asp Met Glu Trp Thr Lys
        195                 200                 205

Glu His Phe Cys Gly Ser Glu Phe Val Pro Val Glu Gly Asn Ser Glu
    210                 215                 220

Gln Ala Gly Glu Gln Asp Leu Tyr Leu Met Ser Cys Cys Lys Asn His
225                 230                 235                 240

Ile Leu Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asp Asn
                245                 250                 255

Gly Lys Asp Lys Leu Val Ile Ala Pro Glu Lys Trp Met Asn Gly Arg
            260                 265                 270

Gly Cys Cys Asp Ile Tyr Thr Asp Glu Met Ile Arg Val
        275                 280                 285
```

<210> 94
<211> 287
<212> PRT
<213> Amphritea japonica

<400> 94

```
Met Val Lys Ile Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Ala Lys Ser Leu Ala Val Leu Asn Asn Thr Arg Val Ser
            20                  25                  30

Ala Asn Val Ser Val Phe Ser Asn Tyr Lys Thr His Pro Leu Arg Leu
        35                  40                  45

Asn Lys Leu Asn Cys Asp Cys Glu Phe Asp Phe Thr Arg Asp Phe Arg
    50                  55                  60

Leu Val Leu Ser Gly Phe Pro Leu Leu Gly Ser Ala Phe Ser Lys Lys
65                  70                  75                  80

Ser Met Leu Leu Asn His Tyr Val Glu Lys Asp Leu Leu Phe Asp Ser
                85                  90                  95

Ser Phe Phe Asp Leu Asp Asp Asn Val Leu Leu Ser Gly Tyr Phe Gln
```

100 105 110

Ser Glu Lys Tyr Phe Ser Asn Ile Arg Glu Leu Leu Ile Gln Glu Phe
115 120 125

Ser Leu Asp Asp Arg Leu Thr Glu Ala Glu Leu Ala Ile Asn Asn Lys
130 135 140

Ile Glu Ser Cys Asn Ser Ile Ala Ile His Ile Arg Arg Gly Asp Tyr
145 150 155 160

Ile Thr Asp Leu Ser Ala Asn Asn Ile His Gly Ile Cys Ser Glu Glu
165 170 175

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

Asp Pro Thr Thr Thr Leu Phe Ile Phe Ser Asp Asp Ile Leu Trp Cys
195 200 205

Lys Asp Asn Leu Ala Phe Lys Tyr Arg Thr Val Phe Val Glu Gly Ser
210 215 220

Val Asp Arg Pro Glu Val Asp Ile His Leu Met Ser Lys Cys Lys His
225 230 235 240

Gln Val Ile Ser Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn
245 250 255

Thr Asn Leu Asp Lys Cys Val Ile Ala Pro Leu Lys Trp Phe Asn Ser
260 265 270

Leu His Asp Ser Thr Asp Ile Val Pro Lys Gln Trp Met Arg Leu
275 280 285

<210> 95
<211> 273
<212> PRT
<213> Bacteroides salyersiae

<400> 95

Met Lys Gln Thr Ile Ile Met Ser Gly Gly Leu Gly Asn Gln Met Phe
1 5 10 15

Gln Tyr Ala Leu Tyr Cys Ser Met Arg Glu Lys Gly Ile Arg Val Lys
20 25 30

Ile Asp Ile Ser Leu Tyr Glu Phe Asn Arg Met His Asn Gly Tyr Met
35 40 45

Leu Asp Tyr Ala Phe Gly Leu Asn Ile Ser His Asn Lys Ile Asn Lys
50 55 60

```
Tyr Ser Val Leu Trp Thr Arg Leu Ile Arg Ser Asn Arg Ala Pro Phe
65                  70                  75                  80

Leu Leu Phe Arg Glu Asp Glu Ser Arg Phe Cys Asp Asp Val Phe Thr
                85                  90                  95

Thr Tyr Lys Pro Tyr Ile Asp Gly Cys Trp Ile Asp Glu Arg Tyr Phe
            100                 105                 110

Phe Asn Ile Lys Lys Lys Ile Ile Ser Gln Phe Ser Phe His Asn Ile
        115                 120                 125

Asp Gln Lys Asn Leu Met Val Ala Asn Met Met Lys Val Cys Asn Ser
    130                 135                 140

Val Ser Leu His Ile Arg Arg Gly Asp Tyr Leu Ser Gln Ser Met Tyr
145                 150                 155                 160

Asn Ile Cys Asn Glu Ser Tyr Tyr Lys Ser Ala Ile Glu Tyr Ile Ile
                165                 170                 175

Ser Arg Val Glu Asp Ser Lys Phe Phe Ile Phe Ser Asp Asp Pro Glu
            180                 185                 190

Trp Cys Lys Tyr Phe Met Glu Lys Phe Asn Val Asp Tyr Glu Ile Ile
        195                 200                 205

Gln His Asn Phe Gly Lys Asp Ser Tyr Lys Asp Met Tyr Leu Met Thr
    210                 215                 220

Gln Cys Lys His Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly
225                 230                 235                 240

Ala Trp Leu Asn Asn Asn Ala Gly Lys Asn Val Val Cys Pro Ser Val
                245                 250                 255

Trp Ile Asn Gly Arg Asp Phe Asn Pro Cys Leu Glu Glu Trp Tyr His
            260                 265                 270

Ile
```

<210> 96
<211> 291
<212> PRT
<213> Bacteroides fragilis

<400> 96

```
Met Asp Ile Ile Leu Leu His Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                   10                  15
```

```
Tyr Ala Phe Tyr Leu Ser Lys Lys Lys Asn Gly Ile His Thr Ser Tyr
            20                  25                  30

Ile Cys Leu Ser Asn Asp His Asn Gly Ile Glu Leu Asp Lys Val Phe
        35                  40                  45

Gly Val Glu Cys Gln Met Gly Cys Lys Lys Ile Phe Leu Leu Phe Ile
    50                  55                  60

Leu Arg Leu Leu Met Ser Asn Arg Thr Gly Phe Leu Ile Arg Lys Val
65                  70                  75                  80

Asn Leu Leu Phe Ser Lys Ile Lys Ile Lys Leu Ile Thr Glu Asn Leu
                85                  90                  95

Asp Tyr Ser Phe His Pro Ser Phe Leu Ser Ala Ser Pro Tyr Cys Leu
            100                 105                 110

Ala Phe Trp Val Gly Gly Trp His His Pro Gln Tyr Tyr Ser Glu Ile
        115                 120                 125

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

Glu Arg Asn Ile Cys Ile Glu Lys Arg Met Arg Glu Pro Asn Ser Val
145                 150                 155                 160

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

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

Tyr Ile Glu Gly Lys Leu Ser Asp Ile Cys Tyr Tyr Val Phe Ser Asn
        195                 200                 205

Asp Met Glu Trp Ala Lys Lys Ile Leu Leu Gly Lys Asn Ala Val Phe
    210                 215                 220

Val Asp Trp Asn Arg Gly Glu Glu Ser Trp Lys Asp Met Tyr Leu Met
225                 230                 235                 240

Ser Lys Cys Ser Asn Leu Ile Ile Pro Asn Ser Thr Phe Ser Trp Trp
                245                 250                 255

Ala Ala Trp Leu Cys Glu His Pro Val Asn Ile Val Cys Pro Lys Leu
            260                 265                 270

Phe Val Tyr Gly Asp Glu Gln Ser Asp Ile Tyr Leu Asp Asn Trp His
        275                 280                 285
```

Lys Ile Glu
290

<210> 97
<211> 288
<212> PRT
<213> Bacteroides nordii

<400> 97

Met Met Gly Ile Glu Lys Thr Asn Met Val Ile Val Arg Leu Trp Gly
1 5 10 15

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

Glu Lys Tyr Gln Val Asp Val Ile Tyr Asp Ile Ala Ser Phe Gly Lys
35 40 45

Ser Asp Lys Leu Arg Lys Leu Glu Leu Ser Val Val Val Pro Gly Ile
50 55 60

Pro Val Thr Thr Asp Ile Ser Phe Ser Lys Tyr Val Gly Thr Lys Asn
65 70 75 80

Arg Leu Leu Arg Phe Ile Tyr Gly Leu Lys Asn Ser Phe Ile Glu Glu
85 90 95

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

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

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

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

Leu His Val Arg Arg Gly Asp Tyr Phe Ser Ser Lys His Ile Asn Thr
165 170 175

Phe Gly Val Cys Asp Ala His Tyr Tyr Glu Lys Ala Val Asp Ile Met
180 185 190

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

Asp Trp Val Arg Arg Tyr Val Asn Leu Pro Thr Asn Val Ile Tyr Val
210 215 220

Pro Asn Tyr Asp Ile Pro Gln Tyr Trp Tyr Ile Tyr Leu Met Ser Leu
225 230 235 240

Cys Arg His Asn Ile Ile Ser Asn Ser Ser Phe Ser Trp Trp Gly Ala
245 250 255

Phe Leu Asn Met Asn Thr Asn Lys Ile Val Val Ser Pro Ser Lys Trp
260 265 270

Thr Leu Asn Ser Asp Lys Thr Ile Ala Leu Asp Glu Trp Phe Lys Ile
275 280 285

<210> 98
<211> 281
<212> PRT
<213> Butyrivibrio proteoclasticus

<400> 98

Met Glu Cys Ser Met Ile Ile Ile Lys Phe Cys Gly Ala Leu Gly Asn
1 5 10 15

Gln Leu Phe Gln Tyr Ala Leu Tyr Glu Lys Met Arg Ile Leu Gly Lys
20 25 30

Asp Val Lys Ala Asp Ile Ser Ala Phe Gly Asp Gly Asn Glu Lys Arg
35 40 45

Phe Phe Tyr Leu Asp Glu Leu Gly Ile Glu Phe Asn Ile Ala Ser Ala
50 55 60

Asp Glu Ile Ala Glu Tyr Leu Asn Arg Lys Thr Ile Arg Phe Val Pro
65 70 75 80

Gly Phe Leu Gln His Arg His Tyr Tyr Phe Glu Lys Lys Pro Tyr Val
85 90 95

Tyr Asn Lys Lys Ile Leu Ser Tyr Asp Asp Cys Tyr Leu Glu Gly Tyr
100 105 110

Trp Gln Asn Tyr Arg Tyr Phe Asp Asp Ile Lys Asp Glu Leu Leu Lys
115 120 125

His Met Lys Phe Pro Cys Leu Pro Leu Glu Gln Lys Lys Leu Ala Glu
130 135 140

Lys Met Glu Asn Glu Asn Ser Val Ala Val His Val Arg Met Gly Asp
145 150 155 160

Tyr Leu Asn Leu Gln Asp Leu Tyr Gly Gly Ile Cys Asp Ala Asp Tyr
165 170 175

Tyr Asp Arg Ala Phe Ser Tyr Ile Glu Gly Asn Ile Ser Asn Pro Val

180 185 190

Tyr Tyr Gly Phe Ser Asp Asp Val Asp Lys Ala Ser Ala Leu Leu Ala
195 200 205

Lys His Lys Ile Asn Trp Ile Asp Tyr Asn Ser Glu Lys Gly Ala Ile
210 215 220

Tyr Asp Leu Ile Leu Met Ser Lys Cys Lys Asn Asn Ile Ile Ala Asn
225 230 235 240

Ser Ser Phe Ser Trp Trp Gly Ala Tyr Leu Glu Tyr Asn Asn Gly Lys
245 250 255

Val Val Val Ser Pro Asn Arg Trp Met Asn Cys Phe Glu Asn Ser Asn
260 265 270

Ile Ala Tyr Trp Gly Trp Ile Ser Leu
275 280

<210> 99
<211> 289
<212> PRT
<213> Prevotella ruminicola

<400> 99

Met Arg Ile Val Lys Val Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Phe Ala Leu Tyr Lys Ala Leu Gln Lys Gln Tyr Pro Glu Glu Arg Val
20 25 30

Leu Leu Asp Leu His Cys Phe Asn Gly Tyr His Lys His Arg Gly Phe
35 40 45

Glu Ile Asp Ser Val Phe Gly Val Thr Tyr Glu Lys Ala Thr Leu Lys
50 55 60

Glu Val Ala Ser Leu Ala Tyr Pro Tyr Pro Asn Tyr Gln Cys Trp Arg
65 70 75 80

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

Pro Asn Phe Thr Leu Glu Pro Ser Ala Leu Ser Leu Pro Asp Ser Thr
100 105 110

Tyr Tyr Asp Gly Tyr Trp Gln His Glu Glu Tyr Phe Met His Ile Arg
115 120 125

Glu Glu Ile Leu Ser Thr Tyr Ala Phe Pro Ala Phe Asp Asp Glu Arg
130 135 140

```
Asn Lys Thr Thr Ala Gln Leu Ala Ala Ser Thr Asn Ser Cys Ser Ile
145                 150                 155                 160

His Ile Arg Arg Gly Asp Tyr Leu Thr Asp Pro Leu Arg Lys Gly Thr
                165                 170                 175

Thr Asn Gly Asn Tyr Val Ile Ala Ala Ile Lys Glu Met Gln Gln Glu
            180                 185                 190

Val Lys Pro Glu Lys Trp Leu Val Phe Ser Asp Asp Ile Ala Trp Cys
        195                 200                 205

Gln Gln His Leu Ala Ser Thr Leu Asp Ala Thr Asn Thr Ile Tyr Ile
    210                 215                 220

Asp Trp Asn Thr Gly Ala Asn Ser Ile His Asp Met His Leu Met Ala
225                 230                 235                 240

Leu Cys Arg His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ala Trp Leu Ser Gln Gln Asp Gly Ile Thr Ile Ala Pro Ser Asn Trp
            260                 265                 270

Met Asn Leu Lys Asp Val Cys Ser Pro Val Pro Asp Asn Trp Ile Lys
        275                 280                 285

Ile
```

<210> 100
<211> 290
<212> PRT
<213> Prevotella salivae

<400> 100

```
Met Lys Ile Ile Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Ala Ile Ala Leu Gln Gln Gln Tyr Lys Asp Glu Glu Ile
            20                  25                  30

Arg Leu Asp Leu Asn Cys Phe Arg Gly Tyr Asn Lys His Gln Gly Tyr
        35                  40                  45

Leu Leu Asp Glu Ile Phe Gly Arg Arg Phe Arg Ala Ala Ser Leu Gln
    50                  55                  60

Glu Val Ala Arg Leu Ala Trp Pro Tyr Pro His Tyr Gln Leu Trp Arg
65                  70                  75                  80
```

```
Val Gly Ser Arg Val Leu Pro Arg Arg Gln Thr Met Val Cys Glu Pro
                85                  90                  95

Ala Asp Gly Ser Phe Ser Pro Asp Val Leu Thr Leu Glu Gly Asn Arg
            100                 105                 110

Tyr Tyr Asp Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Lys Ala Tyr Arg
        115                 120                 125

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

Asn Arg His Val Glu Asn Met Leu Arg Asn Glu Arg Phe Ala Ser Leu
145                 150                 155                 160

His Val Arg Arg Gly Asp Tyr Leu Asn Asp Ala Leu Tyr Gln Asn Thr
                165                 170                 175

Cys Gly Ile Asp Tyr Tyr Gln Arg Ala Ile Ser Gln Met Asn Ala Met
            180                 185                 190

Ala Asn Pro Ser Cys Tyr Phe Ile Phe Ser Asp Asp Ile Ala Trp Cys
        195                 200                 205

Lys Thr His Ile Glu Pro Leu Cys Glu Gly His Arg Pro Tyr Tyr Ile
    210                 215                 220

Asp Trp Asn Lys Gly Lys Glu Ala Tyr Arg Asp Met Gln Leu Met Ala
225                 230                 235                 240

Leu Cys Lys Tyr His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ala Trp Leu Asn Asp Ala Glu Asp Gly Ile Thr Ile Ala Pro Gln Gln
            260                 265                 270

Trp Tyr Ser His Gly Asn Lys Pro Ser Pro Ala Ser Glu Ser Trp Ile
        275                 280                 285

Lys Val
    290
```

<210> 101
<211> 293
<212> PRT
<213> Lachnospiraceae bacterium COE1

<400> 101

```
Met Asn Ile Val Arg Ile Ser Asp Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15
```

```
Tyr Ala Tyr Ala Arg Lys Ile Ser Ile Leu Ser Arg Gln Arg Thr Tyr
            20                  25                  30

Leu Asp Ile Arg Phe Ile Asn Asn Glu Asp Leu Val Lys Lys Gly Asn
        35                  40                  45

His Val Gln Phe Arg Lys Lys Leu Gly His Arg Lys Tyr Gly Leu Ser
    50                  55                  60

His Phe Asn Val Ser Leu Gln Ile Ala Asp Leu Lys Met Leu Ser His
65                  70                  75                  80

Trp Glu Tyr Leu Ile Gln Ser Asn Cys Met Gln Gln Leu Ile Tyr Ser
                85                  90                  95

Leu Ser Met Gln Asp Lys Trp Ile Trp Arg Tyr Arg His Glu Glu Val
            100                 105                 110

Asn Tyr Asp Gly Met Leu Ser Lys Val Glu Leu Leu Phe Pro Thr Tyr
        115                 120                 125

Tyr Gln Gly Tyr Phe Phe Ala Leu Lys Tyr Tyr Asp Asp Ile Lys His
    130                 135                 140

Ile Leu Gln His Asp Phe Ser Leu Lys Asp Lys Met Lys Leu Leu Pro
145                 150                 155                 160

Glu Leu Arg Asp Ala Leu Tyr Asn Arg Asn Thr Ile Ser Leu His Val
                165                 170                 175

Arg Arg Gly Asp Phe Leu Glu Ile Asn Arg Asp Ile Ser Gly Ser Glu
            180                 185                 190

Tyr Tyr Glu Lys Ala Val Gln Met Ile Gly Ser Lys Val Glu Ser Pro
        195                 200                 205

Ile Phe Leu Ile Phe Ser Asp Asp Ile Glu Trp Val Lys Glu His Ile
    210                 215                 220

Arg Ile Pro Asn Asp Lys Ile Tyr Val Ser Gly Ile Gly Tyr Glu Asp
225                 230                 235                 240

Tyr Glu Glu Leu Thr Ile Met Lys His Cys Lys His Asn Ile Ile Ala
                245                 250                 255

Asn Ser Thr Phe Ser Tyr Trp Ala Ala Tyr Leu Asn Ser Asn Lys Asp
            260                 265                 270

Lys Ile Val Ile Cys Pro Lys His Trp Arg Glu Arg Ile Ile Pro Lys
        275                 280                 285
```

Asp Trp Ile Cys Ile
290

<210> 102
<211> 300
<212> PRT
<213> Bacteroides dorei

<400> 102

Met Ile Val Val Asn Val Asn Ala Gly Leu Ala Asn Gln Met Phe His
1 5 10 15

Tyr Ala Phe Gly Arg Gly Leu Glu Ala Lys Gly Trp Asn Ile Tyr Phe
20 25 30

Asp Gln Thr Asn Phe Lys Pro Arg Lys Glu Trp Ser Phe Glu Asn Val
35 40 45

Gln Leu Gln Asp Ala Phe Pro Asn Leu Gly Leu Lys Met Met Pro Glu
50 55 60

Gly Lys Phe Lys Trp Ile Cys Val Asn Asn Thr Asn Lys Leu Ser Lys
65 70 75 80

Gly Leu His Leu Ala Met Ile Asn Leu His Asn Leu Ile Gly Asp Glu
85 90 95

Lys Tyr Ile Phe Glu Thr Thr Tyr Gly Tyr Asp Pro Asp Ile Glu Lys
100 105 110

Glu Ile Thr Lys Asn Cys Ile Leu Lys Gly Phe Trp Gln Ser Glu Lys
115 120 125

Tyr Phe Ala His Cys Lys Asp Asp Ile Arg Lys Gln Phe Ser Phe Leu
130 135 140

Pro Phe Asp Glu Glu Lys Asn Ile Val Ile Met Asn Lys Met Val Lys
145 150 155 160

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

Ser Glu Leu Met Gly Lys Gly Leu Cys Gly Val Glu Tyr Tyr Ile Lys
180 185 190

Ala Ile Glu Tyr Ile Lys Lys Asn Ile Asp Asn Pro Val Phe Tyr Val
195 200 205

Phe Thr Asp Asn Pro Val Trp Val Lys Asn Asn Leu Pro Lys Phe Asp
210 215 220

Tyr Ile Leu Val Asp Trp Asn Glu Val Ala Gly Lys Lys Asn Phe Arg

225 230 235 240

Asp Met Gln Leu Met Ser Cys Ala Lys His Asn Ile Ile Ala Asn Ser
245 250 255

Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn Pro Asn Pro Asn Lys Ile
260 265 270

Val Ile Gly Pro Ala Lys Phe Phe Asn Pro Ile Asn Asn Phe Phe Ser
275 280 285

Ser Ser Asp Ile Met Cys Glu Asp Trp Val Lys Ile
290 295 300

<210> 103
<211> 288
<212> PRT
<213> Roseobacter sp. SK209-2-6

<400> 103

Met Leu Ser Lys Asp Pro Gly Met Ile Thr Thr Arg Leu His Gly Arg
1 5 10 15

Leu Gly Asn Gln Met Phe Gln Tyr Ala Ala Gly Arg Ala Leu Ala Ala
20 25 30

Arg Leu Gly Val Pro Leu Ala Leu Asp Ser Arg Gly Ala Lys Leu Arg
35 40 45

Gly Glu Gly Val Leu Thr Arg Val Phe Asp Leu Pro Leu Ala Gln Pro
50 55 60

Leu Ser Leu Pro Pro Leu Lys Gln Asp Ala Pro Leu Arg Tyr Ala Ala
65 70 75 80

Trp Arg Leu Thr Gly Arg Thr Pro Arg Phe Arg Arg Glu Gln Gly Leu
85 90 95

Gly Tyr Asn Pro Ala Phe Glu Thr Trp Gly Asp Asp Ser Tyr Leu His
100 105 110

Gly Tyr Trp Gln Ser Glu Ala Tyr Phe Asp Ser Ile Ala Asp Gln Ile
115 120 125

Arg Gln Asp Phe Thr Phe Pro Glu Phe Ser Asn Ser Gln Asn Arg Glu
130 135 140

Met Ala Gln Arg Ile Ala Gly Ser Thr Ala Ile Ser Leu His Val Arg
145 150 155 160

Arg Gly Asp Tyr Val Ala Leu Ala Ala His Val Leu Cys Asp Gln Ala
165 170 175

```
Tyr Tyr Glu Ala Ala Leu Thr Arg Ile Leu Glu Gly Val Glu Gly Ser
            180                 185                 190

Pro Thr Val Tyr Val Phe Ser Asp Asp Pro Asn Trp Ala Lys Glu Asn
        195                 200                 205

Leu Pro Leu Pro Cys Glu Lys Val Val Val Asp Phe Asn Gly Pro Asp
    210                 215                 220

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

Ile Gly Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Thr His
                245                 250                 255

Asn Glu Lys Arg Val Ala Gly Pro Ala His Trp Phe Gly Asn Pro Lys
            260                 265                 270

Leu Gln Asn Pro Asp Ile Leu Pro Glu Ser Trp Leu Lys Ile Ser Val
        275                 280                 285


<210>  104
<211>  285
<212>  PRT
<213>  alpha proteobacterium SCGC AAA076-C03

<400>  104

Met Ile Tyr Ser Arg Ile Arg Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Cys Val Ala Arg Ser Leu Ala Asp Asn Leu Gly Thr Ser Leu Gly
            20                  25                  30

Leu Asp Val Arg Asp Phe Asn Glu Asn Ser Pro Tyr Leu Met Gly Leu
        35                  40                  45

Lys His Phe Asn Ile Arg Ala Asp Phe Asn Pro Pro Gly Met Ile Glu
    50                  55                  60

His Lys Lys Asn Gly Tyr Phe Arg Tyr Leu Ile Asp Val Val Asn Gly
65                  70                  75                  80

Lys Gln Lys Phe Val Tyr Lys Glu Pro His Leu Asn Phe Asp Lys Asn
                85                  90                  95

Ile Phe Ser Leu Pro Asn Ser Ser Tyr Leu Lys Gly Tyr Trp Gln Thr
            100                 105                 110

Glu Lys Tyr Phe Ile Lys Asn Lys Val Asn Ile Leu Asn Asp Leu Lys
        115                 120                 125
```

```
Ile Ile Ser His Gln Ser Asp Lys Asn Lys Thr Ile Ser Ser Lys Ile
    130                 135                 140

Ala Asn Asn Thr Ser Val Ser Leu His Ile Arg Arg Gly Asp Tyr Ile
145                 150                 155                 160

Ser Asn Ser Ala Tyr Asn Ser Thr His Gly Thr Cys Ser Leu Ala Tyr
                165                 170                 175

Tyr Thr Asn Ala Val Asn Phe Leu Val Asn Lys Ile Gly Gly Asn Phe
            180                 185                 190

Lys Val Phe Ala Phe Ser Asp Asp Pro Glu Trp Val Ser Ser Asn Leu
        195                 200                 205

Lys Leu Pro Val Asp Ile Cys Phe Val Lys Asn Asn Ser Ser Glu Tyr
    210                 215                 220

Asn Tyr Glu Asp Leu Arg Leu Met Ser Glu Cys Asn His Asn Ile Ile
225                 230                 235                 240

Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Thr Asn His
                245                 250                 255

Asn Lys Thr Val Ile Thr Pro Cys Lys Trp Tyr Ala Asp Asn Ser Thr
            260                 265                 270

Lys Asn Ala Asp Ile Thr Pro Ser Asn Trp Ile Lys Ile
        275                 280                 285


<210>  105
<211>  292
<212>  PRT
<213>  Helicobacter bilis

<400>  105

Met Gly Gly Gly Gly Gln Asp Leu Arg Leu Phe Glu Leu Met Leu Tyr
1               5                   10                  15

Asn Ile Ser Leu Pro Leu Cys Phe Asp Tyr Lys Thr Leu Val Lys Tyr
            20                  25                  30

Phe Tyr Ser Asn Asp Lys Ser Leu Lys Tyr Asn Phe Pro Leu Gln Tyr
        35                  40                  45

Ile Arg Tyr Ala Thr Arg Ser Lys Tyr His Lys Leu Tyr Trp Leu Ala
    50                  55                  60

Leu Lys His Tyr Lys Tyr Phe Tyr Asp Glu Asp Pro Gln Gly Asp Asn
65                  70                  75                  80
```

```
Ile Val Lys Met Tyr Leu Asn Asn Ser Leu Glu Lys His Ala Tyr Pro
                85                  90                  95

Phe Gly Tyr Phe Gln Asn Leu Ile Tyr Phe Asp Glu Ile Asp Ser Ile
            100                 105                 110

Ile Arg Glu Glu Phe Cys Leu Lys Ile Pro Leu Lys Pro His Asn Gln
        115                 120                 125

Ala Leu Lys Glu Lys Ile Glu Lys Thr Glu Asn Ser Val Phe Leu His
    130                 135                 140

Val Arg Leu Gly Asp Tyr Leu Lys Met Glu Ala Thr Asp Gly Gly Tyr
145                 150                 155                 160

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

Thr Arg Leu Gly Gln Pro His Ile Phe Ile Phe Ser Asn Asp Ile Glu
            180                 185                 190

Trp Cys Glu Lys Asn Leu Cys Asn Leu Leu Asp Phe Thr Gly Cys His
        195                 200                 205

Ile Glu Phe Val Lys Ala Asn Gly Glu Gly Asn Ala Ala Glu Glu Met
    210                 215                 220

Glu Leu Met Arg Ala Cys Lys His Ala Val Ile Ala Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Ala Ser Tyr Leu Ile Asp Asn Pro Asp Lys Gln Ile Ile
                245                 250                 255

Met Pro Thr Gln Val Phe Asn Asp Thr Arg Arg Ile Pro Lys Ser Asn
            260                 265                 270

Met Leu Ala Lys Lys Gly Tyr Ile Leu Ile Asp Pro Phe Trp Gly Met
        275                 280                 285

His Ser Ile Val
    290
```

<210> 106
<211> 288
<212> PRT
<213> Ralstonia sp. GA3-3

<400> 106

```
Met Ile Val Thr Arg Val Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Arg Ala Leu Ala Arg Arg Leu Gly Val Pro Leu Lys
```

20 25 30

Ile Asp Ser Ser Gly Phe Ala Asp Tyr Pro Leu His Asn Tyr Gly Leu
35 40 45

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

Ser Gly Arg Ala Glu Asn Arg Trp Ala Lys Ala Leu Arg Arg Phe Gly
65 70 75 80

Leu Gly Thr Glu Leu Arg Val Phe Arg Glu Arg Gly Phe Ala Val Asp
85 90 95

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

Gln Ser Glu Ser Tyr Phe Ala Glu Met Thr Gln Glu Leu Arg Arg Asp
115 120 125

Phe Gln Ile Ala Thr Pro Pro Thr Ser Glu Asn Ala Glu Trp Leu Ala
130 135 140

Arg Ile Gly Gly Asp Glu Gly Ala Val Ser Ile His Val Arg Arg Gly
145 150 155 160

Asp Tyr Val Thr Asn Ala Ser Ala Asn Ala Val His Gly Ile Cys Ser
165 170 175

Leu Asp Tyr Tyr Met Arg Ala Ala Arg Tyr Val Ala Glu Asn Ile Gly
180 185 190

Val Lys Pro Thr Phe Tyr Val Phe Ser Asp Asp Pro Asp Trp Val Ala
195 200 205

Gly Asn Leu His Leu Gly His Glu Thr Arg Tyr Val Arg His Asn Asp
210 215 220

Ser Ala Arg Asn Tyr Glu Asp Leu Arg Leu Met Ser Ala Cys Arg His
225 230 235 240

His Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn
245 250 255

Ala Ser Glu Lys Lys Val Val Ile Ala Pro Ala Gln Trp Phe Arg Asp
260 265 270

Glu Lys Tyr Asp Thr Arg Asp Leu Leu Pro Pro Thr Trp Thr Lys Leu
275 280 285

<210> 107

<211> 289
<212> PRT
<213> Bacteroides ovatus

<400> 107

Met Val Val Val Tyr Ile Ala Ala Gly Leu Ala Asn Lys Met Phe Gln
1 5 10 15

Tyr Ala Phe Ser Arg Gly Leu Met Ser His Gly Leu Asp Val Phe Leu
20 25 30

Asp Gln Thr Ser Phe Gln Pro Glu Trp Ser Phe Glu Asp Ile Ala Leu
35 40 45

Glu Glu Val Phe Pro Asn Ile Glu Ile Lys Asn Ala Pro Asn Asn Met
50 55 60

Phe Ser Leu Ala Tyr Lys Lys Asp Leu Leu Ser Arg Ile Tyr Arg Arg
65 70 75 80

Met Ser Ala Phe Phe Pro Asn Asn Arg Tyr Leu Met Glu Arg Pro Phe
85 90 95

Ile Tyr Asp Glu Leu Ile Tyr Lys Lys Ala Thr Asn Asn Cys Ile Phe
100 105 110

Cys Gly Leu Trp Gln Thr Glu Leu Tyr Phe Asn Phe Cys Glu Arg Asp
115 120 125

Val Arg Arg Asn Phe Val Phe Thr Pro Phe Gln Asp Asp Gln Asn Ile
130 135 140

Lys Leu Ala Glu Lys Met Lys Asn Glu Asn Ser Val Ala Ile His Ile
145 150 155 160

Arg Lys Gly Ala Asp Tyr Leu Lys Arg Asn Ile Trp Asp Gly Thr Cys
165 170 175

Ser Val Glu Tyr Tyr Asn Gln Ala Ile Asn Tyr Leu Lys Glu His Val
180 185 190

Ser Asn Pro Val Phe Tyr Leu Phe Thr Asp Asn Pro Glu Trp Val Glu
195 200 205

Glu Asn Leu Lys Asn Ile Asp Tyr Lys Leu Val Asp Trp Asn Pro Val
210 215 220

Ser Gly Lys Gln Ser Tyr Arg Asp Met Gln Leu Met Ser Cys Ala Lys
225 230 235 240

His Asn Ile Ile Ala Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu
245 250 255

```
Asn Asn Asn Pro Gln Lys Ile Val Val Ala Pro Lys Ile Trp Phe Asn
            260                 265                 270

Pro Lys Ile Glu Lys Ala Pro Tyr Ile Ile Pro Asp Arg Trp Ile Arg
        275                 280                 285

Leu
```

<210> 108
<211> 294
<212> PRT
<213> Loktanella vestfoldensis

<400> 108

```
Met Ile Ile Thr Lys Leu Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Arg Ser Leu Ala Met Arg His Gly Val Pro Leu Leu
            20                  25                  30

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

Phe Glu Asp Val Phe Ala Gly Arg Phe Glu Ile Ala Gly Leu Ile Pro
    50                  55                  60

Leu Ile Arg Val Leu Gly Arg Lys Ala Arg Lys Val Pro Lys Thr Val
65                  70                  75                  80

Ala Val Val Ser Pro Lys Trp Pro Pro Met Gly Asp His Val Trp Val
                85                  90                  95

Arg Gln Arg Thr His Asp Tyr Asp Ala Ala Phe Glu Ser Ile Gly Ala
            100                 105                 110

Asp Cys Tyr Leu Ser Gly Phe Trp Gln Ser Glu Lys Tyr Phe Ala Thr
        115                 120                 125

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

Gly Ala Asn Ala Ala Ile Ala Ser Arg Met Lys Glu Ala Pro Ser Ala
145                 150                 155                 160

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

Ala Phe His Gly Leu Cys Ala Trp Asp Tyr Tyr Asp Ala Ala Ile Asp
            180                 185                 190
```

```
His Ile Ser Arg His Glu Pro Asp Ala Arg Phe Phe Val Phe Ser Asp
        195                 200                 205

Asp Val Val Ala Ala Gln Glu Arg Phe Ala Asn Arg Gln Arg Ala Glu
    210                 215                 220

Val Val Ala Val Asn Ser Gly Arg His Ser Tyr Arg Asp Met Met Leu
225                 230                 235                 240

Met Ala Gln Cys Lys His Gln Ile Ile Ala Asn Ser Thr Phe Ser Trp
                245                 250                 255

Trp Ala Ala Trp Leu Asn Gln Asn Pro Asp Lys Ile Val Val Ala Pro
            260                 265                 270

Gly Thr Trp Phe Ser Gly Asn Asp Gly Gln Ile Lys Asp Ile Tyr Cys
        275                 280                 285

Lys Asp Trp Ile Val Ile
    290
```

<210> 109
<211> 292
<212> PRT
<213> Flavobacterium sp. ACAM 123

<400> 109

```
Met Asp Val Val Ile Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                   10                  15

Tyr Ala Phe Tyr Ser Gln Lys Lys Lys Ile Asn Asn Ser Thr Tyr Phe
            20                  25                  30

Val Pro Phe Cys Lys Asp His Asn Gly Leu Glu Leu Glu Thr Val Phe
        35                  40                  45

Ser Leu Asn Thr Lys Glu Thr Leu Ile Gln Lys Ser Leu Tyr Ile Leu
    50                  55                  60

Phe Arg Ile Leu Leu Thr Asp Arg Leu Lys Ile Val Ser Asp Pro Leu
65                  70                  75                  80

Lys Trp Ile Leu Asn Leu Phe Lys Cys Lys Ile Val Lys Glu Ser Phe
                85                  90                  95

Asn Tyr Asn Tyr Asn Pro Glu Tyr Leu Lys Pro Ser Lys Gly Ile Thr
            100                 105                 110

Phe Tyr Tyr Gly Gly Trp His Ala Glu Lys Tyr Phe Ala Lys Glu Asn
        115                 120                 125
```

```
Gln Gln Ile Lys Ser Val Phe Glu Phe Thr Gly Asp Leu Gly Lys Ile
    130                 135                 140

Asn Lys Glu His Val Lys Asp Ile Ala Ser Thr Asn Ala Val Ser Leu
145                 150                 155                 160

His Val Arg Arg Gly Asp Phe Met Asn Glu Ala Asn Ile Gly Leu Phe
                165                 170                 175

Gly Gly Val Ser Thr Lys Ala Tyr Phe Glu Gly Ala Ile Lys Leu Ile
            180                 185                 190

Ala Thr Lys Val Asp His Pro His Phe Phe Val Phe Ser Asn Asp Met
        195                 200                 205

Asp Trp Val Lys Glu Asn Leu Ser Met Asp Thr Val Thr Tyr Val Thr
    210                 215                 220

Cys Asn Ser Gly Lys Asp Ser Trp Lys Asp Met Cys Leu Met Ser Leu
225                 230                 235                 240

Cys Gln His Asn Ile Ile Pro Asn Ser Thr Phe Ser Trp Trp Gly Ala
                245                 250                 255

Trp Leu Asn Lys Asn Pro His Lys Ile Val Val Cys Pro Ser Arg Phe
            260                 265                 270

Leu Asn Asn Asp Thr Tyr Thr Asp Ile Tyr Pro Asp Ser Trp Val Lys
        275                 280                 285

Ile Ser Asp Tyr
    290
```

<210> 110
<211> 283
<212> PRT
<213> Bacteroides fragilis

<400> 110

```
Met Met Lys Leu Val Arg Met Thr Gly Gly Leu Gly Asn Gln Met Phe
1               5                   10                  15

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

Ile Asp Met Ser Glu Met Lys Lys Tyr Lys Leu His Asn Gly Tyr Glu
        35                  40                  45

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

Trp Leu Lys Arg Val Ile Val Tyr Ala Phe Phe Ser Ile Ile Arg Glu
```

65 70 75 80

Lys Ser Glu Glu Glu Leu Ser Ile His Lys Tyr Thr Gln His Lys Arg
85 90 95

Trp Pro Leu Val Tyr Tyr Lys Gly Phe Phe Gln Ser Glu Leu Phe Phe
100 105 110

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

Asn Ala Asn Phe Arg Thr Lys Glu Trp Ala Lys Ile Ile Lys Glu Gln
130 135 140

Arg Ser Ser Val Ser Ile His Ile Arg Arg Gly Asp Tyr Thr Ser Ala
145 150 155 160

Lys Asn Lys Ile Lys Tyr Gly Asn Ile Cys Thr Glu Glu Tyr Tyr Gln
165 170 175

Lys Ala Ile Ser Ile Ile Leu Lys Lys Glu Pro Lys Ala Phe Phe His
180 185 190

Ile Phe Ser Asp Asp Val Glu Trp Thr Lys Ala His Leu Lys Ile His
195 200 205

His Leu Pro His Gln Tyr Ile Ser Trp Asn Lys Gly Pro Asp Ser Trp
210 215 220

Gln Asp Met Met Leu Met Ser Leu Cys Arg His Asn Ile Ile Ala Asn
225 230 235 240

Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Ala Tyr Lys Asp Lys
245 250 255

Thr Val Ile Ala Pro Ser Arg Trp Ser Asn Val Lys Lys Thr Pro His
260 265 270

Ile Leu Pro Glu Ser Trp Ile Ser Ile Asp Ile
275 280

<210> 111
<211> 290
<212> PRT
<213> Spirosoma panaciterrae

<400> 111

Met Ile Ile Ser Arg Val Thr Ser Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

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

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

Ser Phe Lys Leu Gly Phe Phe Ser Val Pro Tyr Arg Ile Leu Gln Glu
    50                  55                  60

Ser Pro Val Glu Tyr Leu Ser Lys Ser Thr Lys Leu Phe Pro Asn Arg
65                  70                  75                  80

Ser Leu Arg Pro Phe Phe Leu Phe Leu Lys Glu Lys Gln Phe His Phe
                85                  90                  95

Asp Pro Thr Ile Leu Gln Ala His Ala Gly Cys Val Ile Met Glu Gly
            100                 105                 110

Phe Trp Gln Ser Glu Cys Tyr Phe Arg Asp His Ala Glu Ile Ile Arg
        115                 120                 125

Arg Glu Leu Gln Leu Ser Lys Ser Pro Ser Ser Glu Phe Glu Gly Tyr
    130                 135                 140

His Gln Gln Ile Gln Ala Thr Pro Val Pro Val Ser Val His Val Arg
145                 150                 155                 160

Arg Gly Asp Tyr Val Asn His Pro Glu Phe Ser Lys Thr Phe Gly Phe
                165                 170                 175

Ile Gly Leu Asp Tyr Tyr Lys Thr Ala Ile Arg His Leu Thr Lys Thr
            180                 185                 190

Ile Lys Asn Pro His Phe Tyr Val Phe Ser Asp Asp Lys Glu Trp Ala
        195                 200                 205

Arg Ala Asn Leu Pro Leu Pro Thr Asp Ser Val Phe Val Thr Asn Thr
    210                 215                 220

Gly Pro Ser Gly Asp Val Ala Asp Leu Val Leu Met Ser Thr Cys His
225                 230                 235                 240

His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu
                245                 250                 255

Asn Pro Asn Pro Asp Lys Leu Val Ile Thr Pro Lys Leu Trp Tyr Lys
            260                 265                 270

Asn Gln Pro Thr Trp Asn Thr Lys Asp Leu Leu Pro Pro Thr Trp Val
        275                 280                 285

Ser Leu
    290
```

<210> 112
<211> 288
<212> PRT
<213> Unknown

<220>
<223> uncultured bacterium

<400> 112

```
Met Ile Ile Thr Lys Leu Thr Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Ile Gly Arg Asn Leu Ile Tyr Ile Asn Gly Ser Asp Leu Lys
            20                  25                  30

Leu Asp Val Ser Glu Tyr Asp Val Ser Asn Lys Gly Asn Phe Arg His
        35                  40                  45

Tyr Ala Leu Asp Lys Phe Asn Thr Ile Gln Asn Phe Ala Ser Lys Lys
    50                  55                  60

Glu Thr Asn Asn Phe Lys Phe Gly Val Phe Lys Lys Trp Leu Tyr Lys
65                  70                  75                  80

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

Phe Asp Lys Glu Ile Leu Lys Ile Lys Asp Asn Ala Phe Leu Gln Gly
            100                 105                 110

Tyr Trp Gln Ser Glu Lys Tyr Phe Ile Gly Ile Arg Asp Ile Leu Leu
        115                 120                 125

Gln Glu Phe Ser Leu Lys Glu Asn Ile Glu Leu Lys Phe Gly Glu Ile
    130                 135                 140

Leu Lys Glu Ile Asn Glu Ser Asn Ser Val Ser Ile His Val Arg Arg
145                 150                 155                 160

Gly Asp Tyr Val Lys Asn Pro Lys Asn Leu Ser Phe His Gly Val Cys
                165                 170                 175

Ser Pro Lys Tyr Tyr Ser Glu Ser Thr Ser Lys Ile Ala Ser Leu Ile
            180                 185                 190

Glu Lys Pro Val Phe Phe Val Phe Ser Asp Asp Ile Glu Trp Val Lys
        195                 200                 205

Glu Asn Leu Asn Ile Thr Phe Pro Val Val Tyr Leu Ser Gly Ile Lys
    210                 215                 220
```

```
Asn Ile Lys Ser Tyr Glu Glu Leu Val Leu Met Ser Lys Cys Lys His
225                 230                 235                 240

Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn
                245                 250                 255

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

Val Lys Leu Asp Thr Thr Asp Leu Ile Pro Glu Asn Trp Ile Arg Ile
        275                 280                 285
```

<210> 113
<211> 293
<212> PRT
<213> Thermosynechococcus elongatus

<400> 113

```
Met Ile Ile Val His Leu Cys Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Leu Ala Ala Ala His Arg Ile Gly Ser Glu Val Lys
            20                  25                  30

Phe Asp Thr His Trp Phe Asp Ala Thr Cys Leu His Gln Gly Leu Glu
        35                  40                  45

Leu Arg Arg Val Phe Gly Leu Glu Leu Pro Glu Pro Ser Ser Lys Asp
    50                  55                  60

Leu Arg Lys Val Leu Gly Ala Cys Val His Pro Ala Val Arg Arg Leu
65                  70                  75                  80

Leu Ala Gly His Phe Leu His Gly Leu Arg Pro Lys Ser Leu Val Ile
                85                  90                  95

Gln Pro His Phe His Tyr Trp Thr Gly Phe Glu His Leu Pro Asp Asn
            100                 105                 110

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

Ala Asp Ile Ile Arg Gln Gln Phe Arg Phe Val Glu Pro Leu Asp Pro
    130                 135                 140

His Asn Ala Ala Leu Met Asp Glu Met Gln Ser Gly Val Ser Val Ser
145                 150                 155                 160

Leu His Ile Arg Arg Gly Asp Tyr Phe Asn Asn Pro Gln Met Arg Arg
                165                 170                 175

Val His Gly Val Asp Leu Ser Glu Tyr Tyr Pro Ala Ala Val Ala Thr
```

180 185 190

Met Ile Glu Lys Thr Asn Ala Glu Arg Phe Tyr Val Phe Ser Asp Asp
195 200 205

Pro Gln Trp Val Leu Glu His Leu Lys Leu Pro Val Ser Tyr Thr Val
210 215 220

Val Asp His Asn Arg Gly Ala Ala Ser Tyr Arg Asp Met Gln Leu Met
225 230 235 240

Ser Ala Cys Arg His His Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp
245 250 255

Gly Ala Trp Leu Asn Pro Arg Pro Asp Lys Val Val Ile Ala Pro Arg
260 265 270

His Trp Phe Asn Val Asp Val Phe Asp Thr Arg Asp Leu Tyr Cys Pro
275 280 285

Gly Trp Ile Val Leu
290

<210> 114
<211> 293
<212> PRT
<213> Colwellia piezophila

<400> 114

Met Lys Ile Val Lys Ile Ala Gly Gly Phe Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Phe Tyr Leu Ala Leu Asp Lys Lys Tyr Ala Glu Gln Val Cys
20 25 30

Leu Asp Ser Leu Asp Met Ala Lys Tyr Arg Leu His Asn Gly Tyr Glu
35 40 45

Leu Glu Gly Ile Phe Lys Leu Asp Ala Arg Tyr Cys Thr Glu Glu Gln
50 55 60

Arg Ile Ile Val Arg Lys Asp Asn Asn Ile Phe Thr Lys Leu Leu Ser
65 70 75 80

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

Lys Gln Glu His Phe Thr Phe His Glu Lys Ser Phe Gly Gln Ala Asn
100 105 110

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

```
Asn Ile Glu Glu Glu Leu Lys Ser Ser Leu Val Phe Pro Glu Phe Glu
    130                 135                 140

Leu Gly Lys Asn Ile Glu Leu Ala Asn Phe Ile Ser Ser Asn Ser Ser
145                 150                 155                 160

Val Ser Leu His Val Arg Arg Gly Asp Tyr Val Gln His Lys Ala Phe
                165                 170                 175

Gly Gly Ile Cys Asp Leu Ser Tyr Tyr Gln Arg Ala Val Glu Gln Ile
            180                 185                 190

Asn Thr Leu Val Lys Asp Pro Ile Phe Ile Val Phe Ser Asp Asp Ile
        195                 200                 205

Gln Trp Cys Lys Asp Asn Leu Asn Leu Glu Lys Ala Lys Phe Val Asp
    210                 215                 220

Trp Asn Ile Gly Glu Asn Ser Phe Arg Asp Met Gln Leu Met Thr Leu
225                 230                 235                 240

Cys Lys His Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
                245                 250                 255

Trp Leu Asn Ala Asn Asp Asp Lys Asn Val Ile Cys Pro Asp Lys Trp
            260                 265                 270

Val His Tyr Thr Ser Ala Thr Gly Val Leu Pro Ser Glu Trp Ile Lys
        275                 280                 285

Ile Lys Ala Ser Val
    290
```

<210> 115
<211> 289
<212> PRT
<213> Prevotella maculosa

<400> 115

```
Met Lys Ile Val Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

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

Lys Leu Asp Leu His Gly Phe Asn Gly Tyr His Lys His Gln Gly Tyr
        35                  40                  45

Gln Leu Asp Met Leu Phe Gly His Arg Phe Glu Ala Ala Thr Leu Thr
    50                  55                  60
```

```
Asp Val Ala Gln Leu Ala Trp Pro Tyr Pro His Tyr Gln Leu Trp Arg
65                  70                  75                  80

Val Gly Ser Arg Leu Leu Pro Lys Arg Arg Ser Met Leu Cys Glu Pro
                85                  90                  95

Ser Lys Gly Leu Leu Pro Ser Asp Val Leu Lys Gln Lys Gly Ser Leu
            100                 105                 110

Tyr Tyr Asp Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Arg Ala Ile Arg
        115                 120                 125

Pro Gln Ile Met Ala Ala Phe Lys Phe Pro Asp Phe Thr Asp Arg Arg
    130                 135                 140

Asn Leu Glu Thr Glu Lys Arg Leu Lys Ala Ser Glu Ala Val Ser Ile
145                 150                 155                 160

His Val Arg Arg Gly Asp Tyr Leu Asp Asp Val Leu Phe Gln Gly Thr
                165                 170                 175

Cys Asn Ile Ala Tyr Tyr Gln Arg Ala Ile Ala Arg Leu Cys Gln Leu
            180                 185                 190

Lys Thr Pro Val Phe Cys Ile Phe Ser Asn Asp Met Ala Trp Cys Lys
        195                 200                 205

Val His Ile Glu Pro Leu Leu His Gly Lys Glu Ile Leu Tyr Val Asp
    210                 215                 220

Trp Asn Arg Gly Lys Glu Ser Tyr Arg Asp Leu Gln Leu Met Thr Leu
225                 230                 235                 240

Cys Arg His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
                245                 250                 255

Trp Leu Ser Lys Ala Glu Asp Gly Ile Thr Ile Ala Pro Arg His Trp
            260                 265                 270

Tyr Ala His Asp Ala Lys Pro Ser Pro Ala Ala Glu Arg Trp Ile Lys
        275                 280                 285

Val
```

<210> 116
<211> 298
<212> PRT
<213> Salmonella enterica

<400> 116

```
Met Tyr Ser Cys Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr
1               5                  10                  15

Ala Ala Ala Tyr Ile Leu Lys Gln Tyr Phe Gln Ser Thr Thr Leu Val
            20                  25                  30

Leu Asp Asp Ser Tyr Tyr Tyr Ser Gln Pro Lys Arg Asp Thr Val Arg
        35                  40                  45

Ser Leu Glu Leu Asn Gln Phe Asn Ile Ser Tyr Asp Arg Phe Ser Phe
    50                  55                  60

Ala Asp Glu Lys Glu Lys Ile Lys Leu Leu Arg Lys Phe Lys Arg Asn
65                  70                  75                  80

Pro Phe Pro Lys Gln Ile Ser Glu Ile Leu Ser Ile Ala Leu Phe Gly
                85                  90                  95

Lys Tyr Ala Leu Ser Asp Arg Ala Phe Tyr Thr Phe Glu Thr Ile Lys
            100                 105                 110

Asn Ile Asp Lys Ala Cys Leu Phe Ser Phe Tyr Gln Asp Ala Asp Leu
        115                 120                 125

Leu Asn Lys His Lys Gln Leu Ile Leu Pro Leu Phe Glu Leu Arg Asp
    130                 135                 140

Asp Leu Leu Asp Ile Cys Lys Asn Leu Glu Leu Tyr Ser Leu Ile Gln
145                 150                 155                 160

Arg Ser Asn Asn Thr Thr Ala Leu His Ile Arg Arg Gly Asp Tyr Val
                165                 170                 175

Thr Asn Gln His Ala Ala Lys Tyr His Gly Val Leu Asp Ile Ser Tyr
            180                 185                 190

Tyr Asn His Ala Met Glu Tyr Val Glu Arg Glu Arg Gly Lys Gln Asn
        195                 200                 205

Phe Ile Ile Phe Ser Asp Asp Val Arg Trp Ala Gln Lys Ala Phe Leu
    210                 215                 220

Glu Asn Asp Asn Cys Tyr Val Ile Asn Asn Ser Asp Tyr Asp Phe Ser
225                 230                 235                 240

Ala Ile Asp Met Tyr Leu Met Ser Leu Cys Lys Asn Asn Ile Ile Ala
                245                 250                 255

Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn Lys Tyr Glu Asp
            260                 265                 270
```

Lys Leu Val Ile Ser Pro Lys Gln Trp Phe Leu Gly Asn Asn Glu Thr
275 280 285

Ser Leu Arg Asn Ala Ser Trp Ile Thr Leu
290 295

<210> 117
<211> 279
<212> PRT
<213> Bacteroides sp. 3_2_5

<400> 117

Met Lys Lys Val Ile Phe Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Phe Tyr Leu Phe Leu Lys Lys Lys Gly Ile Lys Ala Val Ile
20 25 30

Asp Asn Ser Leu Tyr Ser Glu Phe Lys Met His Asn Gly Phe Glu Leu
35 40 45

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

Lys Val His Leu Ile Phe Ile Lys Leu Leu Met Lys Ile Pro Pro Val
65 70 75 80

Arg Lys Leu Ser Cys Lys Asp Asp Val Ile Pro Ile Gly Asp His Glu
85 90 95

Phe Asp Pro Pro Tyr Ala Arg Phe Tyr Leu Gly Tyr Trp Gln Ser Lys
100 105 110

Lys Ile Val Asn Tyr Val Ile Glu Glu Leu Arg Ala Gln Phe Ile Phe
115 120 125

Arg Asn Ile Pro Gln Met Thr Ile Glu Lys Gly Asp Phe Leu Ser Ser
130 135 140

Ile Asn Ser Val Ser Ile His Ile Arg Arg Gly Asp Tyr Met Gly Ile
145 150 155 160

Pro Ala Tyr Gln Gly Ile Cys Asn Glu Ile Tyr Tyr Glu Arg Ala Ile
165 170 175

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

Asn Asp Ser Ile Trp Ala Lys Leu Phe Leu Glu Lys Phe Asp Ile Asp
195 200 205

Met Glu Ile Ile Val Thr Pro Pro Ile Tyr Ser Tyr Trp Asp Met Tyr

210 215 220

Leu Met Ser Arg Cys Arg Asn His Ile Ile Ala Asn Ser Thr Phe Ser
225 230 235 240

Trp Trp Ala Ala Val Leu Asn Ile Asn Lys Asp Lys Ile Val Ile Ser
245 250 255

Pro Thr Ile Phe Lys Lys Asp Glu Cys Ile Asp Ile Ile Phe Asp Asp
260 265 270

Trp Val Lys Ile Ser Asn Ile
275

<210> 118
<211> 293
<212> PRT
<213> Clostridium sp. CAG:510

<400> 118

Met Ile Met Leu Gln Met Thr Gly Gly Met Gly Asn Gln Met Phe Thr
1 5 10 15

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

Glu Asp Phe Thr His Tyr Asp Thr Pro Glu Lys Asn Cys Leu Gln Thr
35 40 45

Val Phe His Leu Asp Tyr Arg Lys Ala Asp Arg Glu Val Tyr Gln Arg
50 55 60

Leu Thr Asp Ser Glu Pro Asp Phe Leu His Lys Val Lys Arg Lys Leu
65 70 75 80

Thr Gly Arg Lys Glu Lys Ile Tyr Gln Glu Lys Asp Ala Ile Ile Phe
85 90 95

Glu Pro Glu Val Phe Gln Thr Asp Asp Val Tyr Met Ile Gly Tyr Phe
100 105 110

Gln Ser Gly Arg Tyr Phe Glu Lys Ala Val Phe Asp Leu Arg Lys Asp
115 120 125

Phe Thr Phe Ala Trp Asn Thr Phe Pro Glu Lys Ala Lys Lys Leu Arg
130 135 140

Glu Gln Met Gln Ala Glu Ser Ser Val Ser Leu His Ile Arg Arg Gly
145 150 155 160

Asp Tyr Met Asn Gly Lys Phe Ala Ser Ile Tyr Gly Asn Ile Cys Thr
165 170 175

```
Asp Ala Tyr Tyr Glu Ala Ala Arg Arg Tyr Met Lys Glu His Phe Gly
            180                 185                 190

Asp Cys Arg Phe Tyr Leu Phe Thr Asp Asp Ala Glu Trp Gly Arg Gln
        195                 200                 205

Gln Glu Ser Glu Asp Thr Val Tyr Val Asp Ala Ser Glu Gly Ala Gly
    210                 215                 220

Ala Tyr Val Asp Met Ala Leu Met Ser Cys Cys Arg His His Ile Ile
225                 230                 235                 240

Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asp Glu Asn Pro
                245                 250                 255

Asp Lys Thr Val Ile Ala Pro Ala Lys Trp Leu Asn Ile Ser Glu Gly
            260                 265                 270

Lys Asp Ile Tyr Ala Gly Leu Cys Asn Cys Leu Ile Asp Ala Asn Gly
        275                 280                 285

Ser Val Gln Gly Glu
    290
```

<210> 119
<211> 311
<212> PRT
<213> Rhodopirellula europaea

<400> 119

```
Met Ile Val Thr Arg Leu Ile Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Phe Gly His Ser Leu Ala Arg Ser Thr Tyr Gln Thr Leu Leu
            20                  25                  30

Ile Asp Asp Ser Ala Phe Ile Asp Tyr Arg Leu His Pro Leu Ala Ile
        35                  40                  45

Asp His Phe Thr Ile Ser Ala Ser Arg Leu Ser Asp Ala Asp Arg Ser
    50                  55                  60

Arg Val Pro Gly Lys Phe Leu Arg Thr Pro Val Gly Arg Ala Leu Asp
65                  70                  75                  80

Lys Val Ser Arg Phe Val Pro Gly Tyr Gln Gly Val Leu Pro Val Arg
                85                  90                  95

Arg Glu Lys Pro Phe Gly Phe Arg Glu Ser Leu Leu Ala Arg Glu Ser
            100                 105                 110
```

```
Asp Leu Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Lys Phe Phe Pro Gly
        115                 120                 125

Leu Arg Gly Ser Leu Arg Glu Glu Phe Gln Leu Arg Glu Gln Pro Ser
    130                 135                 140

Glu Thr Thr Arg Arg Leu Ser Ala Gln Met Lys Ser Glu Asn Ser Val
145                 150                 155                 160

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

Gln Ile Tyr Arg Thr Leu Asp Ala Asp Tyr Tyr Arg Arg Cys Leu Leu
            180                 185                 190

Asp Leu Ala Ala His Glu Thr Asp Leu Lys Leu Tyr Leu Phe Ser Asn
        195                 200                 205

Asp Val Pro Trp Cys Glu Ser Asn Leu Asp Val Gly Ile Pro Phe Thr
    210                 215                 220

Pro Val Gln His Thr Asp Gly Ala Thr Ala His Glu Asp Leu His Leu
225                 230                 235                 240

Ile Ala Gln Cys Arg His Val Val Ile Ala Asn Ser Thr Phe Ser Trp
                245                 250                 255

Trp Gly Ala Tyr Leu Gly Gln Leu His Pro Thr Arg Arg Val Tyr Tyr
            260                 265                 270

Pro Glu Pro Trp Phe His Pro Gly Thr Leu Asp Gly Ser Ala Met Gly
        275                 280                 285

Cys Asp Asp Trp Ile Ser Glu Ala Ser Leu Glu Glu Gln Ser Ser Leu
    290                 295                 300

Lys Ser Ser Arg Arg Ala Ala
305                 310


<210>  120
<211>  297
<212>  PRT
<213>  Unknown

<220>
<223>  uncultured bacterium

<400>  120

Met Ile Ile Val Lys Leu Lys Gly Gly Met Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ile Gly Arg Asn Leu Ala Thr Lys Leu Gly Thr Gln Leu Arg
```

```
            20                  25                  30

Leu Asp Leu Thr Phe Leu Leu Asp Arg Ser Pro Arg Lys Asp Phe Val
        35                  40                  45

Phe Arg Asp Tyr Asp Leu Asp Ile Phe Ala Leu Asp Val Ala Phe Ala
    50                  55                  60

Gly Pro Thr Asp Leu Lys Pro Phe Thr Gln Phe Arg Ile Ser His Leu
65                  70                  75                  80

Thr Lys Ile Tyr Asn Ile Phe Pro Arg Leu Leu Gly Arg Pro Tyr Val
                85                  90                  95

Ile Ser Glu Pro His Phe His Phe Ser Glu Ala Ile Leu Lys Ser Ser
            100                 105                 110

Asp Asn Val Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Lys Tyr Phe Lys
        115                 120                 125

Glu Ile Glu Asn Ser Ile Arg Asp Asp Phe Lys Phe Arg Gln Pro Leu
    130                 135                 140

Glu Gly Arg Ala Ala Glu Met Ala Ala Gln Ile Lys Asn Glu Asp Arg
145                 150                 155                 160

Ala Val Cys Leu Asn Val Arg Arg Ala Asp Phe Val Thr Ser Lys Lys
                165                 170                 175

Ala Gln Glu Phe His Gly Phe Ile Gly Leu Asp Tyr Tyr Gln Lys Ala
            180                 185                 190

Val Asp Leu Leu Val Ser Lys Val Gly Pro Leu His Leu Phe Ile Phe
        195                 200                 205

Ser Asp Asp Val Asp Trp Cys Ala Ala Asn Leu Lys Phe Asn Tyr Pro
    210                 215                 220

Thr Thr Phe Val Thr Lys Asp Tyr Ser Gly Lys Lys Tyr Glu Ala Tyr
225                 230                 235                 240

Leu Gln Leu Met Thr Leu Cys Arg His Tyr Ile Ile Pro Asn Ser Thr
                245                 250                 255

Phe Ala Trp Trp Gly Ala Trp Leu Asn Ser Asp Pro Asn Lys Ile Val
            260                 265                 270

Ile Ala Pro Lys Gln Trp Phe Lys Glu Ala Ser Ile Asp Thr Thr Asp
        275                 280                 285

Ile Ile Pro Ser Thr Trp Ile Arg Leu
```

290 295

<210> 121
<211> 292
<212> PRT
<213> Bacillus cereus

<400> 121

Met Ile Ile Val Lys Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Gly Lys Ser Leu Ala Leu Tyr Tyr Asp Lys Pro Leu Lys
20 25 30

Ile Asp Ala Asp Tyr Ile Lys Asn Asn Glu Gly Tyr Val Pro Arg Asp
35 40 45

Phe Ser Leu Ser Lys Phe Asn Ile Glu Leu Asp Leu Tyr Gln Glu Ala
50 55 60

Asp Lys Glu Arg Val Gly Phe Ile Leu Lys Asn Asn Phe Leu Ala Lys
65 70 75 80

Lys Leu Arg Asn Tyr Phe Leu Lys Lys Gly Lys Tyr Lys Gly Lys Tyr
85 90 95

Ile Ile Glu Asn Pro Asp Asn Leu Gly Leu Phe Lys Lys Glu Leu Phe
100 105 110

Glu Asn His Asn Glu Ser Met Tyr Ile Asp Gly Tyr Trp Gln Ser Tyr
115 120 125

Leu Tyr Phe Asn Asn Ile Arg Glu Cys Leu Ile Lys Glu Phe Asn Leu
130 135 140

Lys Pro Glu Tyr Thr Lys Glu Met Thr Glu Ile Met Gln Arg Ile Asn
145 150 155 160

Glu Thr Asn Ser Val Ala Val His Ile Arg Arg Gly Asp Tyr Val Lys
165 170 175

Leu Gly Trp Thr Leu Asp Thr Thr Tyr Tyr Lys Lys Ala Ile Ala Glu
180 185 190

Ile Val Lys Asn Val Asp Asn Pro Lys Phe Tyr Val Phe Ser Asp Asp
195 200 205

Thr Asp Trp Val Arg Ser Asn Leu Gln Glu Leu Asp Asn Ala Val Phe
210 215 220

Ile Gly Glu Cys Asn Leu Phe Asp Tyr Gln Glu Leu Trp Leu Met Ser
225 230 235 240

Thr Cys Lys His Asn Ile Ile Ser Asn Ser Thr Phe Ser Trp Trp Gly
245 250 255

Ala Trp Leu Asn Gln Asn Asp His Gln Val Val Val Ser Pro Ser Ala
260 265 270

Trp Ile Asn Gly Met Ser Val Glu Thr Thr Ser Leu Ile Pro Asp Ser
275 280 285

Trp Lys Arg Val
290

<210> 122
<211> 302
<212> PRT
<213> Firmicutes bacterium CAG:95

<400> 122

Met Asp Ile Ile Arg Met Glu Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Arg Gln Leu Gln Phe Met Gly Arg Thr Val Lys Met
20 25 30

Asp Val Thr Thr Glu Tyr Gly Arg Glu His Asp Arg Gln Gln Met Leu
35 40 45

Trp Ala Phe Asp Val His Tyr Glu Glu Ala Thr Gln Glu Glu Ile Asn
50 55 60

Arg Leu Thr Asp Gly Phe Met Asp Leu Pro Ser Arg Ile Arg Arg Lys
65 70 75 80

Leu Thr Gly Arg Arg Thr Lys Lys Tyr Ala Glu Ala Asp Ser Asn Phe
85 90 95

Asp Pro Gln Val Leu Leu Lys Thr Pro Val Tyr Leu Thr Gly Tyr Phe
100 105 110

Gln Ser Glu Lys Tyr Phe Lys Asp Val Glu Gly Ile Leu His Thr Glu
115 120 125

Leu Gly Phe Ser Asp Arg Ile Tyr Asp Gly Ile Ser Glu Val Phe Ala
130 135 140

Asp Gln Ile Arg Asn Tyr Gln Lys Gln Ile Arg Glu Thr Glu Ser Val
145 150 155 160

Ser Leu His Val Arg Arg Gly Asp Tyr Leu Glu His Pro Glu Ile Tyr
165 170 175

```
Gly Met Ser Cys Thr Met Glu Tyr Tyr Gln Ala Gly Val Arg Tyr Ile
            180                 185                 190

Arg Glu Arg His Pro Asp Ala Glu Ile Phe Val Phe Thr Asn Asp Pro
        195                 200                 205

Val Phe Thr Glu Lys Trp Leu Gln Glu Asn Phe Leu Gly Asp Phe Thr
    210                 215                 220

Leu Ile Gln Gly Thr Ser Glu Glu Thr Gly Tyr Leu Asp Leu Met Leu
225                 230                 235                 240

Met Ser Gln Cys Lys His Gln Ile Met Ala Asn Ser Ser Phe Ser Trp
                245                 250                 255

Trp Gly Ala Trp Leu Asn Pro Asn Lys Asp Lys Ile Val Val Ala Pro
            260                 265                 270

Glu Pro Trp Phe Gly Asp Arg Asn Phe His Asp Ile Tyr Thr Glu Glu
        275                 280                 285

Met Ile Arg Ile Ser Pro Arg Gly Glu Val Lys Lys His Gly
    290                 295                 300
```

<210> 123
<211> 296
<212> PRT
<213> Prevotella oris

<400> 123

```
Met Ile Ala Ala Thr Leu Phe Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Thr Val Lys Ala Leu Ser Leu His Tyr Gln Val Pro Met Ala
            20                  25                  30

Phe Asn Leu Asn His Gly Phe Ala Asn Asp Tyr Lys Tyr His Arg Lys
        35                  40                  45

Leu Glu Leu Cys Lys Phe Asn Cys Gln Leu Pro Thr Ala Lys Trp Ile
    50                  55                  60

Thr Phe Asp Tyr Arg Gly Glu Leu Asn Ile Lys Arg Ile Ser Arg Arg
65                  70                  75                  80

Ile Gly Arg Asn Leu Leu Cys Pro Asn Tyr Gln Phe Val Ile Glu Glu
                85                  90                  95

Glu Pro Phe His Tyr Glu Lys Arg Leu Phe Glu Phe Thr Asn Lys Asn
            100                 105                 110
```

```
Ile Phe Leu Glu Gly Tyr Trp Gln Ser Pro Cys Tyr Phe Glu Asn Tyr
        115                 120                 125

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

Glu Met Leu Glu Glu Ile Tyr Ala Leu Lys Ala Thr Gly Lys Thr Leu
145                 150                 155                 160

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

Cys Thr Tyr Lys Leu Cys Asp Lys Glu Tyr Tyr Ile Lys Ala Ile Thr
            180                 185                 190

Tyr Ile Gln Glu Arg Ile Pro Asn Ala Leu Phe Val Val Phe Thr Gln
        195                 200                 205

Asp Lys Glu Trp Ala Thr Thr His Leu Pro Lys Gly Ala Glu Phe Tyr
    210                 215                 220

Phe Val Lys Asp Lys Gln Asp Glu Tyr Ala Thr Val Ala Asp Met Phe
225                 230                 235                 240

Leu Met Thr Gln Cys Thr His Ala Ile Ile Ser Asn Ser Thr Phe Tyr
                245                 250                 255

Trp Trp Gly Ala Trp Leu Gln Cys Thr Thr Lys Asn His Ile Val Ile
            260                 265                 270

Ala Pro Asp Ser Phe Ile Asn Ser Asp Cys Val Cys Lys Glu Trp Ile
        275                 280                 285

Ile Leu Lys Arg Asn Ser Leu Cys
    290                 295


<210>  124
<211>  302
<212>  PRT
<213>  Escherichia coli

<400>  124

Met Tyr Ser Cys Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr
1               5                   10                  15

Ala Ala Ala Tyr Ile Leu Gln Arg Lys Leu Lys Gln Arg Ser Leu Val
            20                  25                  30

Leu Asp Asp Ser Tyr Phe Leu Asp Cys Ser Asn Arg Asp Thr Arg Arg
        35                  40                  45

Arg Phe Glu Leu Asn Gln Phe Asn Ile Cys Tyr Asp Arg Leu Thr Thr
```

50 55 60

Ser Lys Glu Lys Lys Glu Ile Ser Ile Ile Arg His Val Asn Arg Tyr
65 70 75 80

Arg Leu Pro Leu Phe Val Thr Asn Ser Ile Phe Gly Val Leu Leu Lys
85 90 95

Lys Asn Tyr Leu Pro Glu Ala Lys Phe Tyr Glu Phe Leu Asn Asn Cys
100 105 110

Lys Leu Gln Val Lys Asn Gly Tyr Cys Leu Phe Ser Tyr Phe Gln Asp
115 120 125

Ala Thr Leu Ile Asp Ser His Arg Asp Met Ile Leu Pro Leu Phe Gln
130 135 140

Ile Asn Glu Asp Leu Leu His Leu Cys Asn Asp Leu His Ile Tyr Lys
145 150 155 160

Lys Val Ile Cys Glu Asn Ala Asn Thr Thr Ser Leu His Ile Arg Arg
165 170 175

Gly Asp Tyr Ile Thr Asn Pro His Ala Ser Lys Phe His Gly Val Leu
180 185 190

Pro Met Asp Tyr Tyr Glu Lys Ala Ile Arg Tyr Ile Glu Asp Val Gln
195 200 205

Gly Glu Gln Val Ile Ile Val Phe Ser Asp Asp Val Lys Trp Ala Glu
210 215 220

Asn Thr Phe Ala Asn Gln Pro Asn Tyr Tyr Val Val Asn Asn Ser Glu
225 230 235 240

Cys Glu Tyr Ser Ala Ile Asp Met Phe Leu Met Ser Lys Cys Lys Asn
245 250 255

Asn Ile Ile Ala Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn
260 265 270

Thr Phe Glu Asp Lys Ile Val Val Ser Pro Arg Lys Trp Phe Ala Gly
275 280 285

Asn Asn Lys Ser Lys Leu Thr Met Asp Ser Trp Ile Asn Leu
290 295 300

<210> 125
<211> 2102
<212> PRT
<213> Leeia oryzae

<400> 125

Met Ile Ile Val Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Met Gln
1 5 10 15

Tyr Ala Phe Ala His Ala Cys Ala Lys Arg Leu Gly Val Pro Phe Lys
20 25 30

Leu Asp Ile Thr Ala Phe Glu Ser Tyr Lys Leu Trp Pro Tyr Gly Leu
35 40 45

His Asn Phe Glu Ile Thr Ala Pro Ile Ala Ser Leu Glu Glu Ile Glu
50 55 60

His Ala Lys Ser Met Gly Val Ile Thr Glu Thr Ser Phe Arg Phe Asp
65 70 75 80

Asp Ser Leu Val Ser Ala Val Lys Asp Gly Met Tyr Leu Asp Gly Tyr
85 90 95

Trp Ala Asp Tyr Arg Tyr Ser Glu Ser Val Trp Gly Glu Leu Lys Pro
100 105 110

Val Phe Thr Leu Met Asp Pro Leu Thr Pro Glu Gln Gln Ala Leu Ala
115 120 125

Met Asn Leu Ser Ala Pro Asn Ala Val Ala Leu His Val Arg Arg Gly
130 135 140

Asp Tyr Val Thr Asn Pro Asn Cys Phe Leu Leu Pro Gln Gln Tyr Tyr
145 150 155 160

Arg Asp Ala Ile Lys Leu Val Leu Asp Gln Gln Pro Asp Ala Val Phe
165 170 175

Tyr Cys Phe Ser Asp Asp Pro Asp Trp Val Glu Ala His Leu Asp Ile
180 185 190

Pro Ala Pro Lys Val Val Val Arg Gly Gln Gly Ile Asp Asn Gly Phe
195 200 205

Val Asp Met Ile Leu Met Ser Lys Ala Arg His Arg Ile Val Ala Asn
210 215 220

Ser Thr Phe Ser Ile Trp Ala Ser Arg Leu Ala Asp Gln Asp Gly Leu
225 230 235 240

Thr Ile Val Pro Ser Gln Phe Phe Arg Lys Asp Asp Pro Trp Leu Leu
245 250 255

Gln Val Tyr Gly Glu Val Leu Gln Pro Cys Tyr Pro Pro Gln Trp Arg
260 265 270

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Val Val Asp Val Thr Gly Asp Gly Lys Lys Glu Ala Glu Asn Thr Ser
        275                 280                 285

Thr Ala Leu Leu Gln Ile Ala Gly Gly Asp Val Arg Gly Arg Lys Leu
    290                 295                 300

Arg Ile Gly Val Trp Gly Phe Tyr Glu Glu Phe Tyr Gln Asn Asn Tyr
305                 310                 315                 320

Ile Phe Leu Asn Lys Asn Ala Pro Ile Gly His Glu Leu Leu Lys Pro
                325                 330                 335

Phe Asn Gln Leu Tyr Gln Tyr Gly Gln Ala His Asn Leu Glu Phe Val
            340                 345                 350

Thr Leu Asp Leu Val Ala Asp Leu Ser Thr Leu Asp Ala Val Leu Phe
        355                 360                 365

Phe Asp Ala Pro Asn Met Arg Ser Pro Leu Val Ser Ser Val Met Gln
    370                 375                 380

Leu Asp Ile Lys Lys Tyr Leu Cys Leu Leu Glu Cys Glu Leu Ile Lys
385                 390                 395                 400

Pro Asp Asn Trp Gln Gln Ser Leu His Glu Leu Phe Thr Arg Ile Phe
                405                 410                 415

Thr Trp His Asp Gly Leu Val Asp Asn His Arg Tyr Ile Lys Val Asn
            420                 425                 430

Tyr Val Thr Asp Leu Met Pro Trp Ile Glu Ser Ala Gln Ser Leu Thr
        435                 440                 445

Ala Pro Phe Glu Glu Thr Ala Arg Lys Gly Tyr Leu Gln Lys Lys Leu
    450                 455                 460

Ile Cys Asn Ile Ser Gly Asn Lys Leu Val Ser His Pro Phe Glu Leu
465                 470                 475                 480

Tyr Ser Lys Arg Ile Glu Val Ile Arg Trp Phe Glu Ser His His Pro
                485                 490                 495

Glu His Phe Asp Leu Tyr Gly Met Gly Trp Ser Ala Ser Asp Tyr Pro
            500                 505                 510

Ser Tyr Lys Gly Lys Ile Asp Asp Lys Leu Glu Val Leu Lys Gly Tyr
        515                 520                 525

Arg Phe Ser Leu Cys Tyr Glu Asn Ala Lys Glu Leu Pro Gly Tyr Ile
    530                 535                 540
```

```
Thr Glu Lys Ile Ile Asp Cys Phe Lys Ala Gly Val Val Pro Val Tyr
545                 550                 555                 560

Ser Gly Ala Pro Asn Ile Ala Asp Trp Ile Pro Asp Asn Cys Phe Ile
                565                 570                 575

Asp Ser Gly Lys Phe Pro Asp Thr Asp Ala Leu Tyr Thr Tyr Leu Ile
            580                 585                 590

Ser Met Thr Glu Glu Val His Ala Asp Tyr Leu Glu Asn Ile Arg Gln
        595                 600                 605

Phe Phe Leu Gly Gly Lys Ala Tyr Pro Phe Ser Ala Asp Ala Phe Ile
    610                 615                 620

Asn Thr Ile Thr Arg Thr Ile Val Gln Asp Cys Leu Phe Pro His Glu
625                 630                 635                 640

Arg Thr Asp Val Ser Val Val Val Pro Asn Tyr Asn His Gly Asn Phe
                645                 650                 655

Val Val Ser Ala Ile Thr Ser Ala Leu Asn Gln Asn Val Ser Val Glu
            660                 665                 670

Leu Leu Val Leu Asp Asn Ala Ser Thr Asp Asp Ser Trp Ser Gln Leu
        675                 680                 685

Gln Phe Phe Ala Asp Tyr Pro Gln Val Arg Leu Ile Arg Asn Arg Trp
    690                 695                 700

Asn Ile Gly Val Gln His Asn Trp Asn His Ala Thr Trp Leu Ala Thr
705                 710                 715                 720

Gly Arg Tyr Val Val Met Leu Ser Ala Asp Asp Leu Leu Leu Pro Gly
                725                 730                 735

His Leu Glu Gln Ala Val Lys Arg Leu Asp Glu Asn Pro Ala Ser Ser
            740                 745                 750

Leu Tyr Tyr Thr Pro Cys Leu Trp Ile Asn Glu His Asp Gln Pro Leu
        755                 760                 765

Gly Thr Leu Asn His Pro Gly His Leu Glu Ser Asp Tyr Val Gly Gly
    770                 775                 780

Arg Asp Glu Ile Ser Asp Leu Leu Lys Phe Asp Ser Tyr Ile Thr Pro
785                 790                 795                 800

Ser Ala Ala Val Ile Arg Arg Glu Thr Leu Asn Arg Ile Gly Ser Met
                805                 810                 815
```

```
Asn Leu His Leu Lys Gly Ala Ile Asp Trp Asp Leu Trp Ile Arg Ile
            820                 825                 830

Ala Glu Ile Ser Pro Ala Phe Ile Phe Arg Lys Gln Pro Gly Val Cys
        835                 840                 845

Tyr Arg Gln His Ser Gly Asn Asn Ser Val Asp Phe Tyr Ala Ser Thr
    850                 855                 860

Ala Pro Leu Glu Asp His Ile Arg Ile Val Glu Ser Ile Ile Asp Arg
865                 870                 875                 880

Lys Val Ala Val Lys Tyr Leu Leu Lys Ala Lys Glu Glu Ile Ile Ala
                885                 890                 895

His Leu Asp Asn Arg Ala Ser Ser Tyr Pro Glu Asn Gln Ile Gln His
            900                 905                 910

Leu Leu Ser Arg Ile Asn Asn Ile Lys Asp Tyr Leu Arg Lys Gly Ala
        915                 920                 925

Gly Pro Val Ile Ser Val Ile Ile Pro Thr Lys Asn Arg Pro Gly Leu
    930                 935                 940

Leu Ala Asn Ala Leu Glu Ser Leu Thr Tyr Gln Thr Phe Lys Asp Phe
945                 950                 955                 960

Glu Val Val Ile His Asn Asp Gly Gly Cys Asp Ile Gly Gly Ile Val
                965                 970                 975

Asp Phe Phe Ser Asp Gln Leu Gln Ile Ser Tyr Val Arg Ser Ser Gln
            980                 985                 990

Ser Gly Gly Ala Ala Ala Ser Arg  Asn Arg Ala Leu Lys  Leu Ala Lys
        995                 1000                1005

Gly Arg  Ile Ile Ala Tyr Leu  Asp Asp Asp Asp Val  Tyr Leu Asp
    1010                1015                1020

Ser His  Leu Glu Lys Leu Val  Asp Ala Tyr Lys Gly  Arg Ser Glu
    1025                1030                1035

Lys Phe  Ile Tyr Thr Asn Cys  Glu Tyr Leu Ile Gln  Glu Arg Lys
    1040                1045                1050

Glu Gly  Arg Leu Ile Glu Leu  Gly Arg Glu Arg Arg  Tyr Ala Gly
    1055                1060                1065

Ile Ser  Tyr Ser Arg Ala Gln  Leu Leu Val Ser Asn  Phe Ile Pro
    1070                1075                1080
```

```
Thr Pro  Thr Trp Ser His Thr  Lys Glu Leu Ile Asp  Thr Ile Gly
    1085                1090                1095

Asp Phe  Asp Glu Ser Leu Glu  Ile Leu Glu Asp Trp  Asp Phe Leu
    1100                1105                1110

Leu Arg  Ala Ser Lys Val Thr  Glu Phe Tyr Gln Val  Asn Ala Thr
    1115                1120                1125

Thr Val  Glu Val Arg Ser Asp  Arg Ser Arg Asp Asp  His Thr Leu
    1130                1135                1140

Arg Ala  Asn Ala Asp Lys Leu  Leu Ala Tyr His Gln  Lys Ile Tyr
    1145                1150                1155

Ala Lys  His Pro Val Glu Asn  Glu Ser Ile Leu Ala  Asn Arg Gln
    1160                1165                1170

Ser Leu  Ile Asn Ser Leu Ser  Asn Arg Gln Asp Val  Thr Pro Lys
    1175                1180                1185

Asn Glu  Asn Ser Tyr Gln Gly  Trp Val Asn Ala Arg  Gln Pro Asn
    1190                1195                1200

Glu Leu  Ala Val Gln Ile Leu  Ala Glu Arg Met Met  Leu Gln Trp
    1205                1210                1215

Ser Lys  Gln Tyr Gln Phe Met  Ile Val Met Val Val  Lys Gln Ser
    1220                1225                1230

Gln Gln  Asn Leu Leu Ala Asn  Thr Ile Asp Ser Phe  Cys Gln Gln
    1235                1240                1245

Leu Tyr  Ser Gly Trp Lys Leu  Ile Val Ile Ser Asp  Phe Glu Ala
    1250                1255                1260

Pro Asp  Glu Ser Phe Ile Asn  Asn Glu Val Leu Gly  Trp Leu Thr
    1265                1270                1275

Leu Glu  Thr Val Glu Asp Glu  Asn Leu Leu Thr Gln  Ala Phe Asn
    1280                1285                1290

Gly Val  Leu Ala Glu Val Pro  Ser Asp Trp Val Thr  Ile Leu Pro
    1295                1300                1305

Val Gly  Thr Arg Leu Thr Ser  Thr Ala Leu Leu Lys  Val Gly Asp
    1310                1315                1320

Arg Leu  Leu Leu Asn Gly Gly  Ala Cys Val Ile Tyr  Thr Asp His
    1325                1330                1335
```

```
Asp Tyr  Val Ser Asp Asp Gly  Met Ile Lys Asp Pro  Val Leu Lys
    1340                 1345                 1350

Pro Ala  Phe Asn Leu Asp Met  Leu Arg Ser Gln Asp  Tyr Ile Gly
    1355                 1360                 1365

Ser Ser  Ile Phe Phe Arg Thr  Asp Ser Leu Ala Ala  Val Gly Gly
    1370                 1375                 1380

Phe Ala  Ser Phe Pro Gly Ala  Arg Thr Tyr Glu Ala  Cys Phe Arg
    1385                 1390                 1395

Met Leu  Asp Asn Tyr Gly Pro  Gln Thr Ile Glu His  Leu Pro Glu
    1400                 1405                 1410

Pro Val  Met Thr Phe Pro Glu  Asn Gln Pro Glu Asn  Ser Leu Arg
    1415                 1420                 1425

Val Ala  Ala Met Gln Leu Ala  Leu Glu Glu His Leu  His Arg Asn
    1430                 1435                 1440

Asn Ile  Ser Ala Ser Ile Glu  Glu Gly Tyr Val Thr  Gly Thr Phe
    1445                 1450                 1455

Leu Val  Gln Tyr His His Ser  Glu Gln Pro Phe Val  Ser Ile Ile
    1460                 1465                 1470

Ile Pro  Asn Lys Asp Lys His  Glu Phe Leu Ala Pro  Cys Ile Glu
    1475                 1480                 1485

Thr Leu  Met Lys Val Thr Gln  Tyr Pro Ala Phe Glu  Val Ile Ile
    1490                 1495                 1500

Val Asp  Asn Gln Ser Thr Asp  Pro Asp Thr Leu Ser  Tyr Tyr Glu
    1505                 1510                 1515

Glu Ile  Glu Ser Arg Phe Ala  Asn Asn Val Lys Val  Ile Gln Tyr
    1520                 1525                 1530

Asp Asn  Pro Phe Asn Phe Ser  Ala Gln Cys Asn Leu  Gly Ala Glu
    1535                 1540                 1545

Ser Ala  Arg Gly Asp Phe Ile  Leu Phe Leu Asn Asn  Asp Thr Glu
    1550                 1555                 1560

Ile Val  Gln Ala Asn Trp Leu  Glu Arg Met Met Gln  His Ala Gln
    1565                 1570                 1575

Arg Asn  Asp Val Gly Val Val  Gly Ala Arg Leu Val  Phe Pro Glu
    1580                 1585                 1590
```

```
Thr Val  Thr Ile Gln His Ala  Gly Ile Val Leu Gly  Gly Lys Tyr
    1595                 1600                 1605

Pro Asp  Glu Val Phe Gln Phe  Pro Tyr Met Asn Phe  Pro Val Asp
    1610                 1615                 1620

Lys Asp  Val Ser Leu Asn Arg  Thr Lys Val Val Gln  Asn Tyr Ser
    1625                 1630                 1635

Ala Val  Thr Gly Ala Cys Leu  Leu Val Arg Lys Ser  Leu Tyr Gln
    1640                 1645                 1650

Gln Val  Gly Gly Met Asn Glu  Gln Asn Leu Ala Val  Leu Tyr Gly
    1655                 1660                 1665

Asp Val  Asp Leu Cys Leu Arg  Ile Arg Gln Leu His  Lys Ser Val
    1670                 1675                 1680

Val Trp  Thr Pro Phe Ser Thr  Leu Val His His Thr  Gly Lys Thr
    1685                 1690                 1695

Leu Asn  Ser Asn Ser Asp His  Glu Lys His Leu Met  Met Val Ile
    1700                 1705                 1710

Gln Thr  Arg Gln Glu Arg Glu  Tyr Met Leu Ser His  Trp Leu Asp
    1715                 1720                 1725

Ile Ile  Ala Asn Asp Pro Tyr  Tyr His Arg Leu Leu  Asp Lys Ser
    1730                 1735                 1740

Glu Cys  Asn Gly Thr Ile Asp  Cys Thr His Thr Pro  Leu Trp Asp
    1745                 1750                 1755

Asp Ile  Pro Ser Ala Arg Pro  Arg Leu Gln Gly Met  Ala Leu Val
    1760                 1765                 1770

Gly Gly  Ser Gly Glu Tyr Arg  Val Asn Met Pro Phe  Arg Thr Leu
    1775                 1780                 1785

Glu Arg  Ser Ala Leu Ala Glu  Ile Val Leu Ser Asn  Met Thr Ser
    1790                 1795                 1800

Lys Ala  Arg Leu Pro Ser Ile  Thr Glu Leu Ala Arg  Asn Ala Pro
    1805                 1810                 1815

Asp Val  Phe Val Val Gln Asn  Ala Leu Ala Asp Glu  Phe Ile Arg
    1820                 1825                 1830

Met Leu  Glu Met Tyr Lys Lys  Tyr Leu Pro Ser Val  Phe Arg Ile
    1835                 1840                 1845
```

```
Gln Met  Leu Asp Asp Leu Leu  Thr Glu Ile Pro Asp  Ala Ser Ser
    1850                1855                1860

Phe Lys  Arg His Phe Gln Lys  Asn Trp Arg Asp Ala  Lys Ala Arg
    1865                1870                1875

Leu Arg  Lys Ser Leu Lys Phe  Cys Asp Arg Leu Ile  Val Ser Thr
    1880                1885                1890

Glu Pro  Leu Arg Thr Phe Ala  Glu Asp Met Ile Asp  Asp Ile Ile
    1895                1900                1905

Val Val  Pro Asn Met Leu Glu  Arg Ser Val Trp Gly  Asp Leu Val
    1910                1915                1920

Ser Lys  Arg Arg Ala Gly Lys  Lys Pro Arg Val Gly  Trp Val Gly
    1925                1930                1935

Ala Gln  Gln His Ala Gly Asp  Leu Ala Leu Met Thr  Asp Val Val
    1940                1945                1950

Lys Ala  Thr Gly His Glu Val  Asp Trp Val Phe Gln  Gly Met Cys
    1955                1960                1965

Pro Asp  Asp Ile Arg Pro Tyr  Val Ala Glu Val Asn  Thr Glu Trp
    1970                1975                1980

Leu Thr  Tyr Asp Lys Tyr Pro  Gln Gly Ile Ala Ala  Leu Asn Leu
    1985                1990                1995

Asp Leu  Ala Ile Ala Pro Leu  Glu Ile Asn Ala Phe  Asn Glu Ala
    2000                2005                2010

Lys Ser  Asn Leu Arg Leu Leu  Glu Tyr Gly Ala Leu  Gly Trp Pro
    2015                2020                2025

Val Ile  Cys Thr Asp Ile Tyr  Pro Tyr Gln Thr Asn  Asn Ala Pro
    2030                2035                2040

Val Cys  Arg Val Pro Asn Asp  Ala Ser Ala Trp Ile  Glu Ala Ile
    2045                2050                2055

Arg Ser  His Ile Ala Asp Leu  Asp Ala Thr Ala Gln  Lys Gly Asp
    2060                2065                2070

Gln Leu  Arg Gln Trp Val His  Asp His Tyr Met Ile  Glu Asp His
    2075                2080                2085

Ala Gln  Glu Trp Leu Ser Ala  Leu Thr Arg Pro Ala  Gly Lys
    2090                2095                2100
```

<210> 126
<211> 284
<212> PRT
<213> Desulfovibrio africanus

<400> 126

```
Met Phe Gln Tyr Ala Ala Ala Arg Ala Leu Ser Leu Arg His Ser Ala
1               5                   10                  15

Ser Leu Ala Ala Asp Leu Thr Trp Phe Ser Gln Gln Phe Asp Val Gln
            20                  25                  30

Thr Thr Pro Arg Glu Tyr Ala Leu Pro Ala Phe Arg Leu Asn Leu Pro
        35                  40                  45

Glu Ala Asp Lys Arg Ile Val Ala Thr Phe Arg Leu Asn Pro Thr Glu
    50                  55                  60

Leu Arg Ile Val Ser Phe Leu Arg His Arg Ile Cys Phe Pro Ser Arg
65                  70                  75                  80

Phe Leu Pro Arg His Ile Thr Glu Leu Ser Phe Asp Tyr Trp Asp Gly
                85                  90                  95

Phe Arg Asp Ile Leu Pro Pro Ala Tyr Leu Asp Gly Tyr Trp Gln Ser
            100                 105                 110

Glu Arg Tyr Phe Ser Asp Tyr Pro Asp Ile Ile Arg Ala Asp Phe Ser
        115                 120                 125

Met Leu Ser Ile Ser Glu Gln Ala Ala Trp Met Ser Ala Lys Ile Ala
    130                 135                 140

Ser Val Gln Asp Ser Ile Ser Leu His Ile Arg Arg Gly Asp Tyr Val
145                 150                 155                 160

Asn Ser Leu Ala Thr Arg Lys Ala His Gly Ile Asp Thr Glu Arg Tyr
                165                 170                 175

Tyr Ala Lys Ala Leu Glu Trp Ile Ala Asp Arg Ile Gly Ala Ala Thr
            180                 185                 190

Ile Phe Ala Phe Ser Asp Asp Pro Arg Trp Val Arg Ala Asn Phe Asp
        195                 200                 205

Phe Gly Lys His Lys Gly Ile Val Val Asp Gly Ser Trp Thr Ala His
    210                 215                 220

Glu Asp Met His Leu Met Ser Leu Cys Ser His His Ile Ile Ala Asn
225                 230                 235                 240
```

```
Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Ser Thr Ser Gln Gly Ile
                245                 250                 255

Thr Ile Ala Pro Lys Ser Trp Phe Ser Asn Pro His Ile Trp Thr Pro
            260                 265                 270

Asp Val Cys Pro Ala Thr Trp Glu Arg Ile Pro Cys
        275                 280
```

<210> 127
<211> 298
<212> PRT
<213> Akkermansia muciniphila CAG:154

<400> 127

```
Met Ala Lys Gly Lys Ile Ile Val Met Arg Leu Phe Gly Gly Leu Gly
1               5                   10                  15

Asn Gln Leu Phe Gln Tyr Ala Phe Leu Phe Ala Leu Ser Arg Gln Gly
            20                  25                  30

Gly Lys Ala Arg Leu Glu Thr Ser Ser Tyr Glu His Asp Asp Lys Arg
        35                  40                  45

Val Cys Glu Leu His His Phe Arg Val Ser Leu Pro Ile Glu Gly Gly
    50                  55                  60

Pro Pro Pro Trp Ala Phe Arg Lys Ser Arg Ile Pro Ala Cys Leu Arg
65                  70                  75                  80

Ser Leu Phe Ala Ala Pro Lys Tyr Pro His Phe Arg Glu Glu Lys Arg
                85                  90                  95

His Gly Phe Asp Pro Gly Leu Ala Ala Pro Pro Arg Arg His Thr Tyr
            100                 105                 110

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

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

Ala Arg Ile Leu Glu Asp Ile Arg Ser Cys Cys Ser Ile Ser Leu His
145                 150                 155                 160

Ile Arg Arg Thr Asp Tyr Leu Ser Asn Pro Tyr Leu Ser Pro Pro Pro
                165                 170                 175

Leu Glu Tyr Tyr Leu Arg Ser Met Ala Glu Met Glu Gly Arg Leu Arg
            180                 185                 190
```

```
Ala Ala Asp Ala Pro Gln Glu Ser Leu Arg Tyr Phe Ile Phe Ser Asp
        195                 200                 205

Asp Ile Glu Trp Ala Arg Gln Asn Leu Arg Pro Ala Leu Pro His Val
    210                 215                 220

His Val Asp Ile Asn Asp Gly Gly Thr Gly Tyr Phe Asp Leu Glu Leu
225                 230                 235                 240

Met Arg Asn Cys Arg His His Ile Ile Ala Asn Ser Thr Phe Ser Trp
                245                 250                 255

Trp Ala Ala Trp Leu Asn Glu His Ala Glu Lys Ile Val Ile Ala Pro
            260                 265                 270

Arg Ile Trp Phe Asn Arg Glu Glu Gly Asp Arg Tyr His Thr Asp Asp
        275                 280                 285

Ala Leu Ile Pro Gly Ser Trp Leu Arg Ile
    290                 295
```

<210> 128
<211> 292
<212> PRT
<213> Dysgonomonas mossii

<400> 128

```
Met Lys Ile Val Lys Leu Gln Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ile Ala Arg Thr Leu Glu Thr Asn Lys Lys Lys Asp Ile Phe
            20                  25                  30

Leu Asp Leu Ser Phe Leu Arg Met Asn Asn Val Ser Thr Asp Cys Phe
        35                  40                  45

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

Lys Leu Asn Ser Leu Gln Glu Lys Phe Leu Leu Ser Asp Arg Val Arg
65                  70                  75                  80

Tyr Lys Phe Ile Arg Lys Ile Ala Asn Ile Asn Phe His Lys Ile Asn
                85                  90                  95

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

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

Phe Asp Leu Ile Lys Asp Phe Glu Phe Pro Glu Leu Asp Thr Arg Asn
```

130 135 140

Glu Ala Leu Lys Lys Thr Ile Val Asn Asn Asn Ser Val Ser Ile His
145 150 155 160

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

Gly Val Leu Ser Leu Glu Tyr Tyr Leu Asn Cys Ile Lys Arg Ile Gly
180 185 190

Glu Glu Thr Lys Glu Gln Leu Ser Phe Phe Ile Phe Ser Asp Asp Pro
195 200 205

Glu Tyr Ala Ser Lys Ser Leu Ser Phe Leu Pro Asn Met Gln Ile Val
210 215 220

Asp Trp Asn Leu Gly Lys Asn Ser Trp Lys Asp Met Ala Leu Met Leu
225 230 235 240

Ala Cys Lys His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
245 250 255

Ala Trp Leu Ser Glu Arg Asn Gly Ile Thr Tyr Ala Pro Val Lys Trp
260 265 270

Phe Asn Asn Glu Ser Gln Tyr Asn Ile Asn Asn Ile Ile Pro Ser Asp
275 280 285

Trp Val Ile Ile
290

<210> 129
<211> 291
<212> PRT
<213> Prevotella oris

<400> 129

Met Asp Ile Val Leu Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1 5 10 15

Tyr Ala Phe Tyr Met Ser Lys Lys Lys Phe Val Pro Gln Ser Lys Cys
20 25 30

Met Tyr Tyr Lys Gly Ala Ser Asn Asn His Asn Gly Ser Glu Leu Asp
35 40 45

Lys Leu Phe Asp Ile Lys Tyr Ser Glu Thr Phe Phe Cys Lys Leu Ile
50 55 60

Leu Leu Leu Phe Lys Leu Tyr Glu Asn Ile Pro Arg Leu Arg Lys Tyr
65 70 75 80

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

Tyr Asn Glu Ser Ile Leu Lys Lys Lys Thr Arg Phe Gly Ile Thr Leu
            100                 105                 110

Tyr Lys Gly Gly Trp His Ser Glu Lys Tyr Phe Leu Ala Asn Lys Gln
        115                 120                 125

Asp Val Leu Asn Thr Phe Ser Phe Lys Ile Ala Lys Glu Asp Lys Asn
    130                 135                 140

Phe Ile Asp Leu Ala Lys Ser Ile Glu Glu Asp Thr Asn Ser Val Ser
145                 150                 155                 160

Leu His Val Arg Arg Gly Asp Tyr Leu Asn Ile Ser Pro Thr Asp His
                165                 170                 175

Tyr Gln Phe Gly Gly Val Ala Thr Thr Asn Tyr Tyr Lys Asn Ala Val
            180                 185                 190

Ser Tyr Met Leu Lys Arg Asn Lys Gln Ala His Phe Tyr Ile Phe Ser
        195                 200                 205

Asp Asp Ile Thr Trp Cys Lys Ala Glu Tyr Lys Asp Leu Met Pro Thr
    210                 215                 220

Phe Ile Glu Cys Asn Lys Lys Asn Lys Ser Trp Arg Asp Met Leu Leu
225                 230                 235                 240

Met Ser Leu Cys Thr Asn His Ile Asn Ala Asn Ser Thr Phe Ser Trp
                245                 250                 255

Trp Gly Ala Trp Leu Ser Thr Lys Asn Gly Ile Thr Ile Cys Pro Thr
            260                 265                 270

Glu Phe Ile His Asn Val Val Thr Arg Asp Ile Tyr Pro Glu Thr Trp
        275                 280                 285

Val Gln Leu
    290


<210>  130
<211>  294
<212>  PRT
<213>  Pseudogulbenkiania ferrooxidans

<400>  130

Met Ile Ile Val Arg Leu Met Gly Gly Met Gly Asn Gln Leu Phe Gln
1               5                   10                  15
```

```
Tyr Ala Thr Ala Phe Ala Leu Ser Lys Arg Lys Ser Glu Pro Leu Val
            20                  25                  30

Leu Asp Thr Arg Phe Phe Asp His Tyr Thr Leu His Gly Gly Tyr Lys
        35                  40                  45

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

Ser Leu Tyr Pro Asn Trp Gln Ala Asn Leu Leu Leu Arg Tyr Pro Ile
65                  70                  75                  80

Ile Asp Arg Ala Phe Lys Lys Trp His Val Glu Arg Gln Phe Thr Tyr
                85                  90                  95

Gln Asp Arg Ile Tyr Arg Met Lys Arg Gly Gln Ala Leu Leu Gly Tyr
            100                 105                 110

Trp Gln Ser Glu Leu Tyr Phe Gln Glu Tyr Arg Lys Glu Ile Ser Ala
        115                 120                 125

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

Val Ala Met Gln Gly Gly Asn Ser Val Ala Val His Ile Arg Arg Gly
145                 150                 155                 160

Asp Tyr Leu Ser Asn Pro Ser Ala Leu Arg Thr His Gly Ile Cys Ser
                165                 170                 175

Leu Gly Tyr Tyr Asn His Ala Met Ser Leu Leu Asn Glu Arg Ile Asn
            180                 185                 190

Asp Ala Gln Phe Tyr Ile Phe Ser Asp Asp Ile Ala Trp Ala Lys Glu
        195                 200                 205

Asn Ile Lys Ile Gly Lys Thr Ser Lys Asn Leu Ile Phe Ile Glu Gly
    210                 215                 220

Glu Ser Val Glu Thr Asp Phe Trp Leu Met Thr Gln Ser Lys His His
225                 230                 235                 240

Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Ala Asn
                245                 250                 255

Asn Thr Asp Glu Gln Leu Val Ile Cys Pro Ser Pro Trp Phe Asp Asp
            260                 265                 270

Lys Asn Leu Ser Glu Thr Asp Leu Ile Pro Lys Ser Trp Ile Arg Leu
        275                 280                 285
```

Asn Lys Asp Leu Pro Val
290

<210> 131
<211> 298
<212> PRT
<213> Salmonella enterica

<400> 131

Met Tyr Ser Cys Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr
1 5 10 15

Ala Ala Ala Tyr Ile Leu Lys Gln Tyr Phe Gln Ser Thr Thr Leu Val
20 25 30

Leu Asp Asp Ser Tyr Tyr Tyr Ser Gln Pro Lys Arg Asp Thr Val Arg
35 40 45

Ser Leu Glu Leu Asn Gln Phe Asn Ile Ser Tyr Asp Arg Phe Ser Phe
50 55 60

Thr Asp Glu Lys Glu Lys Ile Lys Leu Leu Arg Lys Phe Lys Arg Asn
65 70 75 80

Pro Phe Pro Lys Lys Ile Ser Glu Ile Leu Ser Ile Ala Leu Phe Gly
85 90 95

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

Asn Ile Asp Lys Ala Cys Leu Phe Ser Phe Tyr Gln Asp Ala Asp Leu
115 120 125

Leu Asn Lys His Lys Gln Leu Ile Leu Pro Leu Phe Glu Leu Arg Asp
130 135 140

Asp Leu Leu Asp Ile Cys Lys Asn Leu Asp Val Tyr Pro Leu Ile Leu
145 150 155 160

Arg Asn Asn Asn Thr Thr Ala Leu His Ile Arg Arg Gly Asp Tyr Leu
165 170 175

Thr Asn Gln His Ala Ala Lys Tyr His Gly Val Leu Asp Thr Ser Tyr
180 185 190

Tyr Asn Asn Ala Met Glu Tyr Val Glu Arg Glu Arg Gly Lys Gln Asn
195 200 205

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

```
Gly Asn Glu Asn Cys Tyr Ile Val Asn Asn Gly Asp Tyr Asp Tyr Ser
225                 230                 235                 240

Ala Ile Asp Met Tyr Leu Met Ser Leu Cys Lys Asn Asn Ile Ile Ala
                245                 250                 255

Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn Lys Ser Glu Asp
            260                 265                 270

Lys Leu Val Ile Ser Pro Lys Gln Trp Phe Leu Gly Asn Asn Glu Thr
        275                 280                 285

Ser Leu Arg Asn Ala Ser Trp Ile Ile Leu
    290                 295
```

<210> 132
<211> 287
<212> PRT
<213> Carnobacterium sp. WN1359

<400> 132

```
Met Leu Ile Val Lys Val Tyr Gly Gly Ile Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ser Phe Tyr Lys Tyr Leu Gln Lys Asn Asn Asp Asp Val Phe Leu
            20                  25                  30

Asp Ile Ser Asp Tyr Lys Val His Asn His His Asn Gly Phe Glu Leu
        35                  40                  45

Ile Asp Val Phe Asn Ile Glu Val Lys Gln Ala Asp Met Ser Lys Phe
    50                  55                  60

Lys Gly His Val Ser Ser Lys Asn Ser Ile Phe Tyr Arg Leu Thr Ser
65                  70                  75                  80

Lys Leu Phe Lys Arg Asn Ile Leu Gly Tyr Ser Glu Phe Met Asp Ser
                85                  90                  95

Asn Gly Ile Ser Ile Val Arg Asn Glu Lys Ile Leu Thr Asp His Tyr
            100                 105                 110

Phe Ile Gly Phe Trp Gln Asp Val Leu Tyr Leu Gln Ser Val Glu Glu
        115                 120                 125

Glu Ile Lys Glu Ala Phe Asn Phe Lys Asn Val Ala Ile Gly Lys Gln
    130                 135                 140

Asn Leu Glu Leu Ile Ser Leu Ser Glu Ser Val Glu Ser Val Ser Val
145                 150                 155                 160

His Ile Arg Lys Gly Asp Tyr Ala Asn Asn Ser Asp Leu Ser Asp Ile
```

165 170 175

Cys Asp Leu Glu Tyr Tyr Glu Glu Ala Met Lys Ile Ile Asp Ser Lys
180 185 190

Val Ser Glu Pro Leu Tyr Phe Ile Phe Ser Asp Asp Ile Glu Trp Cys
195 200 205

Lys Gln Lys Phe Gly Lys Arg Asp Asn Leu Ile Tyr Val Asp Trp Asn
210 215 220

Ile Ala Lys Lys Ser Tyr Ile Asp Met Leu Leu Met Ser Lys Cys Lys
225 230 235 240

His Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu
245 250 255

Asn Asn Asn Ser Lys Lys Ile Val Ile Cys Pro Lys Thr Trp Asp Arg
260 265 270

Lys Lys Asn Glu Asn His Leu Leu Leu Asn Asp Trp Ile Ala Ile
275 280 285

<210> 133
<211> 291
<212> PRT
<213> Prevotella sp. CAG:1185

<400> 133

Met Met Lys Ile Ile Val Asn Met Ala Cys Gly Leu Ala Asn Arg Met
1 5 10 15

Phe Gln Tyr Ser Tyr Tyr Leu Phe Leu Met His Lys Gly Tyr Asn Val
20 25 30

Lys Val Asp Phe Tyr Asn Ser Ala Lys Leu Ala His Glu Lys Val Ala
35 40 45

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

Asp Ile Leu Lys Ser Gly Gly Gly Ser Asp Val Ile Ser Lys Ile Arg
65 70 75 80

Arg Lys Tyr Leu Pro Phe Leu Ser Ser Val Val Asn Met Pro Thr Ala
85 90 95

Phe Asp Ala Asn Leu Pro Val Glu Asn Lys Lys Leu Gln Tyr Ile Ile
100 105 110

Gly Val Phe Gln Asn Ala Asn Met Val Glu Ala Val Glu Glu Asp Val
115 120 125

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

Leu Gln Asn Glu Met Gln Ser Cys Glu Ser Val Ala Ile His Val Arg
145                 150                 155                 160

Lys Gly Lys Asp Tyr Ala Gln Arg Ile Trp Tyr Gln Asn Thr Cys Pro
                165                 170                 175

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

Asn Pro Lys Leu Tyr Val Phe Thr Asp Asn Pro Glu Trp Val Lys Glu
        195                 200                 205

His Phe Lys Asp Phe Pro Tyr Thr Leu Val Glu Gly Asn Pro Ala Ser
    210                 215                 220

Gly Trp Gly Ser His Phe Asp Met Gln Leu Met Ser Val Cys Lys His
225                 230                 235                 240

Asn Ile Ile Ser Asn Ser Thr Tyr Ser Trp Trp Ser Ala Phe Leu Asn
                245                 250                 255

Val His Asn Glu Lys Ile Val Ile Gly Pro Lys Val Trp Phe Asn Pro
            260                 265                 270

Asp Ser Cys Ser Glu Phe Thr Ser Glu Arg Ile Leu Cys Lys Asp Trp
        275                 280                 285

Ile Ala Val
    290
```

<210> 134
<211> 294
<212> PRT
<213> Selenomonas sp. CM52

<400> 134

```
Met Phe Gln Tyr Ala Met Ala Ser Ser Val Ala Arg Arg Ala Gly Glu
1               5                   10                  15

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

Ser Ala Asp Asp Ile Tyr Gly Leu Gly Ile Phe Ser Phe Asp Glu Lys
        35                  40                  45

Phe Ser Thr Ser Asn Glu Val Gln Lys Phe Leu Pro Ser Gly Lys Phe
    50                  55                  60
```

```
Ser Ala Lys Ile Tyr Arg Ala Val Asn Arg Arg Met Pro Phe Ser Trp
65                  70                  75                  80

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

Glu Ile Arg Arg Ser Val Tyr Phe Tyr Met Gly Tyr Trp Gln Ser Glu
            100                 105                 110

Lys Tyr Phe Ser Asp Phe Ile Gln Glu Ile Arg Lys Asp Phe Thr Phe
        115                 120                 125

Arg Glu Glu Val Arg Gln Ser Ile Glu Glu Arg Arg Pro Ile Val Glu
    130                 135                 140

Lys Ile Arg Lys Ser Asp Ala Val Ser Leu His Ile Arg Arg Gly Asp
145                 150                 155                 160

Tyr Ala Gln Asn Pro Ala Leu Gly Glu Ile Phe Leu Ser Phe Thr Met
                165                 170                 175

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

Pro Val Phe Phe Ile Phe Ser Asp Asp Ile Pro Trp Ala Lys Glu Asn
        195                 200                 205

Leu Pro Leu Pro Tyr Glu Val Cys Tyr Ile Asp Asp Asn Ile Gln Thr
    210                 215                 220

Asn Glu Arg Glu Ile Gly His Lys Ser Lys Gly Tyr Glu Asp Met Tyr
225                 230                 235                 240

Leu Met Thr Gln Cys Gln His Asn Ile Ile Ala Asn Ser Ser Phe Ser
                245                 250                 255

Trp Trp Gly Ala Trp Leu Asn His Asn Pro Asn Lys Ile Val Val Ala
            260                 265                 270

Pro Lys Lys Trp Cys Asn Gly Ser Phe Asn Tyr Ala Asp Ile Val Pro
        275                 280                 285

Glu Gln Trp Val Lys Leu
    290
```

<210> 135
<211> 293
<212> PRT
<213> Bacteroides nordii

<400> 135

```
Met Glu Ile Val Phe Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                  10                  15

Tyr Ala Leu Tyr Leu Ser Lys Arg Asn Leu Gly Cys Lys Val Arg Tyr
            20                  25                  30

Ala Tyr Asn Ile Arg Ser Leu Ser Asp His Asn Gly Phe Glu Leu Asp
        35                  40                  45

Arg Val Phe Gly Ile Thr Tyr Pro Asn Asn Leu Phe Asn Lys Cys Ile
    50                  55                  60

Asn Ile Ile Tyr Arg Leu Leu Phe Ala Asn Lys Tyr Leu Phe Leu Val
65                  70                  75                  80

Gln Lys Met Ile Tyr Val Leu Arg Gln Met Asn Val Tyr Ser Ile Lys
                85                  90                  95

Glu Lys Asp Asn Tyr Asp Tyr Asp Tyr Lys Ile Leu Thr Arg His Lys
            100                 105                 110

Gly Ile Val Leu Tyr Tyr Gly Gly Trp His Ser Glu Lys Tyr Phe Leu
        115                 120                 125

Ser Asn Ala Asp Ile Ile Lys Asp Lys Phe Arg Phe Asn Ile Ser Lys
    130                 135                 140

Leu Asn Ser Glu Ser Leu Val Leu Tyr His Arg Leu Ser Ser Leu Asn
145                 150                 155                 160

Ala Val Ala Leu His Val Arg Arg Gly Asp Tyr Met Ala Pro Glu His
                165                 170                 175

Tyr Asn Val Phe Gly Cys Val Cys Gly Ile Glu Tyr Tyr Lys Ala Ala
            180                 185                 190

Ile Gln Tyr Ile Gln Ser Gln Ile Leu Asn Pro Val Phe Ile Val Phe
        195                 200                 205

Ser Asn Asp Ile Glu Trp Val Lys Glu Asn Ile Thr Gly Ile Gln Met
    210                 215                 220

Ile Phe Val Asp Phe Asn Lys Lys Glu Asn Ser Trp Met Asp Met Cys
225                 230                 235                 240

Leu Met Ser Cys Cys Glu His Asn Ile Ile Ser Asn Ser Thr Phe Ser
                245                 250                 255

Trp Trp Gly Ala Trp Leu Asn Asn Asn Lys Asn Lys Ile Val Val Cys
            260                 265                 270
```

Pro Lys Tyr Phe Met Ser Asn Ile Asp Thr Lys Asp Ile Tyr Pro Glu
275 280 285

Ser Trp Ile Lys Ile
290

<210> 136
<211> 276
<212> PRT
<213> Parabacteroides merdae

<400> 136

Met Lys Lys Lys Asp Ile Ile Leu Arg Val Trp Gly Gly Val Gly Asn
1 5 10 15

Gln Leu Phe Ile Tyr Ala Phe Ala Lys Val Leu Ser Leu Ile Thr Asp
20 25 30

Cys Lys Val Thr Leu Asp Ile Arg Thr Gly Phe Ala Asn Asp Gly Tyr
35 40 45

Lys Arg Val Tyr Arg Leu Gly Asp Phe Ser Ile Ser Leu Leu Pro Ala
50 55 60

Leu Arg Phe Tyr Thr Leu Leu Ser Phe Ala Gln Arg Lys Met Pro Tyr
65 70 75 80

Ile Arg His Leu Leu Ala Tyr Lys Phe Asp Phe Phe Glu Glu Asp Gln
85 90 95

Lys Tyr Pro Leu Glu Thr Leu Asp Ser Phe Phe Lys Ile Tyr Ser Asp
100 105 110

Lys Asn Leu Tyr Leu Gln Gly Tyr Trp Gln Tyr Phe Asp Phe Ser Ser
115 120 125

Tyr Arg Asp Val Leu Leu Lys Asp Leu Arg Phe Glu Val Glu Ile Asn
130 135 140

Asn Thr Tyr Leu Tyr Tyr Ser Asp Leu Ile Glu Lys Ser Asn Ala Val
145 150 155 160

Ala Ile His Phe Arg Arg Ile Gln Tyr Glu Pro Val Ile Ser Ile Asp
165 170 175

Tyr Tyr Lys Lys Ala Ile Lys Tyr Ile Ser Glu Asn Val Glu Asn Pro
180 185 190

Thr Phe Phe Ile Phe Ser Asp Asp Ile Asn Trp Cys Arg Glu Asn Leu
195 200 205

Ser Ile Asn Gly Ile Cys Phe Phe Val Glu Asn Phe Lys Asp Glu Leu

210 215 220

Tyr Glu Leu Lys Leu Met Ser Gln Cys Asn His Phe Ile Ile Ala Asn
225 230 235 240

Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Ser Val Asn Ala Asp Lys
245 250 255

Lys Val Ile Met Pro Asp Gly Tyr Thr Asp Val Ser Met Asn Gly Ser
260 265 270

Ile Val His Ile
275

<210> 137
<211> 290
<212> PRT
<213> Butyrivibrio sp. NC2007

<400> 137

Met Ile Ile Ile Gln Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Tyr Lys Glu Leu Lys His Arg Gly Arg Asp Val Lys Ile
20 25 30

Asp Asp Glu Ser Gly Phe Ile Gly Asp Lys Leu Arg Val Pro Val Leu
35 40 45

Asp Arg Phe Gly Val Glu Tyr Asp Arg Ala Thr Lys Asp Glu Val Ile
50 55 60

Ala Leu Thr Asp Ser Lys Met Asp Ile Phe Ser Arg Ile Arg Arg Lys
65 70 75 80

Leu Thr Gly Arg Lys Thr Phe Arg Ile Asp Glu Met Glu Gly Ile Phe
85 90 95

Asp Pro Lys Ile Leu Glu Thr Glu Asn Ala Tyr Leu Val Gly Tyr Trp
100 105 110

Gln Ser Glu Lys Tyr Phe Thr Ser Pro Glu Val Ile Glu Gln Ile Gln
115 120 125

Glu Ala Phe Gly Lys Arg Pro Gln Glu Ile Met His Asp Ser Val Ser
130 135 140

Trp Ser Thr Leu Gln Gln Ile Glu Cys Cys Glu Ser Val Ser Ile His
145 150 155 160

Val Arg Arg Thr Asp Tyr Met Asp Ala Glu His Ile Lys Ile His Asn
165 170 175

```
Leu Cys Ser Glu Lys Tyr Tyr Lys Asn Ala Ile Ser Lys Ile Arg Glu
            180                 185                 190

Glu His Pro Asn Ala Val Phe Phe Ile Phe Thr Asp Asp Lys Glu Trp
        195                 200                 205

Cys Lys Glu His Phe Lys Gly Pro Lys Phe Ile Thr Val Glu Leu Gln
    210                 215                 220

Glu Gly Glu Phe Thr Asp Val Ala Asp Met Leu Leu Met Ser Arg Cys
225                 230                 235                 240

Lys His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ser Ala Trp
                245                 250                 255

Leu Asn Asp Ser Pro Glu Lys Ile Val Ile Ala Pro Ser Lys Trp Ile
            260                 265                 270

Asn Asn Lys Lys Met Asp Asp Ile Tyr Thr Glu Arg Met Thr Lys Val
        275                 280                 285

Ala Ile
    290
```

<210> 138
<211> 286
<212> PRT
<213> Bacteroides ovatus

<400> 138

```
Met Ile Val Val Tyr Ser Asn Ala Gly Leu Ala Asn Arg Met Phe His
1               5                   10                  15

Tyr Ala Leu Tyr Lys Ala Leu Glu Val Lys Gly Ile Asp Val Tyr Phe
            20                  25                  30

Asp Glu Lys Ser Tyr Val Pro Glu Trp Ser Phe Glu Thr Thr Thr Leu
        35                  40                  45

Met Asp Val Phe Pro Asn Ile Gln Tyr Arg Glu Ser Leu Gln Phe Lys
    50                  55                  60

Arg Ala Ser Lys Lys Thr Phe Leu Asp Lys Ile Val Ile His Cys Ser
65                  70                  75                  80

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

Asp Lys Leu Phe Thr Lys Leu Glu Thr Asn Gln Asp Leu Cys Leu Ile
            100                 105                 110
```

```
Gly Leu Trp Gln Ser Glu Lys Tyr Phe Met Asp Val Arg Gln Glu Ile
        115                 120                 125

Gln Lys Cys Phe Gln Tyr Arg Ser Phe Val Asp Asp Lys Asn Val Lys
    130                 135                 140

Thr Ala Gln Gln Met Leu Ser Glu Asn Ser Val Ala Ile His Val Arg
145                 150                 155                 160

Lys Gly Ala Asp Tyr Gln Gln Asn Arg Ile Trp Lys Asn Thr Cys Thr
                165                 170                 175

Ile Asp Tyr Tyr Arg Leu Ala Ile Asp Tyr Ile Arg Met His Val Gln
            180                 185                 190

Asn Pro Val Phe Tyr Val Phe Thr Asp Asn Lys Asp Trp Val Ile Glu
        195                 200                 205

Asn Phe Thr Asp Leu Asp Tyr Thr Leu Cys Asp Trp Asn Pro Thr Ser
    210                 215                 220

Gly Lys Gln Asn Tyr Leu Asp Met Gln Leu Met Ser Cys Ala Lys His
225                 230                 235                 240

Asn Val Ile Ala Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn
                245                 250                 255

Glu Asn Ser Asp Lys Ile Val Ile Ala Pro Lys Arg Trp Phe Asn Lys
            260                 265                 270

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


<210>  139
<211>  288
<212>  PRT
<213>  Mesotoga prima MesG1.Ag.4.2;Mesotoga prima

<400>  139

Met Arg Val Val Trp Phe Gly Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Gly Leu Tyr Cys Phe Leu Lys Lys Asn Asn Gln Glu Val Lys Ala
            20                  25                  30

Asp Cys Thr Gln Tyr Ser Thr Thr Pro Met Asn Asn Gly Phe Glu Leu
        35                  40                  45

Glu Arg Leu Phe Asn Leu Asp Ile Ala His Ala Asn Leu Asp Val Ile
    50                  55                  60
```

```
Ser Lys Leu Thr Gly Gly Asn Arg Leu Ser Pro Arg Lys Val Ile Trp
65                  70                  75                  80

Lys Leu Phe Arg Lys Pro Lys Val Tyr Phe Glu Glu Lys Ile Pro Phe
                85                  90                  95

Ser Phe Asp Pro Asp Val Leu Lys Gly Asn Asn Arg Tyr Leu Lys Gly
            100                 105                 110

Tyr Trp Gln Asn Met Asn Tyr Leu Glu Pro Cys Ala Lys Glu Leu Arg
        115                 120                 125

Asp Val Phe Thr Phe Pro Ala Phe Ser Ser Asp Asn Asn Lys Arg Leu
    130                 135                 140

Ala Asp Glu Ile Ala Lys Val Glu Ala Val Gly Val His Phe Arg Arg
145                 150                 155                 160

Gly Asp Phe Leu Lys Ser Ser Asn Leu Gly Leu Phe Gly Gly Ile Cys
                165                 170                 175

Ser Asp Gln Tyr Tyr Leu Arg Ala Ile Gln Thr Met Glu Asn Thr Val
            180                 185                 190

Val Glu Pro Val Phe Tyr Val Phe Cys Asp Asp Pro Gln Trp Ala Lys
        195                 200                 205

Asn Ser Phe Ser Asp Ala Arg Phe Thr Val Ile Asp Trp Asn Ile Gly
    210                 215                 220

Ser Asn Ser Tyr Arg Asp Met Gln Leu Met Ser Leu Cys Lys His Asn
225                 230                 235                 240

Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Ala Ala Trp Leu Asn Arg
                245                 250                 255

Asn Pro Asn Arg Thr Val Ile Ala Pro Glu Arg Met Val Asn Arg Asp
            260                 265                 270

Leu Asp Phe Ser Gly Ile Phe Pro Asn Asp Trp Ile Arg Leu Gln Gly
        275                 280                 285


<210>  140
<211>  296
<212>  PRT
<213>  Clostridium sp. KLE 1755

<400>  140

Met Ile Val Leu Lys Leu Gln Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Ala Phe Ala Arg Thr Ile Gln Glu Gln Lys Lys Asp Lys Lys Leu
```

20 25 30

Ile Leu Asp Thr Ser Asp Phe Gln Tyr Asp Lys Gln Arg Glu Tyr Ser
35 40 45

Leu Gly His Phe Ile Leu Asn Glu Asn Ile Glu Ile Asp Ser Ser Gly
50 55 60

Lys Phe Asn Leu Trp Tyr Asp Gln Arg Lys Asn Pro Leu Leu Lys Val
65 70 75 80

Gly Phe Lys Phe Trp Pro Lys Phe Gln Phe Gln Thr Leu Lys Leu Phe
85 90 95

Gly Ile Tyr Val Trp Asp Tyr Ala Lys Tyr Ile Pro Val Asp Val Ser
100 105 110

Lys Lys His Lys Asn Ile Leu Leu His Gly Leu Trp Gln Ser Asp Lys
115 120 125

Tyr Phe Ser Gln Ile Ser Glu Ile Ile Arg Lys Glu Phe Ala Val Lys
130 135 140

Asp Glu Pro Ser Gln Gly Asn Lys Ala Trp Leu Glu Arg Ile Ser Ser
145 150 155 160

Ala Asn Ala Val Cys Val His Ile Arg Arg Gly Asp Phe Leu Ala Lys
165 170 175

Gly Ser Val Leu Leu Thr Cys Ser Asn Ser Tyr Tyr Leu Lys Ala Met
180 185 190

Glu Ile Ile Ser Lys Lys Val Asn Glu Pro Glu Phe Phe Ile Phe Ser
195 200 205

Asp Asp Ile Glu Asp Val Lys Lys Ile Phe Glu Phe Pro Gly Tyr Gln
210 215 220

Ile Thr Leu Val Asn Gln Ser Asn Pro Asp Tyr Glu Glu Leu Arg Leu
225 230 235 240

Met Ser Lys Cys Lys His Phe Ile Ile Ala Asn Ser Thr Phe Ser Trp
245 250 255

Trp Ser Ser Leu Leu Ser Glu Asn Glu Asp Lys Val Ile Val Ala Pro
260 265 270

Arg Leu Trp Tyr Ser Asp Gly Arg Asp Thr Ser Ala Leu Met Arg Asp
275 280 285

Glu Trp Ile Ile Ile Asp Asn Glu

290 295

<210> 141
<211> 289
<212> PRT
<213> Bacteroides plebeius CAG:211

<400> 141

Met Asp Leu Val Thr Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Phe Ala Phe Tyr Trp Ala Leu Lys Lys Arg Gly Lys Lys Val Phe Leu
20 25 30

Tyr Lys Asn Lys Leu Ala Ala Lys Glu His Asn Gly Tyr Glu Leu Gln
35 40 45

Thr Leu Phe Gly Val Glu Glu Lys Cys Val Asp Gly Leu Trp Met Thr
50 55 60

Arg Leu Leu Gly Cys Pro Leu Leu Gly Lys Ile Leu Lys His Ile Leu
65 70 75 80

Phe Pro His Lys Ile Arg Glu Arg Val Leu Tyr Asn Tyr Ser Ile Tyr
85 90 95

Leu Pro Leu Phe Glu Arg Asn Gly Leu His Trp Val Gly Tyr Trp Gln
100 105 110

Ser Glu Lys Tyr Phe Gln Asp Val Ala Asp Asp Ile Arg Arg Ile Phe
115 120 125

Cys Phe Asp His Leu Ser Leu Asn Pro Ala Thr Ser Ala Ala Leu Lys
130 135 140

Cys Met Ser Glu Gln Val Ala Val Ser Val His Ile Arg Arg Gly Asp
145 150 155 160

Tyr Tyr Leu Pro Cys Asn Val Ala Thr Tyr Gly Gly Leu Cys Thr Val
165 170 175

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

Ala Val Phe Tyr Val Phe Ser Asp Asp Leu Asp Trp Val Arg Glu Asn
195 200 205

Ile Pro Ser Ala Gly Lys Met Val Phe Val Asp Trp Asn Arg Gly Lys
210 215 220

Asp Ser Trp Gln Asp Met Phe Leu Met Ser Lys Cys His His Asn Ile
225 230 235 240

```
Leu Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Thr His
                245                 250                 255

Pro Glu Lys Leu Val Ile Ala Pro Glu Arg Trp Ala Asn Cys Pro Ala
            260                 265                 270

Pro Asp Ala Leu Pro Asp Gly Trp Val Arg Ile Glu Gly Val Ser Arg
        275                 280                 285

Arg
```

<210> 142
<211> 308
<212> PRT
<213> Treponema lecithinolytikum

<400> 142

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

Phe Cys Tyr Ala Phe Ala Cys Ala Leu Gln Lys Cys Gly His Lys Val
            20                  25                  30

Tyr Val Asp Thr Ser Leu Tyr Arg Lys Ala Thr Val His Ser Gly Ile
        35                  40                  45

Asp Phe Cys His Asn Gly Leu Glu Thr Glu Arg Leu Phe Gly Ile Lys
    50                  55                  60

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

Glu Gly Leu Leu Asn Arg Ile Arg Arg Lys Tyr Phe Thr Lys Lys Thr
                85                  90                  95

His Tyr Ile Asp Thr Val Phe Lys Tyr Thr Pro Glu Leu Leu Ser Asp
            100                 105                 110

Lys Asn Asp Cys Tyr Leu Glu Gly Tyr Trp Gln Thr Glu Lys Tyr Phe
        115                 120                 125

Leu Pro Ile Glu Lys Asp Ile Arg Arg Leu Phe Thr Phe Arg Pro Thr
    130                 135                 140

Leu Ser Glu Lys Ser Ala Ala Val Gln Ser Ala Leu Gln Ala Gln Gln
145                 150                 155                 160

Ala Ala Val Leu Ser Ala Ser Ile His Val Arg Arg Gly Asp Phe Leu
                165                 170                 175
```

Asn Thr Lys Thr Leu Asn Val Cys Thr Glu Thr Tyr Tyr Asn Asn Ala
180 185 190

Ile Lys Tyr Ala Val Lys Lys His Ala Val Ser Arg Phe Tyr Ile Phe
195 200 205

Ser Asp Asp Ile Pro Trp Cys Arg Glu His Leu Cys Phe Cys Asn Ala
210 215 220

His Ala Val Phe Ile Asp Trp Asn Thr Gly Asn Asp Ser Trp Gln Asp
225 230 235 240

Met Ala Leu Met Ser Met Cys Arg Cys Asn Ile Ile Ala Asn Ser Ser
245 250 255

Phe Ser Trp Trp Ala Ala Trp Leu Asn Asn Ala Ser Asp Lys Thr Val
260 265 270

Leu Ala Pro Ala Ile Trp Asn Arg Arg Gln Leu Glu Tyr Val Asp Arg
275 280 285

Tyr Tyr Gly Tyr Asp Tyr Ser Asp Ile Val Pro Glu Ser Trp Ile Arg
290 295 300

Ile Pro Ile Asp
305

<210> 143
<211> 281
<212> PRT
<213> Bacteroides eggerthii

<400> 143

Met Arg Leu Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Phe Tyr Leu Arg Met Lys Lys Arg His Thr Asn Thr Arg Ile
20 25 30

Asp Leu Ser Asp Met Met His Tyr Asn Val His His Gly Tyr Glu Met
35 40 45

His Arg Val Phe Asn Leu Pro Lys Thr Glu Phe Cys Ile Asn Gln Pro
50 55 60

Leu Lys Lys Val Ile Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65 70 75 80

Lys Gln Asp Pro Ser Ser Leu Leu Pro Phe Asp Lys Lys Tyr Leu Trp
85 90 95

```
Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
            100                 105                 110

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

Phe Asn Glu Lys Thr Gln Ala Met Leu Thr Gln Ile Lys His Asn Glu
    130                 135                 140

His Ala Val Ser Leu His Ile Arg Arg Gly Asp Tyr Leu Glu Pro Lys
145                 150                 155                 160

His Trp Lys Thr Thr Gly Ser Val Cys Gln Leu Pro Tyr Tyr Leu Asn
                165                 170                 175

Ala Ile Thr Glu Met Asn Lys Arg Ile Glu Gln Pro Ser Tyr Tyr Val
            180                 185                 190

Phe Ser Asp Asp Ile Ala Trp Val Lys Glu Asn Leu Pro Leu Pro Gln
        195                 200                 205

Ala Val Phe Ile Asp Trp Asn Lys Gly Ala Glu Ser Trp Gln Asp Met
    210                 215                 220

Met Leu Met Ser His Cys Arg His His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Arg Glu Asn Lys Thr Val Ile
                245                 250                 255

Met Pro Glu Arg Trp Phe Gln His Cys Asp Thr Pro Asn Ile Tyr Pro
            260                 265                 270

Asp Gly Trp Ile Lys Val Pro Val Asn
        275                 280


<210>  144
<211>  287
<212>  PRT
<213>  Bacteroides stercoris

<400>  144

Met Arg Phe Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Phe Tyr Met Arg Met Lys Lys His Tyr Ser Asn Thr Arg Ile
            20                  25                  30

Asp Leu Ser Asp Met Val His Tyr Lys Ala His Asn Gly Tyr Glu Met
        35                  40                  45

His Arg Val Phe Asn Leu Pro Pro Ile Glu Phe Arg Ile Asn Gln Pro
```

50 55 60

Leu Lys Lys Val Ile Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65 70 75 80

Lys Gln Val Pro Ser Ser Leu Val Pro Tyr Asp Lys Lys Tyr Phe Trp
85 90 95

Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
100 105 110

Asp Met Ala Asp Asp Ile Arg Lys Ala Phe Thr Phe Asn Pro Arg Leu
115 120 125

Ser Asn Arg Lys Thr Lys Glu Met Ser Glu Gln Ile Asp His Asp Glu
130 135 140

Asn Ala Val Ser Ile His Val Arg Arg Gly Asp Tyr Leu Glu Pro Lys
145 150 155 160

Tyr Trp Lys Thr Thr Gly Cys Val Cys Gln Leu Pro Tyr Tyr Leu Asn
165 170 175

Ala Ile Ala Glu Met Asn Lys Arg Ile Ser Gln Pro Ser Tyr Tyr Val
180 185 190

Phe Ser Asp Asp Ile Ala Trp Val Lys Glu Asn Leu Pro Leu Pro Lys
195 200 205

Ala Phe Phe Ile Asp Trp Asn Lys Gly Ala Glu Ser Trp Gln Asp Met
210 215 220

Met Leu Met Ser Arg Cys Arg His His Ile Ile Cys Asn Ser Thr Phe
225 230 235 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Arg Glu Asn Lys Thr Val Ile
245 250 255

Met Pro Glu Arg Trp Phe Arg His Cys Glu Thr Pro Asp Ile Cys Pro
260 265 270

Asp Lys Trp Ile Lys Val Pro Ile Asn Gln Pro Asp Ser Ile Gln
275 280 285

<210> 145
<211> 290
<212> PRT
<213> Butyrivibrio proteoclasticus

<400> 145

Met Ile Ile Ile Gln Leu Lys Gly Gly Met Gly Asn Gln Met Phe Gln
1 5 10 15

```
Tyr Ala Leu Tyr Arg Gln Leu Lys Lys Leu Gly Arg Glu Val Lys Ile
            20                  25                  30

Asp Asp Glu Thr Gly Phe Val Asp Asp Glu Leu Arg Ile Pro Val Leu
        35                  40                  45

Gln Arg Phe Gly Ile Ser Tyr Asp Lys Ala Thr Arg Glu Glu Ile Val
    50                  55                  60

Lys Leu Thr Asp Ser Lys Met Asp Ile Phe Ser Arg Ile Arg Arg Lys
65                  70                  75                  80

Leu Thr Gly Arg Lys Thr Phe Arg Ile Asp Glu Glu Ser Gly Ile Phe
                85                  90                  95

Asp Pro Arg Ile Leu Glu Val Glu Asp Ala Tyr Leu Val Gly Tyr Trp
            100                 105                 110

Gln Ser Asp Lys Tyr Phe Ala Asn Glu Glu Val Glu Lys Glu Ile Arg
        115                 120                 125

Glu Ala Phe Glu Lys Arg Pro Gln Glu Val Met Gln Asp Ser Val Ser
    130                 135                 140

Trp Thr Ile Leu Gln Gln Ile Glu Cys Cys Glu Ser Val Ser Leu His
145                 150                 155                 160

Ile Arg Arg Thr Asp Tyr Ile Asp Glu Glu His Ile His Ile His Asn
                165                 170                 175

Ile Cys Thr Glu Lys Tyr Tyr Lys Ser Ala Ile Asp Glu Val Arg Asn
            180                 185                 190

Gln Tyr Pro Ser Ala Val Phe Phe Ile Phe Thr Asp Asp Lys Asp Trp
        195                 200                 205

Cys Arg Gln His Phe Arg Gly Pro Asn Phe Phe Val Val Asp Leu Asp
    210                 215                 220

Glu Asp Thr Asn Thr Asp Ile Ala Glu Met Thr Leu Met Ser Arg Cys
225                 230                 235                 240

Lys His His Ile Leu Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp
                245                 250                 255

Leu Asn Asp Asn Pro Gly Lys Ile Val Ile Ala Pro Ser Lys Trp Ile
            260                 265                 270

Asn Asn Arg Lys Met Asp Asp Ile Tyr Thr Ala Arg Met Lys Lys Ile
        275                 280                 285
```

Ala Ile
290

<210> 146
<211> 303
<212> PRT
<213> Prevotella oulora

<400> 146

Met Ser Pro Ile Val His Phe Pro Ser Asp Arg Leu Leu Arg Tyr Glu
1 5 10 15

His Leu Asn Ser Leu Trp Lys Thr Ala Met Ile Tyr Thr Arg Leu Leu
20 25 30

Ala Arg Leu Gly Asn Gln Met Phe Gln Tyr Ala Ala Gly Arg Gly Leu
35 40 45

Ala Ala Arg Leu Gly Val Asp Phe Thr Val Asp Ser Arg Arg Ala Val
50 55 60

His Lys Gly Asp Gly Val Leu Thr Arg Val Phe Asp Leu Asp Trp Ala
65 70 75 80

Ala Pro Glu Asn Met Pro Pro Ala Gln His Glu Arg Pro Leu Ala Tyr
85 90 95

Tyr Ala Trp Arg Gly Leu Arg Arg Asp Pro Lys Ile Tyr Arg Glu Asn
100 105 110

Gly Leu Gly Tyr Asn Ala Ala Phe Glu Thr Leu Pro Asp Asn Thr Tyr
115 120 125

Leu His Gly Tyr Trp Gln Cys Glu Arg Tyr Phe Ala His Ile Ala Asp
130 135 140

Asp Ile Arg Ala Ala Phe Val Pro Arg His Pro Met Ser Ala Gln Asn
145 150 155 160

Ala Asp Met Ala Arg Arg Ile Ala Ser Gly Pro Ser Val Ser Leu His
165 170 175

Val Arg Arg Gly Asp Tyr Leu Thr Val Gly Ala His Gly Ile Cys Asp
180 185 190

Gln Thr Tyr Tyr Asp Ala Ala Leu Ala Ala Val Met Gln Gly Leu Pro
195 200 205

Ser Pro Thr Val Tyr Val Phe Ser Asp Asp Pro Gln Trp Ala Lys Asp
210 215 220

```
Asn Leu Pro Leu Thr Phe Glu Lys Val Val Val Asp Phe Asn Gly Pro
225                 230                 235                 240

Asp Ser Asp Tyr Glu Asp Met Arg Leu Met Ser Leu Cys Gln His Asn
                245                 250                 255

Val Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Ala
            260                 265                 270

Asn Pro Gln Lys Arg Val Ala Gly Pro Ala Asn Trp Phe Ser Asn Pro
        275                 280                 285

Lys Leu Ser Asn Pro Asp Ile Leu Pro Ser Arg Trp Ile Arg Ile
    290                 295                 300
```

<210> 147
<211> 289
<212> PRT
<213> Thalassobacter arenae

<400> 147

```
Met Gly Gln Asp Met Ile Tyr Ser Arg Ile Phe Gly Gly Leu Gly Asn
1               5                   10                  15

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

Val Glu Leu Val Leu Asp Thr Arg Leu Ala Pro Pro Gly Ser His Trp
        35                  40                  45

Ala Phe Gly Leu Asp His Phe Asn Ile Ser Ala Arg Ile Ala Glu Pro
    50                  55                  60

Ser Glu Leu Pro Pro Ser Lys Asp Asn Phe Phe Lys Tyr Val Met Trp
65                  70                  75                  80

Arg Ala Phe Gly His Asp Pro Ala Phe Met Arg Glu Arg Gly Leu Gly
                85                  90                  95

Tyr Gln Ser Arg Ile Ala Gln Ala Pro Asp Gly Thr Tyr Leu His Gly
            100                 105                 110

Tyr Phe Gln Ser Glu Arg Tyr Phe Ala Asp Val Leu Asp His Leu Glu
        115                 120                 125

Asn Glu Leu Arg Ile Val Thr Pro Pro Asp Thr Arg Asn Ala Glu Tyr
    130                 135                 140

Ala Asp Arg Ile Ala Ser Ala Gly His Thr Val Ser Leu His Val Arg
145                 150                 155                 160
```

```
Arg Gly Asp Tyr Val Glu Thr Ser Lys Ser Asn Ser Thr His Ala Thr
                165                 170                 175

Cys Asp Glu Ala Tyr Tyr Leu Arg Ala Leu Ala Arg Leu Ser Glu Gly
            180                 185                 190

Lys Ser Asp Leu Lys Val Phe Val Phe Ser Asp Asp Pro Glu Trp Val
        195                 200                 205

Arg Asp Asn Leu Lys Leu Pro Tyr Asp Thr Thr Pro Val Gly His Asn
    210                 215                 220

Gly Pro Asp Lys Pro His Glu Asp Leu Arg Leu Met Ser Cys Cys Ser
225                 230                 235                 240

Asp His Val Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Gly Trp Leu
                245                 250                 255

Asp Arg Arg Pro Glu Ala Arg Val Val Gly Pro Ala Lys Trp Phe Asn
            260                 265                 270

Asn Pro Lys Leu Val Asn Pro Asp Ile Leu Pro Glu Arg Trp Ile Ala
        275                 280                 285

Ile
```

<210> 148
<211> 290
<212> PRT
<213> Prevotella oris

<400> 148

```
Met Lys Ile Ile Lys Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Ala Val Ala Leu Gln Lys Lys Trp Lys Asp Glu Glu Ile
            20                  25                  30

Lys Leu Asp Leu His Gly Phe Asn Gly Tyr His Lys His Gln Gly Tyr
        35                  40                  45

Gln Leu Asp Glu Ile Phe Gly His Arg Phe Lys Ala Ala Ser Leu Lys
    50                  55                  60

Glu Val Ala Gln Leu Ala Trp Pro Tyr Pro His Tyr Gln Leu Trp Arg
65                  70                  75                  80

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

Ala Asp Cys Arg Phe Gln Ser Asp Leu Leu Asn Leu Glu Gly Ser Leu
```

100 105 110

Tyr Tyr Asp Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Lys Ala Phe Arg
115 120 125

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

Asn Arg Lys Val Glu Asn Met Leu Lys Glu Gly Arg Phe Ala Ser Leu
145 150 155 160

His Val Arg Arg Gly Asp Tyr Leu Lys Glu Pro Leu Phe Gln Ser Thr
165 170 175

Cys Asp Ile Ala Tyr Tyr Gln Arg Ala Ile Ser Arg Leu Asn Gln Met
180 185 190

Ala Asp Pro Tyr Cys Tyr Leu Ile Phe Ser Asn Asp Ile Ala Trp Cys
195 200 205

Lys Thr His Ile Glu Pro Leu Cys Asp Gly Arg Arg Thr His Tyr Val
210 215 220

Asp Trp Asn His Gly Lys Glu Ser Tyr Arg Asp Met Gln Leu Met Thr
225 230 235 240

Phe Cys Lys His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
245 250 255

Ala Trp Leu Ser Thr Ala Asn Asp Gly Ile Thr Ile Ala Pro His Gln
260 265 270

Trp Tyr Ala Asn Asp Arg Lys Pro Ser Pro Ala Ala Glu Ala Trp Leu
275 280 285

Lys Leu
290

<210> 149
<211> 290
<212> PRT
<213> Prevotella oulora

<400> 149

Met Lys Ile Val Arg Ile Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Ala Leu Ala Leu Lys Gln Gln Gln Glu Asn Glu Glu Val
20 25 30

Lys Leu Asp Leu Ser Ala Phe Arg Gly Tyr Lys Lys His Gly Gly Phe
35 40 45

```
Gln Leu Val Gln Cys Phe Gly Thr Thr Leu Pro Ala Ala Thr Trp Gln
    50                  55                  60

Glu Val Ala Gln Leu Ala Trp Tyr Tyr Pro His Tyr Gln Leu Trp Arg
65                  70                  75                  80

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

Asp Asn Gly Ala Phe Leu Pro Glu Val Leu Gln Arg Lys Gly Asp Ala
            100                 105                 110

Tyr Tyr Glu Gly Cys Trp Gln Asp Glu Arg Tyr Phe Ser His Tyr Arg
        115                 120                 125

Pro Ala Ile Leu Gln Ala Phe Thr Phe Pro Thr Phe Thr Asn Pro Arg
    130                 135                 140

Asn Leu Ala Met Gln Gln Gln Ile Asn Thr Thr Glu Ser Val Ala Ile
145                 150                 155                 160

His Val Arg Arg Gly Asp Tyr Leu His Asp Ala Leu Phe Arg Asn Thr
                165                 170                 175

Cys Gly Leu Ala Tyr Phe Gln Arg Ala Ile Thr Cys Ile Leu Gln His
            180                 185                 190

Val Ala His Pro Val Phe Tyr Val Phe Ser Asp Asp Met Ala Trp Cys
        195                 200                 205

Arg Gln His Ile Gln Pro Leu Leu Gln Thr Asn Glu Ala Val Phe Val
    210                 215                 220

Asp Trp Asn His Gly Lys Ala Ser Ile Cys Asp Leu His Leu Met Thr
225                 230                 235                 240

Leu Cys Arg His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly
                245                 250                 255

Ala Trp Leu Ser Pro His Gln Ala Gly Trp Ile Ile Ala Pro Lys Gln
            260                 265                 270

Trp Tyr Ala His Glu Glu Lys Met Ser Pro Ala Ala Glu Arg Trp Leu
        275                 280                 285

Lys Leu
    290
```

<210> 150
<211> 298

<212> PRT
<213> Spirosoma panaciterrae

<400> 150

```
Met Asn Arg Arg Val Ala Val Gln Leu Lys Gly Gly Leu Gly Asn Gln
1               5                   10                  15

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

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

Asn Phe Thr Phe Arg Ser Phe Asp Leu Asp Met Phe Arg Ile Ala Gly
    50                  55                  60

Arg Val Ala Thr Pro Ser Asp Leu Pro Leu Phe Pro Lys Ser Ala Ser
65                  70                  75                  80

Ile Arg Ser Pro Trp Pro His Leu Val Gln Leu Ala Arg Leu Trp Lys
                85                  90                  95

Gln Gly Tyr Ser Tyr Val Tyr Glu Arg Gly Phe Ala Tyr Asn Pro Lys
            100                 105                 110

Met Leu Arg Gln Leu Ser Asp Arg Val Tyr Leu Asn Gly Tyr Trp Gln
        115                 120                 125

Ser Tyr Arg Tyr Phe Glu Asp Ile Ala Ala Thr Leu Arg Ala Asp Cys
    130                 135                 140

Ser Phe Pro Asp Pro Leu Pro Asp Ser Ala Val Gly Leu Ala Gly Gln
145                 150                 155                 160

Ile Asn Ala Thr Asn Ser Ile Cys Leu His Ile Arg Arg Thr Asp Phe
                165                 170                 175

Leu Gln Val Pro Leu His Gln Val Ser Asn Ala Asp Tyr Val Gly Arg
            180                 185                 190

Ala Ile Ala Tyr Met Ala Glu Arg Val Asn Asp Pro His Phe Phe Val
        195                 200                 205

Phe Ser Asp Asp Ile Ala Trp Cys Gln Thr Asn Leu Arg Leu Ser Tyr
    210                 215                 220

Pro Val Val Phe Val Pro Asn Glu Leu Ala Gly Pro Lys Asn Ser Leu
225                 230                 235                 240

His Phe Arg Leu Met Arg Tyr Cys Lys His Phe Ile Thr Ala Asn Ser
                245                 250                 255
```

```
Thr Phe Ser Trp Trp Ala Ala Trp Leu Ser Glu Pro Ser Asp Gly Lys
            260                 265                 270

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

Asp Leu Ile Pro Ala Asn Trp Ile Arg Leu
    290                 295
```

<210> 151
<211> 267
<212> PRT
<213> Butyrivibrio proteoclasticus

<400> 151

```
Met Asn Tyr Val Glu Val Lys Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Thr Phe Tyr Lys Tyr Leu Glu Lys Lys Ser Gly His Lys Val Leu
            20                  25                  30

Leu His Thr Asp Phe Phe Lys Asn Ile Asp Ser Phe Glu Glu Ala Thr
        35                  40                  45

Lys Arg Lys Leu Gly Leu Asp Arg Phe Asp Cys Asp Phe Val Ala Val
    50                  55                  60

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

Asp Ser Met Leu Ser Gln Asp Glu Val Phe Tyr Ser Gly Tyr Trp Gln
                85                  90                  95

Asn Lys Arg Phe Phe Leu Glu Val Met Asp Asp Ile Arg Lys Asp Leu
            100                 105                 110

Leu Leu Lys Asp Glu Asn Ile Gln Asp Glu Val Lys Glu Leu Ala Lys
        115                 120                 125

Glu Leu Arg Ala Val Asp Ser Val Ala Ile His Phe Arg Arg Gly Asp
    130                 135                 140

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

Tyr Tyr Gln Lys Ala Ile Ala Gln Leu Ala Glu Arg Asn Gly Ala Asp
                165                 170                 175

Leu Lys Gly Tyr Ile Phe Thr Asp Glu Pro Glu Tyr Val Ser Gly Ile
            180                 185                 190
```

```
Ile Asp Gln Leu Gly Ser Ile Asp Ile Lys Leu Met Pro Val Arg Glu
        195                 200                 205

Asp Tyr Glu Asp Leu Tyr Leu Met Ser Cys Ala Arg His His Ile Ile
    210                 215                 220

Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Ala Leu Gly Asp Thr Glu
225                 230                 235                 240

Ser Gly Ile Thr Ile Ala Pro Ala Lys Trp Tyr Val Asp Gly Arg Thr
                245                 250                 255

Pro Asp Leu Tyr Leu Arg Asn Trp Ile Ser Ile
            260                 265
```

<210> 152
<211> 290
<212> PRT
<213> Butyrivibrio sp. XPD2006

<400> 152

```
Met Ile Ile Ile Gln Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Leu Tyr Lys Glu Leu Lys His Arg Gly Arg Glu Val Lys Ile
            20                  25                  30

Asp Asp Val Ser Gly Phe Val Asn Asp Lys Leu Arg Val Pro Val Leu
        35                  40                  45

Asp Arg Phe Gly Val Glu Tyr Glu Arg Ala Thr Arg Glu Glu Val Val
    50                  55                  60

Glu Leu Thr Asp Ser Arg Met Asp Ile Phe Ser Arg Ile Arg Arg Lys
65                  70                  75                  80

Leu Thr Gly Arg Lys Thr Tyr Arg Ile Asp Glu Met Glu Gly Ile Phe
                85                  90                  95

Asp Pro Ala Ile Leu Glu Thr Glu Asn Ala Tyr Leu Val Gly Tyr Trp
            100                 105                 110

Gln Ser Glu Lys Tyr Phe Thr Ser Pro Glu Val Ile Glu Gln Ile Gln
        115                 120                 125

Glu Ala Phe Gly Lys Arg Pro Gln Glu Ile Met His Asp Ser Val Ser
    130                 135                 140

Trp Ser Thr Leu Gln Gln Ile Glu Cys Cys Glu Ser Val Ser Ile His
145                 150                 155                 160

Val Arg Arg Thr Asp Tyr Val Asp Ala Glu His Ile Lys Ile His Asn
```

165 170 175

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

Lys His Pro Asn Ala Val Phe Phe Ile Phe Thr Asp Asp Lys Glu Trp
195 200 205

Cys Lys Asp His Phe Lys Gly Pro Asn Phe Ile Thr Val Glu Leu Gln
210 215 220

Glu Gly Glu Phe Thr Asp Val Ala Asp Met Leu Leu Met Ser Arg Cys
225 230 235 240

Lys His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ser Ala Trp
245 250 255

Leu Asn Asp Ser Pro Glu Lys Met Val Ile Ala Pro Ser Lys Trp Ile
260 265 270

Asn Asn Lys Lys Met Asp Asp Ile Tyr Thr Glu Arg Met Thr Arg Val
275 280 285

Ala Ile
290

<210> 153
<211> 306
<212> PRT
<213> Bacteroides sp. 1_1_6

<400> 153

Met Lys Ile Val Asn Ile Thr Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Phe Ala Met Ala Leu Lys Tyr Arg Asn Pro Gln Glu Glu Val
20 25 30

Phe Val Asp Ile Gln His Tyr Asn Thr Ile Phe Phe Lys Lys Phe Lys
35 40 45

Gly Ile Asn Leu His Asn Gly Tyr Glu Ile Asp Lys Val Phe Pro Lys
50 55 60

Ala Lys Leu Pro Val Ala Gly Val Arg Gln Leu Met Lys Phe Ser Tyr
65 70 75 80

Trp Ile Pro Asn Tyr Ile Leu Ser Arg Leu Gly Arg Lys Phe Leu Pro
85 90 95

Ile Arg Lys Lys Glu Tyr Ile Pro Pro Tyr Ser Met Asn Tyr Ser Tyr
100 105 110

```
Asp Glu Lys Ala Leu Asn Trp Lys Gly Asp Gly Tyr Phe Glu Gly Tyr
        115                 120                 125

Trp Gln Ser Tyr Asn His Phe Gly Asp Ile Lys Glu Glu Leu Gln Lys
    130                 135                 140

Val Tyr Ala His Pro Lys Pro Asn Gln Tyr Asn Ala Ala Leu Ile Ser
145                 150                 155                 160

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

Tyr Leu Ala Glu Pro Glu Phe Arg Gly Ile Cys Gly Leu Asp Tyr Tyr
            180                 185                 190

Glu Lys Gly Ile Lys Glu Ile Leu Ser Asp Glu Lys Lys Tyr Val Phe
        195                 200                 205

Phe Ile Phe Ser Asn Asp Met Gln Trp Cys Gln Glu Asn Ile Ala Pro
    210                 215                 220

Leu Val Gly Asp Asn Arg Ile Val Phe Ile Ser Gly Asn Lys Gly Lys
225                 230                 235                 240

Asp Ser Cys Trp Asp Met Phe Leu Met Thr His Cys Lys Asp Leu Ile
                245                 250                 255

Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Phe Leu Asn Lys Lys
            260                 265                 270

Val Asp Arg Val Ile Cys Pro Lys Pro Trp Leu Asn Arg Asp Cys Asn
        275                 280                 285

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

Asp Trp
305
```

<210> 154
<211> 271
<212> PRT
<213> Bacteroides fragilis

<400> 154

```
Met Lys Ile Val Thr Phe Gln Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Val Phe Tyr Leu Trp Leu Asp Met Arg Cys Asp Lys Asp Asn Ile
            20                  25                  30
```

```
Tyr Gly Tyr Tyr Pro Lys Lys Gly Leu Arg Ala His Asn Gly Leu Glu
        35                  40                  45

Ile Glu Lys Val Phe Glu Val Lys Leu Pro Asn Ser Ser Leu Ser Thr
    50                  55                  60

Asp Leu Ile Val Lys Ser Ile Lys Leu Ile Asn Lys Ile Phe Lys Asn
65                  70                  75                  80

Arg Gln Tyr Ile Ser Thr Asp Gly Arg Leu Asp Val Asn Gly Val Leu
                85                  90                  95

Phe Glu Gly Phe Trp Gln Asp Lys Tyr Phe Trp Glu Asp Val Asp Ile
            100                 105                 110

Val Leu Asn Phe Arg Trp Pro Leu Lys Leu Asp Val Thr Asn Ser Phe
        115                 120                 125

Ile Met Thr Lys Ile Gln Ala Asn Asn Ser Ile Ser Ile His Ile Arg
    130                 135                 140

Arg Gly Asp Tyr Leu Leu Pro Lys Tyr Arg Asn Ile Tyr Gly Asp Ile
145                 150                 155                 160

Cys Asn Glu Glu Tyr Tyr Gln Lys Ala Ile Glu Tyr Ile Leu Lys Cys
                165                 170                 175

Val Asp Asp Pro Phe Phe Phe Val Phe Ser Asp Asp Ile Asp Trp Ala
            180                 185                 190

Lys Ser Ile Ile Asn Val Ser Asn Val Thr Phe Val Asn Asn Asn Lys
        195                 200                 205

Gly Lys Asp Ser Tyr Ile Asp Met Phe Leu Met Ser Leu Cys His His
    210                 215                 220

Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Ala Ala Gln Leu Asn
225                 230                 235                 240

Lys His Ser Asp Lys Ile Met Ile Ala Pro Ile Arg Trp Phe Lys Ser
                245                 250                 255

Leu Phe Lys Asp Pro Asn Ile Phe Thr Glu Ser Trp Ile Arg Ile
            260                 265                 270
```

<210> 155
<211> 266
<212> PRT
<213> Bacteroides sp. 9_1_42FAA

<400> 155

```
Met Ile Lys Ile Val Ser Phe Ser Gly Gly Leu Gly Asn Gln Leu Phe
1               5                   10                  15

Gln Tyr Leu Leu Val Val Tyr Leu Arg Glu Cys Gly His Gln Val Tyr
            20                  25                  30

Gly Tyr Tyr Asn Arg Lys Trp Leu Ile Gly His Asn Gly Leu Glu Val
        35                  40                  45

Asn Asn Val Phe Asp Ile Tyr Leu Pro Lys Thr Asn Phe Ile Val Asn
    50                  55                  60

Ala Leu Val Lys Val Ile Arg Val Leu Arg Cys Leu Gly Phe Lys Lys
65                  70                  75                  80

Tyr Val Ala Thr Asp Thr Tyr Asn Asn Pro Ile Ala Ile Phe Tyr Asp
                85                  90                  95

Gly Tyr Trp Gln Asp Gln Lys Tyr Phe Asn Ile Ile Asp Ser Lys Leu
            100                 105                 110

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

Lys Ile Lys Ser Asn Ile Ser Val Ala Leu His Ile Arg Cys Gly Asp
    130                 135                 140

Tyr Leu Ser Ser Ser Asn Val Glu Ile Tyr Gly Gly Val Cys Thr Lys
145                 150                 155                 160

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

Met Phe Phe Val Phe Ser Asp Asp Ile Glu Tyr Ala Lys Leu Leu Leu
            180                 185                 190

Asn Leu Pro Asn Ala Ile Tyr Val Asn Ala Asn Val Gly Asn Ser Ser
        195                 200                 205

Phe Ile Asp Met Tyr Leu Met Ala Asn Cys Lys Val Asn Val Ile Ala
    210                 215                 220

Asn Ser Thr Phe Ser Tyr Trp Ala Ala Arg Leu Asn Gln Asp Asn Ile
225                 230                 235                 240

Leu Thr Ile Tyr Pro Lys Lys Trp Tyr Asn Ser Lys Tyr Ala Val Pro
                245                 250                 255

Asp Ile Phe Pro Ser Glu Trp Val Gly Val
            260                 265
```

<210> 156
<211> 298
<212> PRT
<213> Coraliomargarita sp. CAG:312

<400> 156

Met Ile Ile Val Lys Val Gln Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Phe Gly Arg Ala Leu Ser Glu Lys His Ser Gln Asp Leu Tyr
20 25 30

Leu Asp Cys Ser Glu Tyr Leu Arg Pro Ser Cys Lys Arg Glu Tyr Gly
35 40 45

Leu Asp His Phe Asn Ile Arg Ala Lys Lys Ala Ser Cys Gly Asp Val
50 55 60

Lys Ser Met Val Thr Pro His Phe Ala Leu Arg Lys Lys Leu Lys Lys
65 70 75 80

Ile Phe Ala Val Pro Tyr Ser Leu Ser Pro Thr His Ile Leu Glu Arg
85 90 95

Asn Phe Asn Phe Gln Pro Ser Ile Leu Glu Phe Asn Cys Gly Tyr Phe
100 105 110

Asp Gly Phe Trp Gln Thr Gln Lys Tyr Phe Ser Gly Ile Ser Asp Ile
115 120 125

Val Arg Lys Asp Leu Thr Phe Lys Asp Ala Val Lys Tyr Ser Gly Gly
130 135 140

Glu Thr Phe Ala Lys Ile Thr Ser Leu Asn Ser Val Ser Leu His Ile
145 150 155 160

Arg Arg Gly Asp Tyr Val Lys Val Lys Arg Thr Arg Lys Arg Phe Ser
165 170 175

Val Ile Arg Ala Gly Tyr Phe Lys Arg Ala Val Glu Tyr Met Arg Ser
180 185 190

Lys Leu Asp Thr Pro His Phe Phe Ile Phe Thr Asp Asp Pro Lys Trp
195 200 205

Val Ser Glu Asn Phe Pro Ala Gly Glu Asp Tyr Thr Leu Val Ser Ser
210 215 220

Ser Gly Met Tyr Glu Asp Leu Phe Leu Met Ala Gln Cys Arg His Asn
225 230 235 240

Ile Ile Phe Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Gly

245 250 255

Asn Pro Gly Lys Ile Val Val Ala Pro Asp Met Trp Phe Thr Pro His
260 265 270

Tyr Lys Leu Asp Tyr Ser Asp Val Val Pro Glu Glu Trp Ile Lys Leu
275 280 285

Asn Thr Gly Tyr Phe Glu Ser Lys Glu Phe
290 295

<210> 157
<211> 289
<212> PRT
<213> Pseudorhodobacter ferrugineus

<400> 157

Met Ile Val Met Gln Ile Lys Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Gly Arg Ala Leu Ser Leu Gln Thr Gly Met Pro Leu His
20 25 30

Leu Asp Leu Arg Tyr Tyr Arg Arg Glu Arg Glu His Gly Tyr Gly Leu
35 40 45

Gly Ala Phe Asn Ile Glu Ala Ser Pro Leu Asp Glu Ser Leu Leu Pro
50 55 60

Pro Leu Pro Arg Glu Ser Pro Leu Ala Trp Leu Ile Trp Arg Leu Gly
65 70 75 80

Arg Arg Gly Pro Asn Leu Val Arg Glu Asn Gly Met Gly Phe Asn Pro
85 90 95

Thr Leu Ser Asn Val Thr Lys Pro Ala Trp Ile Thr Gly Tyr Phe Gln
100 105 110

Ser Glu Arg Tyr Phe Ala Ala His Ala Ala Thr Ile Arg Ala Glu Leu
115 120 125

Thr Pro Val Ala Ala Pro Asp Leu Val Asn Ala Arg Trp Leu Ala Glu
130 135 140

Ile Ala Ala Glu Pro Arg Ala Val Ser Leu His Val Arg Arg Gly Asp
145 150 155 160

Tyr Val Arg Asp Ala Lys Ala Ala Ala Lys His Gly Ser Cys Thr Pro
165 170 175

Ala Tyr Tyr Glu Arg Ala Leu Ala His Ile Thr Ala Arg Met Gly Thr
180 185 190

```
Ala Pro Val Val Tyr Ala Phe Ser Asp Asp Pro Ala Trp Val Arg Glu
        195                 200                 205

Asn Leu Arg Leu Pro Ala Glu Ile Arg Val Pro Gly His Asn Asp Thr
    210                 215                 220

Ala Gly Asn Val Glu Asp Leu Arg Leu Met Ser Ala Cys Arg His His
225                 230                 235                 240

Ile Val Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Pro
                245                 250                 255

Arg Ala Asp Lys Ile Val Ala Ser Pro Ala Arg Trp Phe Ala Asp Pro
            260                 265                 270

Ala Phe Thr Asn Pro Asp Ile Trp Pro Glu Ala Trp Ala Arg Ile Glu
        275                 280                 285

Gly
```

<210> 158
<211> 299
<212> PRT
<213> Escherichia coli

<400> 158

```
Met Met Tyr Cys Cys Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Ala Tyr Ile Leu Lys Gln His Phe Pro Asp Thr Ile Leu
            20                  25                  30

Val Leu Asp Asp Ser Tyr Tyr Phe Asn Gln Pro Gln Lys Asp Thr Ile
        35                  40                  45

Arg His Leu Glu Leu Asp Gln Phe Lys Ile Ile Phe Asp Arg Phe Ser
    50                  55                  60

Ser Lys Asp Glu Lys Val Lys Ile Asn Arg Leu Arg Lys His Lys Lys
65                  70                  75                  80

Ile Pro Leu Leu Asn Ser Phe Leu Gln Phe Thr Ala Ile Lys Leu Cys
                85                  90                  95

Asn Lys Tyr Ser Leu Asn Asp Ala Ser Tyr Tyr Asn Pro Glu Ser Ile
            100                 105                 110

Lys Asn Ile Asp Val Ala Cys Leu Phe Ser Phe Tyr Gln Asp Ser Lys
        115                 120                 125
```

```
Leu Leu Asn Glu His Arg Asp Leu Ile Leu Pro Leu Phe Glu Ile Arg
    130                 135                 140

Asp Asp Leu Arg Val Leu Cys His Asn Leu Gln Ile Tyr Ser Leu Ile
145                 150                 155                 160

Thr Asp Ser Lys Asn Ile Thr Ser Ile His Val Arg Arg Gly Asp Tyr
                165                 170                 175

Val Asn Asn Lys His Ala Ala Lys Phe His Gly Thr Leu Ser Met Asp
            180                 185                 190

Tyr Tyr Ile Ser Ala Met Glu Tyr Ile Glu Ser Glu Cys Gly Ser Gln
        195                 200                 205

Thr Phe Ile Ile Phe Thr Asp Asp Val Ile Trp Ala Lys Glu Lys Phe
    210                 215                 220

Ser Lys Tyr Ser Asn Cys Leu Val Ala Asp Ala Asp Glu Asn Lys Phe
225                 230                 235                 240

Ser Val Ile Asp Met Tyr Leu Met Ser Leu Cys Asn Asn Asn Ile Ile
                245                 250                 255

Ala Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn Arg Ser Glu
            260                 265                 270

Asp Lys Leu Val Ile Ala Pro Lys Gln Trp Tyr Ile Ser Gly Asn Glu
        275                 280                 285

Cys Ser Leu Lys Asn Glu Asn Trp Ile Ala Met
    290                 295


<210>  159
<211>  299
<212>  PRT
<213>  Lachnospiraceae bacterium 3_1_57FAA_CT1

<400>  159

Met Ile Ile Ile Lys Val Met Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                   10                  15

Tyr Ala Leu Tyr Glu Lys Phe Lys Ser Ile Gly Lys Asn Val Lys Leu
            20                  25                  30

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

Arg Arg Ser Leu Glu Leu Arg Gln Phe Lys Asp Leu Gln Phe Asp Thr
    50                  55                  60
```

```
Cys Ser Ala Glu Glu Lys Glu Ala Leu Leu Gly Lys Ser Gly Ile Leu
65                  70                  75                  80

Gly Lys Leu Glu Arg Lys Leu Ile Pro Ala Arg Asn Lys His Phe Tyr
                85                  90                  95

Glu Ser Asp Ile Tyr His Ser Glu Val Phe Asn Met Ser Asp Ala Tyr
            100                 105                 110

Leu Glu Gly His Trp Ala Cys Glu Lys Tyr Tyr His Asp Ile Met Pro
        115                 120                 125

Leu Leu Gln Glu Lys Ile Gln Phe Pro Glu Ser Ala Asn Ser Gln Asn
    130                 135                 140

Ile Thr Val Lys Lys Arg Met Lys Ala Glu Asn Ser Val Ser Ile His
145                 150                 155                 160

Ile Arg Arg Gly Asp Tyr Leu Asp Pro Glu Asn Glu Ala Met Phe Gly
                165                 170                 175

Gly Ile Cys Thr Asn Ser Tyr Tyr Lys Ala Ala Glu Glu Tyr Ile Lys
            180                 185                 190

Ser Arg Val Pro Asp Thr His Phe Tyr Leu Phe Ser Asp Asp Thr Ala
        195                 200                 205

Tyr Leu Arg Glu Asn Tyr His Gly Asp Glu Tyr Thr Ile Val Asp Trp
    210                 215                 220

Asn Lys Gly Glu Asp Ser Phe Tyr Asp Met Glu Leu Met Ser Cys Cys
225                 230                 235                 240

Arg His Asn Ile Cys Ala Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg
                245                 250                 255

Leu Asn Arg Thr Pro Asp Lys Ile Val Ile Arg Pro Ala Lys His Lys
            260                 265                 270

Asn Ser Gln Glu Ile Glu Pro Gln Leu Leu His Glu Leu Trp Asp Asn
        275                 280                 285

Trp Val Ile Ile Asp Gly Asp Gly Arg Ile Val
    290                 295

<210>  160
<211>  733
<212>  PRT
<213>  Butyrivibrio fibrisolvens

<400>  160

Met Lys Pro Leu Val Ser Leu Ile Val Pro Val Leu Asn Val Glu Lys
```

1 5 10 15

Tyr Leu Glu Gln Cys Leu Thr Ser Ile Ser Ser Gln Thr Tyr Asp Asn
20 25 30

Phe Glu Val Ile Leu Val Val Gly Lys Cys Ile Asp Asn Ser Glu Asn
35 40 45

Ile Cys Lys Lys Trp Cys Glu Lys Asp His Arg Phe Arg Ile Glu Pro
50 55 60

Gln Leu Lys Ser Cys Leu Gly Tyr Ala Arg Asn Val Gly Ile Asp Ala
65 70 75 80

Ala Lys Gly Glu Tyr Ile Ala Phe Cys Asp Ser Asp Asp Cys Ile Thr
85 90 95

Ser Asp Phe Leu Ser Cys Phe Val Asp Thr Ala Leu Lys Asn Ser Ser
100 105 110

Asp Ile Val Glu Thr Gln Phe Thr Leu Cys Asp Gln Asn Leu Ser Pro
115 120 125

Ile Tyr Asp Tyr Asp Arg Asn Ile Leu Gly His Ile Leu Gly His Gly
130 135 140

Phe Leu Glu Tyr Thr Ser Ala Pro Ser Val Trp Lys Tyr Phe Val Lys
145 150 155 160

Arg Asp Ile Phe Thr Ser Asn Asn Leu His Tyr Pro Glu Ile Arg Phe
165 170 175

Gly Glu Asp Ile Ser Met Tyr Ser Leu Leu Phe Ser Tyr Cys Asn Lys
180 185 190

Ile Asp Tyr Val Glu Lys Pro Thr Tyr Leu Tyr Arg Gln Val Pro Ser
195 200 205

Ser Leu Met Asn Asn Pro Gln Gly Lys Arg Lys Arg Tyr Glu Ser Leu
210 215 220

Phe Asp Ile Ile Asp Phe Val Thr Asn Glu Phe Lys Thr Arg Leu Leu
225 230 235 240

Phe Gln Lys Ser Trp Leu Lys Leu Leu Phe Gln Leu Glu Met His Ser
245 250 255

Ala Ser Ile Ile Ser Asp Ser Ala Thr Ser Asp Asp Glu Ala Ile Ser
260 265 270

Met Arg Gln Glu Ile Ser Gly Tyr Leu Lys Lys Val Phe Pro Val Lys

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        275                 280                 285

Asn Thr Ile Phe Glu Val Thr Ala Leu Gly Trp Gly Gly Glu Ile Val
    290                 295                 300

Ser Ser Ile Ala Ser Lys Phe Asn Thr Leu His Gly Val Ser Ser Ser
305                 310                 315                 320

Asn Met Phe Asn Arg Tyr Phe Phe Glu Leu Leu Glu Asp Ser Thr Arg
                325                 330                 335

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

Ile Asp Leu Ile Ser Glu Ala Asp Tyr Leu Ser Ser Tyr Lys Gly Asn
        355                 360                 365

Leu Gly Thr Phe Val Lys Asn Trp Lys Ile Gly Phe Ser Ile Phe Met
    370                 375                 380

Lys Met Ile Gln Thr His Ser Asn Asn Ser Ser Ile Phe Leu Leu Glu
385                 390                 395                 400

Asn Tyr Met Gln Gln Ala Pro Asp His Val Asp Asn Thr Asn Glu Ile
                405                 410                 415

Leu Lys Met Leu Tyr Asp Asp Ile Lys Ile Asn His Pro Asp Ile Ile
            420                 425                 430

Cys Ile Ser Pro Ala Pro Asp Ile Leu Asn Arg Ser Ser Glu Pro Glu
        435                 440                 445

Leu Pro Cys Ile Tyr Gln Leu Lys Leu Val Ser Asp Lys Leu His Thr
    450                 455                 460

Met Tyr Ser Pro Val Ile Asn Cys Val Glu Thr Lys Gly Gly Leu Gly
465                 470                 475                 480

Asn Gln Ile Phe Gln Tyr Val Phe Ser Lys Tyr Ile Glu Lys Met Thr
                485                 490                 495

Gly Tyr Arg Pro Leu Leu His Ile Gly Phe Phe Asp Tyr Val Lys Ala
            500                 505                 510

Ile Pro Gly Gly Thr Lys Arg Ile Phe Ser Leu Asp Lys Leu Phe Pro
        515                 520                 525

Asp Ile Glu Thr Thr Ser Gly Lys Ile Pro Cys Ser His Val Val Glu
    530                 535                 540

Glu Lys Ser Phe Ile Ser Asn Pro Gly Ser Asp Ile Phe Tyr Arg Gly
```

545 550 555 560

Tyr Trp Gln Asp Ile Arg Tyr Phe Ser Asp Val Lys Asp Glu Val Leu
565 570 575

Glu Ser Phe Asn Val Asp Thr Ser Ser Met Ser Lys Asp Val Ile Asp
580 585 590

Phe Ala Asp Thr Ile Arg Asn Ala Asn Ser Ile Ala Met His Ile Arg
595 600 605

Arg Gln Asp Tyr Leu Asn Glu Asn Asn Val Ser Leu Phe Glu Gln Leu
610 615 620

Ser Ile Asp Tyr Tyr Lys Ser Ala Val Asp Met Ile Arg Lys Glu Tyr
625 630 635 640

Ala Asp Asp Leu Val Leu Phe Ile Phe Ser Asp Asp Pro Glu Tyr Ala
645 650 655

Asn Ser Ile Ala Asp Ser Phe Asp Ile Glu Gly Phe Val Met Pro Leu
660 665 670

His Lys Asp Tyr Glu Asp Leu Tyr Leu Ile Thr Leu Ala His His His
675 680 685

Ile Ile Ala Asn Ser Thr Phe Ser Leu Trp Gly Ala Leu Leu Ser Ala
690 695 700

Arg Lys Asp Gly Ile Arg Ile Ala Pro Arg Asn Trp Phe Lys Gly Thr
705 710 715 720

Pro Ala Thr Asn Leu Tyr Pro Asp Lys Trp Leu Ile Leu
725 730

<210> 161
<211> 286
<212> PRT
<213> Anaeromusa acidaminophila

<400> 161

Met Phe Cys Val Arg Ile Tyr Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Leu Gly Arg Ala Met Ala Lys His Tyr Ser Glu Thr Ala Ala
20 25 30

Phe Asp Leu Ser Trp Tyr Glu Gln Lys Ile Lys Pro Gly Phe Glu Ala
35 40 45

Ser Val Cys Gln Tyr Asn Ile Glu Leu Ser Arg Lys Asp Arg Pro Lys
50 55 60

```
Ala Trp Tyr Glu Pro Ile Leu Lys Arg Ile Ser Arg His Thr Asp Lys
65                  70                  75                  80

Leu Glu Met Trp Phe Gly Leu Phe Phe Glu Lys Lys Tyr His Tyr Asp
                85                  90                  95

Ser Thr Val Phe Glu Arg Gly Leu Cys Lys Lys Asn Ile Thr Leu Asp
            100                 105                 110

Gly Tyr Trp Gln Ser Tyr Lys Tyr Phe Ser Ala Ile Glu Asp Asp Leu
        115                 120                 125

Arg Arg Glu Leu Thr Ile Pro Lys Glu Arg Glu Glu Leu Ile Ala Ile
    130                 135                 140

Ser Arg Ser Leu Pro Glu Asn Ser Val Ser Ile His Val Arg Arg Gly
145                 150                 155                 160

Asp Tyr Val Ser Asn Pro Lys Ala Asn Ala Met His Gly Thr Cys Ser
                165                 170                 175

Trp Glu Tyr Tyr Gln Ala Ala Ile Glu Lys Met Thr Gly Leu Val Lys
            180                 185                 190

Glu Pro Gln Tyr Val Val Phe Ser Asp Asp Ile Thr Trp Thr Lys Glu
        195                 200                 205

Asn Leu Pro Leu Pro Asn Ala Met Tyr Ile Gly Arg Glu Leu Gly Leu
    210                 215                 220

Phe Asp Tyr Glu Glu Leu Ile Leu Met Ser Arg Cys Lys His Asn Ile
225                 230                 235                 240

Met Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn Ser Asn
                245                 250                 255

Pro Asn Lys Val Val Ile Ala Pro Arg Lys Trp Phe Arg His Lys Lys
            260                 265                 270

Ile Lys Val Asn Asp Leu Phe Pro Ser Ser Trp Val Val Leu
        275                 280                 285
```

<210> 162
<211> 292
<212> PRT
<213> Bacteroides sp. 2_1_16

<400> 162

```
Met Asp Ile Val Val Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                   10                  15
```

```
Tyr Ala Phe Tyr Leu Ala Lys Lys Lys Asp Asn Leu Asn Cys His Val
            20                  25                  30

Ile Phe Asp Pro Lys Ser Thr Asn Val His Asn Gly Ala Glu Leu Lys
        35                  40                  45

Arg Val Phe Gly Ile Glu Leu Asn Arg Asn Tyr Leu Asp Lys Ile Ile
    50                  55                  60

Ser Tyr Phe Tyr Gly Tyr Ile Phe Asn Lys Arg Ile Val Asn Lys Leu
65                  70                  75                  80

Phe Ser Leu Val Gly Ile Arg Met Ile Tyr Glu Pro Lys Asn Tyr Asp
                85                  90                  95

Tyr Arg Glu Glu Leu Leu Lys Pro Ser Ser Asn Phe Ile Ser Phe Tyr
            100                 105                 110

Trp Gly Gly Trp His Ser Glu Lys Tyr Phe Lys Asp Ile Glu Leu Glu
        115                 120                 125

Val Lys Lys Val Phe Lys Phe Pro Glu Val Thr Asn Ser Pro Tyr Phe
    130                 135                 140

Thr Glu Trp Phe Asn Lys Ile Phe Leu Asp Asn Asn Ser Val Ser Ile
145                 150                 155                 160

His Ile Arg Arg Gly Asp Tyr Leu Asp Lys Pro Ser Asp Pro Tyr Tyr
                165                 170                 175

Gln Phe Asn Gly Val Cys Thr Ile Asp Tyr Tyr Glu Lys Ala Ile Leu
            180                 185                 190

Tyr Leu Lys Glu Arg Ile Leu Glu Pro Asn Phe Tyr Ile Phe Ser Asn
        195                 200                 205

Asp Ile Asn Trp Cys Met Lys Thr Phe Gly Thr Glu Asn Met Tyr Tyr
    210                 215                 220

Val Asp Cys Asn Lys Gly Lys Asp Ser Trp Arg Asp Met Tyr Leu Met
225                 230                 235                 240

Ser Glu Cys Arg His His Ile Asn Ala Asn Ser Thr Phe Ser Trp Trp
                245                 250                 255

Ala Ala Trp Leu Ser Pro Tyr Ser Asn Gly Ile Val Leu His Pro Lys
            260                 265                 270

Tyr Phe Ile Lys Asp Ile Glu Thr Lys Asp Tyr Tyr Pro Gln Lys Trp
        275                 280                 285
```

Ile Met Ile Glu
290

<210> 163
<211> 283
<212> PRT
<213> Chlorobium phaeobacteroides

<400> 163

Met Asp Lys Val Val Val His Leu Thr Gly Gly Leu Gly Asn Gln Met
1 5 10 15

Phe Gln Tyr Ala Leu Gly Arg Ser Ile Ser Ile Asn Arg Asn Cys Pro
20 25 30

Leu Leu Leu Asn Thr Ser Phe Tyr Asp Thr Tyr Asp Lys Phe Ser Cys
35 40 45

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

Tyr Tyr Asn Asn Lys Tyr Tyr Arg Tyr Val Ile Arg Leu Leu Ser Arg
65 70 75 80

Tyr Gly Val Ala Cys Tyr Phe Gly Ser Tyr Tyr Glu Lys Lys Ile Phe
85 90 95

Ser Tyr Asp Glu Lys Val Tyr Lys Arg Ser Cys Val Ser Tyr Tyr Gly
100 105 110

Thr Trp Gln Ser Tyr Gly Tyr Phe Asp Ser Ile Arg Asp Ile Leu Leu
115 120 125

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

Val Ser Asp Ile Lys Arg Val Asp Ser Val Ser Leu His Ile Arg Arg
145 150 155 160

Gly Asp Tyr Phe Asp Asn Lys Arg Leu Gln Ser Ile His Gly Ile Leu
165 170 175

Thr Met Glu Tyr Tyr Tyr Lys Ala Met Ser Leu Phe Pro Asp Ser Ser
180 185 190

Val Phe Tyr Val Phe Ser Asp Asp Ile Glu Trp Val Arg Glu Asn Leu
195 200 205

Ile Thr Asn Thr Asn Ile Val Tyr Val Val Leu Glu Ser Asp Asn Pro
210 215 220

```
Glu Asn Glu Ile Tyr Leu Met Ser Leu Cys Lys Asn Asn Ile Ile Ser
225                 230                 235                 240

Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn Lys Asn Lys Tyr
                245                 250                 255

Lys Lys Val Ile Ala Pro Arg Met Trp Tyr Lys Asp Asn Gln Ser Ser
            260                 265                 270

Ser Asp Leu Met Pro Ser Asp Trp Cys Leu Ile
        275                 280
```

<210> 164
<211> 297
<212> PRT
<213> Treponema bryantii

<400> 164

```
Met Ile Val Ile Ser Met Gly Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Ala Phe Tyr Thr Gln Leu Lys His Leu Tyr Pro Lys Ser Glu Ile
            20                  25                  30

Lys Val Asp Thr Lys Tyr Ala Phe Pro Tyr Ser His Asn Gly Ile Glu
        35                  40                  45

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

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

Phe Ile Lys Phe Phe Leu Tyr Arg Ile Leu Arg Lys Ala Asn Leu Val
                85                  90                  95

Glu Arg Glu Pro Thr Ser Phe Cys Lys Gln Lys Asp Phe Thr Glu Phe
            100                 105                 110

Tyr Asn Ser Phe Phe Glu Leu Pro Gln Asn Lys Ser Phe Tyr Leu Tyr
        115                 120                 125

Gly Pro Phe Val Asn Tyr Asn Tyr Phe Ala Ala Ile His Asn Glu Ile
    130                 135                 140

Met Asp Leu Tyr Thr Phe Pro Glu Ile Thr Asp Val Thr Asn Ile Glu
145                 150                 155                 160

Tyr Lys Arg Lys Ile Glu Ser Ser His Ser Ile Ser Ile His Ile Arg
                165                 170                 175

Arg Gly Asp Tyr Ile Thr Glu Gly Val Pro Leu Val Pro Asp Ala Tyr
```

180 185 190

Tyr Arg Glu Ala Leu Val Tyr Ile Asn Lys Lys Ile Glu Asp Pro His
195 200 205

Phe Phe Val Phe Thr Asp Asp Lys Asp Tyr Cys Lys Ser Leu Phe Ser
210 215 220

Asp Asn Gln Asn Phe Thr Ile Val Glu Gly Asn Thr Gly Ala Asn Ser
225 230 235 240

Phe Arg Asp Met Gln Leu Met Ser Leu Cys Lys His Asn Ile Ile Ala
245 250 255

Asn Ser Thr Phe Ser Phe Trp Gly Ala Phe Leu Asn Lys Asn Ser Glu
260 265 270

Lys Ile Val Ile Ala Pro Asn Ile Ala Phe Lys Asp Cys Ser Cys Pro
275 280 285

Tyr Ile Cys Pro Asp Trp Ile Ile Leu
290 295

<210> 165
<211> 290
<212> PRT
<213> Bacteroides fragilis

<400> 165

Met Val Ile Ala Lys Leu Phe Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Ala Ala Lys Gly Ile Ala Gln Ile Ser Asn Gln Lys Leu Thr
20 25 30

Phe Asp Ile Tyr Thr Gly Phe Glu Asp Asp Ser Arg Phe Arg Arg Val
35 40 45

Tyr Glu Leu Lys Gln Phe Asn Leu Ser Val Gln Glu Ser Arg Arg Trp
50 55 60

Met Ser Phe Arg Tyr Pro Leu Gly Arg Ile Leu Arg Lys Ile Ser Arg
65 70 75 80

Lys Ile Gly Phe Cys Ile Pro Leu Val Asn Phe Lys Phe Ile Val Glu
85 90 95

Lys Lys Pro Tyr His Phe Gln Asn Glu Ile Met Arg Ile Ala Ser Phe
100 105 110

Ser Ser Ile Tyr Leu Glu Gly Tyr Phe Gln Ser Tyr Lys Tyr Phe Ser
115 120 125

```
Lys Ile Glu Ala Gln Ile Arg Glu Asp Phe Lys Phe Thr Lys Glu Val
    130                 135                 140

Ile Gly Ser Val Glu Lys Glu Ala Ser Phe Ile Thr Asn Ser Arg Tyr
145                 150                 155                 160

Thr Pro Val Ala Ile Gly Val Arg Arg Tyr Ser Glu Met Lys Gly Glu
                165                 170                 175

Phe Gly Glu Leu Ala Val Val Glu His Asp Tyr Tyr Asp Ala Ala Ile
            180                 185                 190

Lys Tyr Ile Ala Asn Lys Val Pro Asn Leu Ile Phe Ile Val Phe Ser
        195                 200                 205

Glu Asp Ile Asp Trp Val Lys Lys Asn Leu Lys Leu Asp Tyr Pro Val
    210                 215                 220

Tyr Phe Val Thr Ser Lys Lys Gly Glu Leu Ala Ala Ile Gln Asp Met
225                 230                 235                 240

Tyr Leu Met Ser Leu Cys Asn His His Ile Ile Ser Asn Ser Ser Phe
                245                 250                 255

Tyr Trp Trp Gly Ala Tyr Leu Ala Ser Thr Asn Asn His Ile Val Ile
            260                 265                 270

Ala Pro Ser Val Phe Leu Asn Lys Asp Cys Thr Pro Ile Asp Trp Val
        275                 280                 285

Ile Ile
    290


<210>  166
<211>  314
<212>  PRT
<213>  Firmicutes bacterium CAG:534

<400>  166

Met Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr Ala Leu Tyr Met
1               5                   10                  15

Lys Leu Thr Ala Met Gly Arg Glu Val Lys Phe Asp Asp Ile Asn Glu
            20                  25                  30

Tyr Arg Gly Glu Lys Ala Trp Pro Ile Met Leu Ala Val Phe Gly Ile
        35                  40                  45

Glu Tyr Pro Arg Ala Thr Trp Asp Glu Ile Val Ala Phe Thr Asp Gly
    50                  55                  60
```

```
Ser Met Asp Phe Ser Lys Arg Leu Lys Arg Leu Phe Arg Gly Arg His
65                  70                  75                  80

Pro Ile Glu Tyr Val Glu Gln Gly Phe Tyr Asp Pro Lys Val Leu Ser
                85                  90                  95

Phe Glu Asn Met Tyr Leu Lys Gly Ser Phe Gln Ser Gln Arg Tyr Phe
            100                 105                 110

Glu Asp Ile Leu Glu Glu Val Gln Glu Thr Phe Arg Phe Pro Glu Leu
        115                 120                 125

Lys Asp Met Asn Leu Pro Ala Pro Leu Tyr Glu Thr Thr Glu Lys Tyr
    130                 135                 140

Leu Leu Arg Ile Glu Gly Cys Asn Ala Val Gly Leu His Met Tyr Arg
145                 150                 155                 160

Gly Asp Ser Arg Ser Asn Glu Glu Leu Tyr Asp Gly Ile Cys Thr Glu
                165                 170                 175

Lys Tyr Tyr Glu Gly Ala Val Arg Phe Ile Gln Asp Lys Cys Pro Asp
            180                 185                 190

Ala Lys Phe Phe Ile Phe Ser Asn Glu Pro Lys Trp Val Lys Gly Trp
        195                 200                 205

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

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

Glu Tyr Thr Gly Tyr Leu Asp Met Phe Leu Met Ser Arg Cys Arg His
                245                 250                 255

Asn Ile Ile Ser Asn Ser Ser Phe Ser Trp Trp Ala Ala Phe Ile Asn
            260                 265                 270

Glu Asn Pro Asp Lys Leu Val Thr Ala Pro Ser Arg Trp Val Asn Gly
        275                 280                 285

Val Pro Ser Glu Asp Val Tyr Val Lys Gly Met Thr Leu Ile Asp Glu
    290                 295                 300

Lys Gly Arg Val Glu Arg Thr Ile Lys Glu
305                 310

<210>  167
<211>  279
<212>  PRT
```

<213> Firmicutes bacterium CAG:882

<400> 167

```
Met Val Ile Val Lys Ile Gly Asp Gly Leu Gly Asn Gln Met Phe Asn
1               5                   10                  15

Tyr Val Cys Gly Tyr Ser Val Ala Lys His Asp Asn Asp Thr Leu Leu
            20                  25                  30

Leu Asp Thr Ser Asp Val Asp Asn Ser Thr Leu Arg Thr Tyr Asp Leu
        35                  40                  45

Asp Lys Phe Asn Ile Asp Phe Thr Asp Arg Glu Ser Phe Thr Asn Lys
    50                  55                  60

Gly Phe Phe His Lys Val Tyr Lys Arg Leu Arg Arg Ser Leu Lys Tyr
65                  70                  75                  80

Asn Val Ile Tyr Glu Ser Arg Thr Glu Asn Cys Pro Cys Val Leu Asp
                85                  90                  95

Val Tyr Arg Arg Lys Phe Ile Arg Asp Lys Tyr Leu His Gly Tyr Phe
            100                 105                 110

Gln Asn Leu Cys Tyr Phe Lys Thr Cys Lys Glu Asp Ile Met Arg Gln
        115                 120                 125

Phe Thr Pro Lys Glu Pro Phe Ser Ala Lys Ala Asp Glu Leu Ile His
    130                 135                 140

Arg Phe Ala Thr Glu Asn Thr Cys Ser Val His Val Arg Gly Gly Asp
145                 150                 155                 160

Ile Lys Pro Leu Ser Ile Lys Tyr Tyr Lys Asp Ala Leu Asp Lys Ile
                165                 170                 175

Gly Glu Ala Lys Lys Asp Met Arg Phe Ile Val Phe Ser Asn Val Arg
            180                 185                 190

Asn Leu Ala Glu Glu Tyr Ile Lys Glu Leu Gly Val Asp Ala Glu Phe
        195                 200                 205

Ile Trp Asp Leu Gly Glu Phe Thr Asp Ile Glu Glu Leu Phe Leu Met
    210                 215                 220

Lys Ala Cys Arg Arg His Ile Leu Ser Asp Ser Thr Phe Ser Arg Trp
225                 230                 235                 240

Ala Ala Leu Leu Asp Glu Lys Ser Glu Glu Val Phe Val Pro Phe Ser
                245                 250                 255
```

```
Pro Asp Ala Asp Lys Ile Tyr Met Pro Glu Trp Ile Met Glu Glu Tyr
            260                 265                 270


Asp Gly Asn Glu Glu Lys Arg
        275


<210>  168
<211>  287
<212>  PRT
<213>  Vibrio parahaemolyticus

<400>  168

Met Val Ile Val Lys Val Ser Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15


Tyr Ala Ile Gly Cys Ala Ile Ser Asn Arg Leu Ser Cys Glu Leu Leu
            20                  25                  30


Leu Asp Thr Ser Phe Tyr Pro Lys Gln Ser Leu Arg Lys Tyr Glu Leu
        35                  40                  45


Asp Lys Phe Asn Ile Lys Ala Lys Val Ala Thr Gln Lys Glu Val Phe
    50                  55                  60


Ser Cys Gly Gly Gly Asp Asp Leu Leu Ser Arg Phe Leu Arg Lys Leu
65                  70                  75                  80


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


Leu Val Tyr Leu Ala Glu Ile Ser His Cys Lys Ser Gly Ser Phe Leu
            100                 105                 110


Asp Gly Tyr Trp Gln Asn Pro Gln Tyr Phe Ser Asp Ile Lys Asp Glu
        115                 120                 125


Leu Val Lys Gln Ile Val Pro Ile Met Pro Leu Ser Ser Pro Ala Leu
    130                 135                 140


Glu Trp Gln Asn Ile Ile Ile Asn Thr Lys Asn Cys Val Ser Leu His
145                 150                 155                 160


Val Arg Arg Gly Asp Tyr Val Asn Asn Ala His Thr Asn Ser Val His
                165                 170                 175


Gly Val Cys Asp Leu Ser Tyr Tyr Arg Glu Ala Ile Thr Asn Ile His
            180                 185                 190


Glu Thr Val Glu Lys Pro Lys Phe Phe Val Phe Ser Asp Asp Ile Ser
        195                 200                 205


Trp Cys Lys Asp Asn Leu Gly Ser Leu Gly His Phe Thr Tyr Val Asp
```

210 215 220

Asn Thr Leu Ser Ala Ile Asp Asp Leu Met Leu Met Ser Phe Cys Glu
225 230 235 240

His His Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu
245 250 255

Asn Asp His Gly Ile Thr Ile Ala Pro Lys Arg Trp Phe Ser Ser Val
260 265 270

Glu Arg Asn Asn Lys Asp Leu Phe Pro Glu Lys Trp Leu Ile Leu
275 280 285

<210> 169
<211> 286
<212> PRT
<213> Herbaspirillum frisingense

<400> 169

Met Ile Val Ser Arg Leu Ile Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Gly Arg Ala Leu Ala Leu Arg Arg Gly Val Pro Phe Ala
20 25 30

Ile Asp Ser Arg Ala Phe Ala Asp Tyr Lys Thr His Ala Phe Gly Met
35 40 45

Gln Cys Phe Cys Ala Asp Gln Thr Glu Ala Pro Ser Arg Leu Leu Pro
50 55 60

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

Pro Asn Pro Leu Arg Val Tyr Thr Glu Lys Thr Phe Thr Phe Asp Glu
85 90 95

Ala Val Leu Ser Leu Pro Asp Gly Ile Tyr Leu Asp Gly Tyr Trp Gln
100 105 110

Ser Glu Lys Tyr Phe Ala Asp Phe Ala Asp Asp Ile Arg Lys Asp Phe
115 120 125

Ala Val Lys Ala Ala Pro Ser Ala Pro Asn Gln Ala Trp Leu Glu Leu
130 135 140

Ile Gly Arg Thr His Ser Val Ser Leu His Ile Arg Arg Gly Asp Tyr
145 150 155 160

Val Ser Asn Ala Ala Ala Ala Ala Val His Gly Thr Cys Asp Leu Gly
165 170 175

```
Tyr Tyr Glu Arg Ala Val Ala His Leu His Gln Val Thr Gly Gln Ala
            180                 185                 190

Pro Glu Leu Phe Val Phe Ser Asp Asp Leu Asp Trp Val Ala Thr Asn
        195                 200                 205

Leu Gln Leu Pro Tyr Thr Met His Leu Val Arg Asp Asn Asp Ala Ala
    210                 215                 220

Thr Asn Phe Glu Asp Leu Arg Leu Met Thr Ala Cys Arg His His Ile
225                 230                 235                 240

Val Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asp Gly Arg
                245                 250                 255

Ser Glu Ser Ile Thr Ile Ala Pro Ala Arg Trp Phe Val Ala Asp Thr
            260                 265                 270

Pro Asp Ala Arg Asp Leu Val Pro Gln Arg Trp Val Arg Leu
        275                 280                 285
```

<210> 170
<211> 288
<212> PRT
<213> Rhizobium sp. CF080

<400> 170

```
Met Ile Ile Thr Arg Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Arg Ala Leu Ala Ile Ala Asn Glu Ala Glu Leu Lys
            20                  25                  30

Leu Asp Leu Ile Glu Met Gly Ala Tyr Lys Leu Arg Pro Phe Ala Leu
        35                  40                  45

Asp Gln Phe Asn Ile Lys Ala Ala Ile Ala Gln Pro Asp Glu Val Pro
    50                  55                  60

Ala Lys Pro Lys Arg Gly Leu Leu Arg Lys Phe Thr Ser Ala Phe Lys
65                  70                  75                  80

Pro Asp Arg Ser Ser Cys Glu Arg Ile Val Glu Asn Gly Leu Thr Phe
                85                  90                  95

Asp Ser Arg Val Pro Ala Leu Arg Gly Ser Leu His Leu Ser Gly Tyr
            100                 105                 110

Trp Gln Ser Glu Gln Tyr Phe Ala Ser Ser Ala Asp Ala Ile Arg Ser
        115                 120                 125
```

```
Asp Phe Ser Leu Lys Ser Pro Leu Gly Pro Ala Arg Gln Asp Val Leu
    130                 135                 140

Ala Arg Ile Gly Ala Ala Thr Thr Pro Val Ser Ile His Val Arg Arg
145                 150                 155                 160

Gly Asp Tyr Val Thr Asn Pro Ser Ala Asn Ala Val His Gly Thr Cys
                165                 170                 175

Glu Pro Pro Trp Tyr His Glu Ala Met Arg Arg Met Leu Asp Arg Ala
            180                 185                 190

Gly Asp Ala Ser Phe Phe Val Phe Ser Asp Glu Pro Gln Trp Ala Arg
        195                 200                 205

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

Asn Gly Arg Asp Gly Glu Asp Met His Leu Met Ala Ala Cys His Ala
225                 230                 235                 240

His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn
                245                 250                 255

Pro Arg Pro Asn Lys His Val Ile Ala Pro Arg Gln Trp Phe Arg Ala
            260                 265                 270

Pro Asp Lys Asp Asp Arg Asp Ile Val Pro Ala Thr Trp Glu Arg Leu
        275                 280                 285
```

<210> 171
<211> 328
<212> PRT
<213> Verrucomicrobium spinosum

<400> 171

```
Met Val Ile Ser His Ile Ser Glu Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

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

Leu Asp Asp Tyr His Tyr Arg Leu His Pro Phe Arg Ser Phe Gln Leu
        35                  40                  45

Asp Arg Phe Leu Ile Thr Ser Pro Ile Ala Thr Asp Ala Glu Ile Ser
    50                  55                  60

His Leu Cys Pro Leu Glu Gly Leu Ala Arg Ala Ile Arg Ala Arg Leu
65                  70                  75                  80
```

```
Pro Gly Lys Leu Arg Gly Ala Thr Leu Arg Leu Leu Gly Asn Leu Gly
                85                  90                  95

Leu Gly Ser Pro Tyr Gln Pro Arg Leu His Ser Phe Lys Glu Glu Thr
            100                 105                 110

Pro Lys Gln Pro Leu Leu Ile Gly Lys Val Val Ser Glu Arg His Phe
        115                 120                 125

His Phe Asp Pro Asp Val Leu Glu Cys Pro Asp Asn Val Cys Leu Val
    130                 135                 140

Gly Tyr Trp Gln Asp Glu Arg Tyr Phe Gly Glu Ile Arg Asp Ile Leu
145                 150                 155                 160

Leu Arg Glu Leu Thr Leu Lys Ser Pro Pro Ala Gly Ala Thr Lys Ala
                165                 170                 175

Val Leu Glu Arg Ile Gln Arg Ser Ser Ser Val Ser Leu His Val Arg
            180                 185                 190

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

Tyr Cys Leu Ala Ala Met Ser Glu Met Arg Ala Arg Leu Gln Ala Pro
    210                 215                 220

Thr Phe Phe Val Phe Ser Asp Asp Trp Asp Trp Val Arg Glu Gln Ile
225                 230                 235                 240

Pro Cys Ser Ser Ser Val Ile His Val Asp His Asn Arg Ala Glu Asp
                245                 250                 255

Val Ser Glu Asp Phe Arg Leu Met Lys Ser Cys Asp His His Ile Ile
            260                 265                 270

Ala Ser Ser Ser Leu Ser Trp Trp Ala Ala Trp Leu Gly Thr Asn Glu
        275                 280                 285

Asn Ser Phe Val Phe Ser Pro Pro Ala Asp Arg Trp Leu Asn Phe Ser
    290                 295                 300

Asn His Phe Thr Ala Asp Val Leu Pro Pro His Trp Ile Gln Leu Asp
305                 310                 315                 320

Gly Ser Ser Leu Leu Pro Ala Gln
                325
```

<210> 172
<211> 300
<212> PRT
<213> Fibrella aestuarina

<400> 172

Met Thr Ala Asn Arg Val Leu Val Asn Ser Pro Met Val Ile Ala Lys
1 5 10 15

Ile Thr Ser Gly Leu Gly Asn Gln Leu Phe Gln Tyr Ala Leu Gly Arg
20 25 30

His Leu Ala Leu Gln Gly Asn Thr Ser Leu Trp Phe Asp Leu Arg Tyr
35 40 45

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

Arg Phe Asn Val Arg Tyr Asn Leu Leu Asp Ser Ser Pro Trp Leu Tyr
65 70 75 80

Ala Ser Lys Ala Thr Arg Leu Leu Pro Gly Arg Ser Leu Arg Pro Leu
85 90 95

Ile Asp Thr Arg Phe Glu Ala Asp Phe His Phe Asp Pro Thr Val Ile
100 105 110

Arg Pro Ala Ala Pro Leu Thr Ile Leu Trp Gly Phe Trp Gln Ser Glu
115 120 125

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

Asn Arg Pro Leu Ser Asp Thr Phe Val Gly Tyr Gln Gln Gln Ile Glu
145 150 155 160

Gln Ala Glu Val Pro Ile Ser Val His Val Arg Arg Gly Asp Tyr Val
165 170 175

Thr His Pro Glu Phe Ser Gln Ser Phe Gly Phe Val Gly Leu Ala Tyr
180 185 190

Tyr Gln Lys Ala Leu Ala His Leu Gln Asp Leu Phe Pro Asn Ala Thr
195 200 205

Leu Phe Phe Phe Ser Asp Asp Pro Asp Trp Val Arg Ala Asn Ile Val
210 215 220

Thr Glu Gln Pro His Val Phe Val Gln Asn Ser Gly Pro Asp Ala Asp
225 230 235 240

Val Asp Asp Leu Gln Leu Met Ser Leu Cys His His His Val Ile Ala
245 250 255

Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asn Pro Arg Pro Asp

260 265 270

Lys Val Val Ile Gly Pro Gln Arg Trp Phe Ala Asn Lys Pro Trp Asp
275 280 285

Thr Lys Asp Leu Leu Pro Ser Gly Trp Leu Arg Leu
290 295 300

<210> 173
<211> 287
<212> PRT
<213> Rhodobacter sp. CACIA14H1

<400> 173

Met Ile His Met Arg Leu Val Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ala Cys Gly Arg Ala Val Ala Leu Arg His Gly Thr Glu Leu Val
20 25 30

Leu Asp Thr Arg Glu Leu Ser Arg Gly Ala Ala His Ala Val Phe Gly
35 40 45

Leu Asp His Phe Ala Ile Arg Ala Arg Met Gly Ala Ser Ala Asp Leu
50 55 60

Pro Pro Pro Arg Ser Arg Val Leu Ala Tyr Gly Leu Trp Arg Ala Gly
65 70 75 80

Phe Met Ala Pro Arg Phe Leu Arg Glu Arg Gly Leu Gly Val Asn Pro
85 90 95

Ala Val Leu Ala Ala Gly Asp Gly Thr Tyr Leu His Gly Tyr Phe Gln
100 105 110

Ser Glu Ala Tyr Phe Arg Asp Val Val Pro Gln Ile Arg Pro Glu Leu
115 120 125

Glu Ile Val Thr Pro Pro Ser Asp Asp Asn Leu Arg Trp Ala Ser Arg
130 135 140

Ile Ala Gly Asp Asp Arg Ala Val Ser Leu His Val Arg Arg Gly Asp
145 150 155 160

Tyr Val Ala Ser Ala Lys Gly Gln Gln Val His Gly Thr Cys Asp Ala
165 170 175

Asp Tyr Tyr Ala Arg Ala Val Ala Ala Ile Arg Ala Arg Ala Gly Ile
180 185 190

Asp Pro Arg Leu Tyr Val Phe Ser Asp Asp Pro His Trp Ala Arg Asp
195 200 205

```
Asn Leu Ala Leu Asp Ala Glu Thr Val Val Leu Asp His Asn Pro Pro
    210                 215                 220

Gly Ala Ala Val Glu Asp Met Arg Leu Met Gly Val Cys Arg His His
225                 230                 235                 240

Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Arg Asn Pro
                245                 250                 255

Ser Ala Gly Lys Val Val Val Ala Pro Val Arg Trp Phe Ala Asp Pro
            260                 265                 270

Lys Leu His Asn Pro Asp Ile Cys Pro Pro Glu Trp Leu Arg Val
        275                 280                 285
```

<210> 174
<211> 316
<212> PRT
<213> Rhodopirellula baltica

<400> 174

```
Met Ala Thr Ser Ala His Leu His Leu Ser Asp Glu Lys Gln Thr Leu
1               5                   10                  15

Asp Ser Lys Ala Ser Asp Arg Asp Cys Ala Thr Thr Glu Ala Ser Ala
            20                  25                  30

Ser Asp Lys Thr Cys Thr Ile Ser Ile Ser Gly Gly Leu Gly Asn Gln
        35                  40                  45

Met Leu Gln Tyr Ala Ala Gly Arg Ala Leu Ser Ile His His Asp Cys
    50                  55                  60

Ser Leu Gln Leu Asp Leu Lys Phe Tyr Ser Ser Lys Arg His Arg Ser
65                  70                  75                  80

Tyr Glu Leu Asp Ala Phe Pro Ile Gln Ala His Arg Ser Ile Lys Pro
                85                  90                  95

Ser Phe Phe Ser Gln Ile Leu Ser Lys Ile Gln Ser Glu Ser Lys His
            100                 105                 110

Val Pro Thr Tyr Gln Glu Gln Ser Lys Arg Phe Asp Pro Ala Phe Phe
        115                 120                 125

Asn Thr Glu Pro Pro Val Lys Ile Arg Gly Tyr Phe Phe Ser Glu Lys
    130                 135                 140

Tyr Phe Ser Pro Tyr Ala Asp Gln Ile Arg Thr Glu Leu Thr Pro Pro
145                 150                 155                 160
```

```
Ile Pro Pro Asp Gln Pro Ala Arg Asp Met Ala Ile Arg Leu Lys Glu
                165                 170                 175

Cys Val Ser Thr Ser Leu His Val Arg Arg Gly Asp Tyr Val Thr Asn
            180                 185                 190

Ala Asn Ala Arg Gln Arg Phe Trp Cys Cys Thr Ser Glu Tyr Phe Glu
        195                 200                 205

Ala Ala Ile Glu Arg Leu Pro Thr Asp Ser Thr Val Phe Val Phe Ser
    210                 215                 220

Asp Asp Ile Glu Trp Ala Lys Gln Asn Ile Arg Ser Ser Arg Thr Thr
225                 230                 235                 240

Val Tyr Val Asn Asp Glu Leu Lys Lys Ala Gly Ser Pro Glu Thr Gly
                245                 250                 255

Leu Arg Asp Leu Trp Leu Met Thr His Ala Lys Ser His Ile Ile Ala
            260                 265                 270

Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Ala Asn Ser Glu Ala
        275                 280                 285

Asn Leu Thr Ile Ala Pro Lys Lys Trp Phe Asn Asp Pro Glu Ile Asp
    290                 295                 300

Asp Ser Asp Ile Val Pro Ser Ser Trp His Arg Ile
305                 310                 315
```

<210> 175
<211> 286
<212> PRT
<213> Spirosoma spitsbergense

<400> 175

```
Met Val Val Val Glu Leu Met Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Phe Gly Met Gln Leu Ala His Gln Arg Gln Asp Thr Leu Thr
            20                  25                  30

Val Ser Thr Phe Leu Leu Ser Asn Lys Leu Leu Ala Asn Leu Arg Asn
        35                  40                  45

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

Lys Ala Ser Pro Phe Asn Leu Leu Arg Ala Leu Leu Pro Phe Asp Leu
65                  70                  75                  80
```

```
Asn Thr Ser Leu Leu Arg Glu Thr Asp Asp Pro Glu Ala Val Ile Pro
                85                  90                  95

Ala Ala Ser Ala Arg Ile Val Cys Val Gly Tyr Trp Gln Ser Glu His
            100                 105                 110

Tyr Phe Glu Glu Val Thr Val His Val Arg Glu Lys Phe Ile Phe Arg
        115                 120                 125

Gln Pro Phe Asn Ser Phe Thr Ser Arg Leu Ala Asn Asn Leu Asn Gly
    130                 135                 140

Ile Pro Asn Ser Val Phe Val His Ile Arg Arg Gly Asp Tyr Val Thr
145                 150                 155                 160

Asn Lys Gly Ala Asn Ala His His Gly Leu Cys Asp Arg Thr Tyr Tyr
                165                 170                 175

Glu Arg Ala Val Thr Phe Met Arg Glu His Leu Glu Asn Pro Leu Phe
            180                 185                 190

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

Ile Leu Glu Pro Ala Thr Tyr Val Gly Gly Asn Gln Lys Asn Asp Ser
    210                 215                 220

Trp Gln Asp Met Tyr Leu Met Ser Leu Cys Arg His Ala Ile Val Ala
225                 230                 235                 240

Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Ser Pro His Ala Ser
                245                 250                 255

Lys Ile Val Val Ala Pro Lys Glu Trp Phe Gly Lys Pro Leu Leu Pro
            260                 265                 270

Val Lys Thr Asn Asp Leu Ile Pro Asn Ser Trp Ile Arg Ile
        275                 280                 285


<210>  176
<211>  295
<212>  PRT
<213>  Unknown

<220>
<223>  uncultured bacterium

<400>  176

Met Asn Ala Ile Ile Pro Arg Leu Thr Gly Gly Ile Gly Asn Gln Leu
1               5                   10                  15

Phe Ile Tyr Ala Ala Ala Arg Arg Met Ala Ile Ala Asn Ser Met Asn
            20                  25                  30
```

```
Leu Val Ile Asp Asp Thr Ser Gly Phe Lys Tyr Asp Val Leu Tyr Lys
        35                  40                  45

Arg Phe Tyr Gln Leu Glu Lys Phe Asn Ile Thr Ser Arg Met Ala Thr
    50                  55                  60

Pro Thr Glu Arg Leu Glu Pro Phe Ser Lys Ile Arg Arg Tyr Leu Lys
65                  70                  75                  80

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

Gln Glu Lys Ser Gly Phe Asp Pro Arg Leu Leu Val Phe Arg Pro Lys
            100                 105                 110

Gly Asn Val Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Asn Tyr Phe Lys
        115                 120                 125

Asp Ile Glu Gly Ile Ile Arg Gln Asp Leu Ile Ile Lys Ser Pro Ser
    130                 135                 140

Asp Ser Leu Asn Ile Ala Thr Ala Glu Arg Ile Lys Asn Thr Leu Ala
145                 150                 155                 160

Ile Ala Val His Val Arg Phe Phe Asp Met Val Asp Ile Ser Asp Ser
                165                 170                 175

Ser Asn Cys Gln Ser Asn Tyr Tyr His Thr Ala Ile Ala Lys Met Glu
            180                 185                 190

Glu Lys Ile Pro Asn Ala His Tyr Phe Ile Phe Ser Asp Lys Pro Val
        195                 200                 205

Leu Ala Arg Leu Ala Met Pro Leu Pro Asp Asp Arg Ile Thr Ile Ile
    210                 215                 220

Asp His Asn Ile Gly Asp Met Asn Ala Tyr Ala Asp Leu Trp Leu Met
225                 230                 235                 240

Ser Leu Cys Lys His Phe Val Ile Ala Asn Ser Thr Phe Ser Trp Trp
                245                 250                 255

Gly Ala Trp Leu Ser Asp Asn Lys Glu Lys Ile Val Ile Ala Pro Asp
            260                 265                 270

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

Pro Asp Glu Trp Ile Lys Leu
    290                 295
```

<210> 177
<211> 289
<212> PRT
<213> Prevotella micans

<400> 177

Met Asp Val Ile Val Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1 5 10 15

Tyr Ala Phe Tyr Leu Glu Lys Arg Leu Arg Asn Arg Gln Thr Thr Tyr
20 25 30

Phe Val Leu Asn Pro Arg Ser Thr Tyr Glu Leu Glu Arg Leu Phe Gly
35 40 45

Ile Pro Tyr Arg Ser Asn Leu Met Cys Arg Met Ile Tyr Lys Leu Leu
50 55 60

Asp Lys Ala Tyr Phe Ser Asn His Ile Arg Leu Lys Lys Ile Leu Arg
65 70 75 80

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

Arg Asn Tyr Ser Leu Ser Asn Phe Thr His His Pro Gly Leu Thr Phe
100 105 110

Tyr Arg Gly Gly Trp His Ser Glu Leu Asn Phe Thr Ser Val Val Thr
115 120 125

Glu Leu Arg Arg Lys Phe Ile Phe Pro Pro Ser Asp Asp Glu Glu Phe
130 135 140

Lys Arg Ile Ser Ala Leu Ile Ile Arg Thr Gln Ser Ile Ser Leu His
145 150 155 160

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

Thr Glu Glu Tyr Tyr Glu Arg Ala Ile Glu Tyr Ile Arg Ser His Val
180 185 190

Glu Asn Pro Val Phe Phe Val Phe Ser Asp Asp Lys Glu Tyr Ala Ile
195 200 205

Asn Lys Phe Ser Gly Asp Asp Ser Phe Arg Ile Val Asp Phe Asn Thr
210 215 220

Gly Glu Asn Ser Trp Arg Asp Met Gln Leu Met Ser Leu Cys Arg His
225 230 235 240

```
His Ile Leu Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asp
                245                 250                 255

Ser Ala Pro Glu Lys Ile Val Leu His Pro Ile Tyr His Met Arg Asp
            260                 265                 270

Val Pro Thr Arg Asp Phe Tyr Pro His Asn Trp Ile Gly Ile Ser Gly
        275                 280                 285

Glu
```

<210> 178
<211> 293
<212> PRT
<213> Thermosynechococcus sp. NK55

<400> 178

```
Met Ile Ile Val Arg Leu Tyr Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Leu Ala Leu Ser Leu Arg His Ala Val Pro Leu Arg
            20                  25                  30

Phe Asp Leu Asp Trp Phe Asp Gly Val Arg Leu His Gln Gly Leu Glu
        35                  40                  45

Leu His Arg Val Phe Asp Leu Asp Leu Pro Arg Ala Ala Pro Ser Glu
    50                  55                  60

Met Arg Gln Val Leu Gly Ser Phe Ser His Pro Leu Val Arg Arg Leu
65                  70                  75                  80

Leu Val Arg Arg Arg Leu Arg Trp Leu Leu Pro Gln Gly Tyr Ala Leu
                85                  90                  95

Glu Pro His Phe His Tyr Trp Pro Gly Phe Glu Ala Leu Gly Pro Lys
            100                 105                 110

Ala Tyr Leu Asp Gly Tyr Trp Gln Ser Glu Arg Tyr Phe Ser Glu Tyr
        115                 120                 125

Gln Asp Ala Val Arg Ala Ala Phe Arg Phe Ala Gln Pro Leu Asp Glu
    130                 135                 140

Arg Asn Arg Gln Ile Val Glu Glu Met Ala Ala Cys Glu Ser Val Ser
145                 150                 155                 160

Leu His Val Arg Arg Gly Asp Phe Val Gln Asp Pro Val Val Arg Arg
                165                 170                 175
```

```
Val His Gly Val Asp Leu Ser Ala Tyr Tyr Pro Arg Ala Val Ala Leu
            180                 185                 190

Leu Met Glu Arg Met Arg Glu Pro Arg Phe Tyr Val Phe Ser Asp Asp
        195                 200                 205

Pro Asp Trp Val Arg Ala Asn Leu Lys Leu Pro Ala Pro Met Ile Val
    210                 215                 220

Ile Asp His Asn Arg Gly Glu His Ser Phe Arg Asp Met Gln Leu Met
225                 230                 235                 240

Ser Ala Cys Arg His His Ile Leu Ala Asn Ser Ser Phe Ser Trp Trp
                245                 250                 255

Gly Ala Trp Leu Asn Ser Gln Pro His Lys Leu Val Ile Ala Pro Lys
            260                 265                 270

Arg Trp Phe Asn Val Asp Asp Phe Asp Thr Arg Asp Leu Tyr Cys Ser
        275                 280                 285

Gly Trp Thr Val Leu
    290
```

<210> 179
<211> 309
<212> PRT
<213> Coleofasciculus chthonoplastes

<400> 179

```
Met Leu Ser Leu Asn Lys Asn Phe Leu Phe Val His Ile Pro Lys Ser
1               5                   10                  15

Cys Ile Leu Lys Glu Val Tyr Ile Tyr Met Ile Ser Phe Pro Asn Leu
            20                  25                  30

Gly Lys Gly Val Arg Leu Gly Asn Gln Met Phe Gln Tyr Ala Phe Leu
        35                  40                  45

Arg Ser Thr Ala Arg Arg Leu Gly Val Lys Phe Tyr Cys Pro Ala Trp
    50                  55                  60

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

Gln Pro Glu Gly Ile Thr Lys Gln Tyr Arg Gln Gly Leu Asn Pro Gly
                85                  90                  95

Phe Ser Glu Asn Ala Leu Ser Ile Gln Asp Gly Thr Glu Ile Ser Gly
            100                 105                 110

Tyr Phe Gln Ser Asp Lys Tyr Tyr Asp Asn Pro Asp Leu Val Arg Gln
```

115 120 125

Trp Phe Ser Leu Lys Glu Glu Lys Ile Ala Ser Ile Arg Asp Arg Phe
130 135 140

Ser Arg Leu Asn Phe Ala Asn Ser Val Gly Met His Leu Arg Phe Gly
145 150 155 160

Asp Val Val Gly Gln Leu Lys Arg Pro Pro Met Arg Arg Ser Tyr Tyr
165 170 175

Lys Lys Ala Leu Ser Tyr Ile Pro Asn Gln Glu Leu Ile Leu Val Phe
180 185 190

Ser Asp Glu Pro Glu Arg Thr Lys Lys Met Leu Asp Gly Leu Ser Gly
195 200 205

Asn Phe Leu Phe Leu Ser Gly His Lys Asn Tyr Glu Asp Leu Tyr Leu
210 215 220

Met Thr Lys Cys Gln His Phe Ile Cys Ser Tyr Ser Thr Phe Ser Trp
225 230 235 240

Trp Gly Ala Trp Leu Gly Gly Glu Arg Glu Arg Thr Val Ile Tyr Pro
245 250 255

Lys Glu Gly Gln Tyr Arg Pro Gly Tyr Gly Arg Lys Ala Glu Gly Val
260 265 270

Ser Cys Glu Ser Trp Ile Glu Val Gln Ser Leu Arg Gly Phe Leu Asp
275 280 285

Asp Tyr Arg Leu Val Ser Arg Leu Glu Lys Arg Leu Pro Lys Ser Leu
290 295 300

Met Asn Phe Phe Tyr
305

<210> 180
<211> 281
<212> PRT
<213> Bacteroides gallinarum

<400> 180

Met Arg Leu Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Phe Tyr Leu Arg Met Lys Lys Arg His Thr Asn Thr Arg Ile
20 25 30

Asp Leu Ser Asp Met Met His Tyr Asn Val His His Gly Tyr Glu Met
35 40 45

```
His His Val Phe Asn Leu Pro Lys Thr Glu Phe Cys Ile Asn Gln Pro
    50                  55                  60

Leu Lys Lys Val Ile Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65                  70                  75                  80

Lys Gln Asp Ser Ser Asn Leu Leu Pro Phe Asp Lys Lys Tyr Phe Trp
                85                  90                  95

Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
            100                 105                 110

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

Phe Asn Glu Lys Thr Gln Thr Met Leu Lys Gln Ile Glu His Asn Glu
    130                 135                 140

His Ala Val Ser Leu His Val Arg Arg Gly Asp Tyr Leu Glu Pro Lys
145                 150                 155                 160

His Trp Lys Thr Thr Gly Ser Val Cys Gln Leu Pro Tyr Tyr Ile Asn
                165                 170                 175

Ala Ile Ala Glu Met Asn Arg Arg Ile Glu Gln Pro Phe Tyr Tyr Val
            180                 185                 190

Phe Ser Asp Asp Ile Ala Trp Val Lys Glu Asn Leu Pro Leu Pro Gln
        195                 200                 205

Ala Val Phe Ile Asp Trp Asn Lys Gly Val Glu Ser Trp Gln Asp Met
    210                 215                 220

Met Leu Met Ser His Cys Arg His His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Lys Glu Asn Lys Thr Val Ile
                245                 250                 255

Met Pro Glu Arg Trp Phe Gln His Cys Glu Thr Pro Asn Ile Tyr Pro
            260                 265                 270

Ala Gly Trp Ile Lys Val Pro Ile Asn
        275                 280
```

<210> 181
<211> 268
<212> PRT
<213> Firmicutes bacterium CAG:882

<400> 181

```
Met Asn Asn Val Glu Ile Met Gly Gly Leu Gly Lys Gln Leu Phe Gln
1               5                  10                  15

Tyr Ala Phe Ser Arg Tyr Leu Gln Lys Leu Gly Val Lys Asn Val Val
            20                  25                  30

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

Thr Lys Arg Glu Phe Val Leu Asp Lys Tyr Asn Thr Arg Tyr Val Ala
    50                  55                  60

Ala Ala Gly Glu Lys Thr Tyr Arg Asp Tyr Cys Asp Glu Asn Asp Tyr
65                  70                  75                  80

Arg Asp Asp Tyr Ala Ile Gly Ser Asp Glu Val Leu Tyr Glu Gly Tyr
                85                  90                  95

Trp Gln Asn Ile Asp Phe Tyr Asn Val Val Arg Lys Glu Met Gln Glu
            100                 105                 110

Glu Leu Lys Leu Lys Pro Glu Phe Ile Asp Asn Ser Met Ala Ala Val
        115                 120                 125

Glu Lys Asp Met Ser Ser Cys Asn Ser Val Ala Leu His Ile Arg Arg
    130                 135                 140

Ser Asp Tyr Leu Thr Gln Val Asn Ala Gln Ile Phe Glu Gln Leu Thr
145                 150                 155                 160

Gln Asp Tyr Tyr Ala Ser Ala Val Ser Ile Ile Glu Gln Tyr Thr His
                165                 170                 175

Glu Lys Pro Val Leu Tyr Ile Phe Ser Asp Asp Pro Glu Tyr Ala Ala
            180                 185                 190

Glu Asn Met Lys Asp Phe Met Gly Cys Arg Thr Val Ile Met Pro Pro
        195                 200                 205

Cys Glu Pro Tyr Gln Asp Met Tyr Leu Met Thr Arg Ala Lys His Asn
    210                 215                 220

Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Thr Leu Asn Ala
225                 230                 235                 240

Asn Pro Asp Asn Ile Thr Val Ala Pro Ser Arg Trp Met Lys Gly Arg
                245                 250                 255

Thr Val Asn Leu Tyr His Lys Asp Trp Ile Thr Leu
            260                 265
```

<210> 182
<211> 301
<212> PRT
<213> Bacteroides xylanisolvens

<400> 182

Met Ile Ala Val Asn Val Asn Ala Gly Leu Ala Asn Gln Met Phe His
1 5 10 15

Tyr Ala Phe Gly Arg Gly Leu Met Ala Lys Gly Leu Asp Val Cys Phe
20 25 30

Asp Gln Ser Asn Phe Lys Pro Arg Ser Gln Trp Ala Phe Glu Leu Val
35 40 45

Arg Leu Gln Asp Ala Phe Pro Ser Ile Asp Ile Lys Val Met Pro Glu
50 55 60

Gly His Phe Lys Trp Val Phe Pro Ser Leu Pro Arg Asn Gly Leu Glu
65 70 75 80

Arg Arg Phe Gln Glu Phe Met Lys Lys Trp His Asn Phe Ile Gly Asp
85 90 95

Glu Val Tyr Ile Asp Glu Pro Met Tyr Gly Tyr Val Pro Asp Met Glu
100 105 110

Lys Cys Ala Thr Arg Asn Cys Ile Tyr Lys Gly Phe Trp Gln Ser Glu
115 120 125

Lys Tyr Phe Arg His Cys Glu Asp Asp Ile Arg Lys Gln Phe Thr Phe
130 135 140

Leu Pro Phe Asp Glu Leu Lys Asn Ile Glu Val Ala Ala Lys Met Ser
145 150 155 160

Gln Glu Asn Ser Val Ala Ile His Leu Arg Lys Gly Asp Asp Tyr Met
165 170 175

Gln Ser Glu Leu Met Gly Lys Gly Leu Cys Thr Val Asp Tyr Tyr Met
180 185 190

Lys Ala Ile Asp Tyr Met Arg Lys His Ile Asn Asn Pro His Phe Tyr
195 200 205

Val Phe Thr Asp Asn Pro Cys Trp Val Lys Asp Asn Leu Pro Glu Phe
210 215 220

Glu Tyr Ile Leu Val Asp Trp Asn Glu Val Ser Gly Lys Arg Asn Phe
225 230 235 240

```
Arg Asp Met Gln Leu Met Ser Cys Ala Lys His Asn Ile Ile Gly Asn
                245                 250                 255

Ser Thr Tyr Ser Trp Trp Ala Ala Trp Leu Asn Ala Asn Gln Asp Lys
            260                 265                 270

Ile Val Val Gly Pro Lys Arg Phe Phe Asn Pro Ile Asn Ser Phe Phe
        275                 280                 285

Ser Thr Cys Asp Ile Met Cys Glu Asp Trp Ile Ser Leu
    290                 295                 300
```

<210> 183
<211> 281
<212> PRT
<213> Geobacter sp. M18

<400> 183

```
Met Ile Gly Met Val Ile Phe Arg Ala Tyr Asn Gly Leu Gly Asn Gln
1               5                   10                  15

Met Phe Gln Tyr Ala Leu Gly Arg His Leu Ala Leu Leu Asn Glu Ala
            20                  25                  30

Glu Leu Lys Ile Asp Thr Thr Ala Phe Ala Asp Asp Pro Leu Arg Glu
        35                  40                  45

Tyr Glu Leu His Arg Leu Lys Val Gln Gly Ser Ile Ala Thr Pro Asp
    50                  55                  60

Glu Ile Ala Phe Phe Arg Glu Met Glu Asn Thr His Pro Gln Ala Tyr
65                  70                  75                  80

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

Ala Arg Gly Asn Ile Tyr Leu His Gly Phe Trp Gln Thr Glu Lys Tyr
            100                 105                 110

Phe Ala Asp Ile Arg Glu Ile Leu Leu Asp Glu Phe Glu Pro Ile Val
        115                 120                 125

Pro Ala Gly Glu Asp Ser Ile Lys Val Leu Ser His Met Lys Ala Thr
    130                 135                 140

Asn Ala Val Ala Leu His Val Arg Arg Ser Asp Tyr Val Ser Asn Pro
145                 150                 155                 160

Met Thr Leu Arg His His Gly Val Leu Pro Leu Asp Tyr Tyr Arg Glu
                165                 170                 175

Ala Val Arg Arg Ile Ala Gly Met Val Pro Asp Pro Val Phe Phe Ile
```

180 185 190

Phe Ser Asp Asp Pro Gln Trp Ala Lys Asp Asn Ile Arg Leu Glu Tyr
195 200 205

Pro Ala Phe Cys Val Asp Ala His Asp Ala Ser Asn Gly His Glu Asp
210 215 220

Leu Arg Leu Met Arg Asn Cys Lys His Phe Ile Ile Ala Asn Ser Ser
225 230 235 240

Phe Ser Trp Trp Gly Ala Trp Leu Ser Gln Asn Thr Gly Lys Lys Val
245 250 255

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

Ile Val Pro Leu Gln Trp Ile Arg Ile
275 280

<210> 184
<211> 281
<212> PRT
<213> Ruegeria pomeroyi DSS-3

<400> 184

Met Ile Thr Thr Arg Leu His Gly Arg Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Ala Arg Gly Leu Ala Ala Arg Leu Gly Thr Gln Val Ala
20 25 30

Leu Asp Thr Arg Leu Ala Glu Ser Arg Gly Glu Gly Val Leu Thr Arg
35 40 45

Val Phe Asp Leu Asp Leu Ala Gln Pro Asp Gln Leu Pro Pro Leu Lys
50 55 60

Gly Asp Gly Leu Leu Arg His Gly Ala Trp Arg Leu Leu Gly Leu Ala
65 70 75 80

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

Thr Trp Asp Asp Gly Thr Tyr Leu His Gly Tyr Trp Gln Ser Glu Arg
100 105 110

Tyr Phe Ala His Ile Ala Ala Arg Ile Arg Ala Asp Phe Ala Phe Pro
115 120 125

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

```
Thr Asp Ala Ile Ser Leu His Val Arg Arg Gly Asp Tyr Val Ala Leu
145                 150                 155                 160

Ala Ala His Thr Leu Cys Asp Gln Arg Tyr Tyr Ala Ala Ala Leu Thr
                165                 170                 175

Arg Leu Leu Glu Gly Val Ala Gly Asp Pro Val Val Tyr Leu Phe Ser
            180                 185                 190

Asp Asp Pro Ala Trp Ala Arg Asp Asn Leu Ala Leu Pro Val Gln Lys
        195                 200                 205

Val Val Val Asp Phe Asn Gly Pro Glu Thr Asp Phe Glu Asp Met Arg
    210                 215                 220

Leu Met Ser Leu Cys Arg His Asn Ile Ile Gly Asn Ser Ser Phe Ser
225                 230                 235                 240

Trp Trp Ala Ala Trp Leu Asn Ala His Pro Gly Lys Arg Ile Ala Ala
                245                 250                 255

Pro Ala Ser Trp Phe Gly Asp Ala Lys Leu His Asn Pro Asp Leu Leu
            260                 265                 270

Pro Pro Asp Trp Leu Lys Ile Glu Val
        275                 280


<210>  185
<211>  299
<212>  PRT
<213>  Lachnospiraceae bacterium 28-4

<400>  185

Met Ile Ile Ile Gln Leu Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                   10                  15

Tyr Ala Met Tyr Gln Lys Leu Leu Ser Leu Gly Lys Lys Val Lys Leu
            20                  25                  30

Asp Ile Ser Trp Phe Glu Glu Lys Asn Arg Gln Lys Asn Val Tyr Ala
        35                  40                  45

Arg Arg Glu Leu Glu Leu Asn Tyr Phe Lys Lys Ala Glu Tyr Glu Ala
    50                  55                  60

Cys Thr Glu Glu Glu Arg Lys Ala Leu Val Gly Glu Gly Gly Phe Ala
65                  70                  75                  80

Gly Lys Ile Lys Gly Lys Leu Phe Pro Gly Thr Arg Lys Ile Phe Arg
                85                  90                  95
```

```
Glu Thr Glu Met Tyr His Pro Glu Ile Phe Asp Phe Glu Asp Arg Tyr
            100                 105                 110

Leu Tyr Gly Tyr Phe Ala Cys Glu Lys Tyr Tyr Ala Asp Ile Met Glu
        115                 120                 125

Ile Leu Gln Glu Gln Phe Val Phe Pro Pro Ser Gly Asn Pro Glu Asn
    130                 135                 140

Gln Lys Met Ala Glu Arg Ile Ala Asp Gly Glu Ser Val Ser Leu His
145                 150                 155                 160

Ile Arg Arg Gly Asp Tyr Leu Asp Ala Glu Asn Met Ala Met Phe Gly
                165                 170                 175

Asn Ile Cys Thr Glu Glu Tyr Tyr Ala Gly Ala Ile Arg Glu Met Lys
            180                 185                 190

Lys Ile Tyr Pro Ser Ala His Phe Phe Val Phe Ser Asp Asp Ile Pro
        195                 200                 205

Tyr Ala Lys Glu Thr Tyr Ser Gly Glu Glu Phe Thr Val Val Asp Ile
    210                 215                 220

Asn Arg Gly Lys Asp Ser Phe Phe Asp Ile Trp Leu Met Ser Gly Cys
225                 230                 235                 240

Arg His Asn Ile Cys Ala Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg
                245                 250                 255

Leu Asn Arg Asn Lys Gly Lys Val Val Met Arg Pro Phe Ile His Lys
            260                 265                 270

Asn Ser Gln Lys Phe Glu Pro Glu Leu Met His Glu Leu Trp Lys Gly
        275                 280                 285

Trp Val Phe Ile Asp Asn Arg Gly Asn Ile Cys
    290                 295


<210>  186
<211>  273
<212>  PRT
<213>  Prevotella sp. CAG:1092

<400>  186

Met Arg Ile Leu Val Phe Thr Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Ala Phe Tyr Lys His Leu Lys Ser Cys Phe Pro Lys Glu Ser Phe
            20                  25                  30
```

```
Tyr Gly His Tyr Gly Val Lys Leu Lys Glu His Tyr Gly Leu Glu Ile
        35                  40                  45

Asn Lys Trp Phe Asp Val Thr Leu Pro Pro Ala Lys Trp Trp Thr Leu
    50                  55                  60

Pro Val Val Gly Leu Phe Tyr Leu Tyr Lys Lys Leu Val Pro Asn Ser
65                  70                  75                  80

Lys Trp Leu Asp Leu Phe Gln Arg Glu Trp Lys His Lys Asp Ala Lys
                85                  90                  95

Val Phe Phe Pro Phe Lys Phe Thr Lys Gln Tyr Phe Pro Lys Glu Asn
            100                 105                 110

Gly Trp Leu Lys Trp Lys Val Asp Glu Ala Ser Leu Cys Glu Lys Asn
        115                 120                 125

Lys Lys Leu Leu Gln Val Ile His Asp Glu Glu Thr Cys Phe Val His
    130                 135                 140

Val Arg Arg Gly Asp Tyr Leu Ala Ser Asn Phe Lys Ser Ile Phe Glu
145                 150                 155                 160

Gly Cys Cys Thr Leu Asp Tyr Tyr Lys Arg Ala Leu Glu Tyr Met Asn
                165                 170                 175

Lys Asn Asn Pro Lys Val Arg Phe Ile Cys Phe Ser Asp Asp Leu Glu
            180                 185                 190

Trp Met Arg Lys Asn Leu Pro Met Asp Asp Ser Ala Ile Tyr Val Asp
        195                 200                 205

Trp Asn Thr Gly Thr Asp Ser Pro Leu Asp Met Tyr Met Met Ser Gln
    210                 215                 220

Cys Asp Asn Gly Ile Ile Ala Asn Ser Ser Phe Ser Tyr Trp Gly Ala
225                 230                 235                 240

Tyr Leu Gly Gly Lys Lys Thr Thr Val Ile Tyr Pro Gln Lys Trp Trp
                245                 250                 255

Asn Met Glu Gly Gly Asn Pro Asn Ile Phe Met Asp Glu Trp Leu Gly
            260                 265                 270

Met
```

<210> 187
<211> 289
<212> PRT
<213> Spirosoma luteum

<400> 187

```
Met Val Ile Ser Val Leu Ser Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                  10                  15

Tyr Ala Phe Gly Leu Lys Leu Ala Ala Gln Leu Gln Thr Glu Leu Arg
            20                  25                  30

Leu Glu Arg His Leu Leu Glu Ser Lys Ala Ile Ala Arg Leu Arg Gln
        35                  40                  45

Tyr Thr Pro Arg Thr Tyr Glu Leu Asp Thr Phe Gly Val Glu Ala Pro
    50                  55                  60

Ala Ala Ser Leu Met Asp Thr Val Ser Cys Leu Ser Arg Val Ala Leu
65                  70                  75                  80

Ser Asp Lys Thr Ala Leu Leu Leu Arg Glu Ser Thr Leu Thr Pro Asn
                85                  90                  95

Ala Ile Asn Asn Leu Asn Asn Arg Val Arg Asp Val Val Cys Leu Gly
            100                 105                 110

Tyr Trp Gln Ser Glu Glu Tyr Phe Arg Pro Ala Thr Glu Gln Leu Arg
        115                 120                 125

Lys His Leu Val Phe Arg Lys Asn Pro Ala Gln Ser Arg Ser Met Ala
    130                 135                 140

Asp Thr Ile Leu Ser Cys Gln Asn Ala Ala Phe Val His Ile Arg Arg
145                 150                 155                 160

Gly Asp Tyr Val Thr Asn Thr His Ala Asn Gln His His Gly Leu Cys
                165                 170                 175

Asp Val Ser Tyr Tyr Arg Arg Ala Cys Glu Tyr Val Lys Glu Cys Ile
            180                 185                 190

Pro Asp Val Gln Phe Phe Val Phe Ser Asp Asp Pro Asp Trp Ala Lys
        195                 200                 205

Arg Glu Leu Gly Ile His Leu Gln Pro Ala Arg Phe Ile Asp His Asn
    210                 215                 220

Arg Gly Ala Asp Ser Trp Gln Asp Met Tyr Leu Met Ser Leu Cys Arg
225                 230                 235                 240

His Ala Ile Val Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu
                245                 250                 255

Asn Pro Val Ala Glu Arg Leu Val Val Ala Pro Gly Gln Trp Phe Val
```

260 265 270

Asn Gln Pro Val Leu Ser Gln Gln Ile Ile Pro Pro His Trp His Cys
275 280 285

Leu

<210> 188
<211> 296
<212> PRT
<213> Marinomonas posidonica

<400> 188

Met Ile Ile Val Asp Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Cys Ala Arg Ser Leu Ser Ile Glu Leu Asn Leu Pro Leu Lys
20 25 30

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

Leu Asn Arg Val Phe Gly Leu Asp Leu Glu Phe Ala Thr Glu Asn Asp
50 55 60

Met Gln Lys Asn Leu Gly Phe Phe Leu Ser Lys Pro Ile Leu Arg Lys
65 70 75 80

Ile Phe Ser Lys Lys Pro Leu Asn Asn Leu Lys Phe Gln Asn Phe Phe
85 90 95

Pro Glu Asn Ser Phe Asn Tyr Asn Ser Ser Leu Phe Ser Tyr Ile Lys
100 105 110

Asp Ser Gly Phe Leu Gln Gly Tyr Trp Gln Thr Glu Lys Tyr Phe Leu
115 120 125

Asn His Lys Ser Gln Ile Leu Lys Asp Phe Cys Phe Val Asn Met Asp
130 135 140

Asp Glu Thr Asn Ile Ser Ile Ala Asn Asp Ile Gln Ser Gly His Ser
145 150 155 160

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

Lys Ala Ile His Gly His Cys Ser Leu Asp Tyr Tyr Leu Lys Ala Ile
180 185 190

Glu Phe Leu Gln Glu Lys Ile Gly Glu Ser Arg Leu Phe Ile Phe Ser
195 200 205

```
Asp Asp Pro Glu Trp Val Ser Glu Asn Ile Ala Thr Arg Phe Ser Asp
    210                 215                 220

Val Ser Val Ile Gln His Asn Arg Gly Val Lys Ser Phe Asn Asp Met
225                 230                 235                 240

Arg Leu Met Ser Met Cys Asp His His Ile Ile Ala Asn Ser Ser Phe
                245                 250                 255

Ser Trp Trp Gly Ala Trp Leu Asn Pro Ser Gln Asn Lys Lys Ile Ile
            260                 265                 270

Ala Pro Lys Asn Trp Phe Val Thr Asp Lys Met Asn Thr Ile Asp Leu
        275                 280                 285

Ile Pro Ser Ser Trp Ile Leu Lys
    290                 295
```

<210> 189
<211> 263
<212> PRT
<213> Bacteroides vulgatus

<400> 189

```
Met Lys Ile Val Val Phe Lys Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Phe Tyr Lys Tyr Leu Ser Arg Lys Asp Glu Thr Phe Tyr Phe
            20                  25                  30

Tyr Asn Asp Ala Trp Tyr Asn Val Ser His Asn Gly Phe Glu Leu Asp
        35                  40                  45

Lys Tyr Phe Lys Thr Asp Asp Leu Lys Lys Cys Ser Arg Phe Trp Ile
    50                  55                  60

Ile Leu Phe Lys Thr Ile Leu Ser Lys Leu Tyr His Trp Lys Ile Tyr
65                  70                  75                  80

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

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

Lys His Leu Leu Leu Ser Glu Lys Asn Gln Ser Leu Leu Lys Asp Ile
        115                 120                 125

Gln Asn Ser Asn Ser Val Gly Val His Ile Arg Arg Gly Asp Tyr Met
    130                 135                 140
```

```
Thr Lys Gln Asn Leu Val Ile Phe Gly Asn Ile Cys Thr Gln Lys Tyr
145                 150                 155                 160

Tyr His Asp Ala Ile Arg Ile Ile Thr Glu Lys Val Asn Asp Ala Val
                165                 170                 175

Phe Tyr Val Phe Ser Asp Asp Ile Ser Trp Val Gln Thr His Leu Asp
            180                 185                 190

Ile Pro Asn Ala Val Tyr Val Asn Trp Asn Thr Gly Glu Ser Ser Ile
        195                 200                 205

Tyr Asp Met Tyr Leu Met Ser Ser Cys Lys Tyr Asn Ile Ile Ala Asn
    210                 215                 220

Ser Thr Phe Ser Tyr Trp Ala Ala Arg Leu Asn Lys Lys Thr Asn Met
225                 230                 235                 240

Val Ile Tyr Pro Ser Lys Trp Tyr Asn Thr Phe Thr Pro Asp Ile Phe
                245                 250                 255

Pro Glu Ser Trp Cys Gly Ile
            260
```

<210> 190
<211> 285
<212> PRT
<213> Candidatus Pelagibacter ubique

<400> 190

```
Met Thr Ile Arg Ile Lys Leu Thr Gly Gly Leu Gly Asn Gln Met Phe
1               5                   10                  15

Gln Phe Ala Thr Gly Phe Ala Ile Ala Lys Lys Lys Asn Val Arg Leu
            20                  25                  30

Ser Leu Asp Leu Lys Tyr Ile Asn Lys Arg Lys Leu Phe Asn Gly Phe
        35                  40                  45

Glu Leu Gln Lys Ile Phe Asn Ile Tyr Ser Lys Val Ser Phe Leu Asn
    50                  55                  60

Lys Thr Leu Ser Phe Lys Ser Ile Asn Phe Thr Glu Ile Leu Asn Arg
65                  70                  75                  80

Ile Asp Thr Thr Phe Tyr Asn Phe Lys Glu Pro His Phe His Tyr Thr
                85                  90                  95

Ser Asn Ile Leu Asn Leu Pro Lys His Ser Phe Leu Asp Gly Tyr Trp
            100                 105                 110
```

```
Gln Ser Glu Leu Tyr Phe Asn Glu Phe Ala Thr Glu Ile Lys Arg Ile
        115                 120                 125

Phe Asn Phe Ser Gly Lys Leu Asp Lys Ser Asn Leu Leu Val Ala Asp
    130                 135                 140

Asp Ile Asn Arg Asn Asn Ser Ile Ser Ile His Ile Arg Arg Gly Asp
145                 150                 155                 160

Phe Leu Leu Lys Gln Asn Asn Asn His His Thr Asp Leu Lys Glu Tyr
                165                 170                 175

Tyr Leu Lys Ala Ile Asn Glu Thr Ser Lys Ile Phe Lys Asn Pro Lys
            180                 185                 190

Tyr Phe Ile Phe Ser Asp Asp Thr Ser Trp Thr Val Asp Asn Phe Val
        195                 200                 205

Ile Asp His Pro Tyr Ile Ile Val Asp Ile Asn Phe Gly Ala Arg Ser
    210                 215                 220

Phe Leu Asp Met Tyr Leu Met Ser Leu Cys Lys Ser Asn Ile Ile Ala
225                 230                 235                 240

Asn Ser Ser Phe Ser Trp Trp Ser Ala Trp Leu Asn Asn Asn Lys Asp
                245                 250                 255

Lys Ile Ile Tyr Ala Pro Lys Asn Trp Phe Asn Asp Lys Ser Ile Cys
            260                 265                 270

Thr Asp Asp Leu Ile Pro Glu Ser Trp Asn Ile Ile Leu
        275                 280                 285
```

<210> 191
<211> 289
<212> PRT
<213> Bacteroides sp. CAG:875

<400> 191

```
Met Ser Val Ile Ile Asn Met Ala Cys Gly Leu Ala Asn Arg Met Phe
1               5                   10                  15

Gln Tyr Ala Phe Tyr Leu Tyr Leu Gln Lys Glu Gly Tyr Asp Ala Tyr
            20                  25                  30

Val Asp Tyr Phe Thr Arg Ala Asp Leu Val His Glu Asn Val Asp Trp
        35                  40                  45

Leu Arg Ile Phe Pro Glu Ala Thr Phe Arg Arg Ala Thr Ala Arg Asp
    50                  55                  60

Ile Arg Lys Met Gly Gly Gly His Asp Cys Phe Ser Arg Leu Arg Arg
```

65 70 75 80

Lys Leu Leu Pro Met Thr Thr Lys Val Leu Glu Thr Ser Gly Ala Phe
85 90 95

Glu Ile Ile Leu Pro Pro Lys Asn Arg Asp Ser Tyr Leu Leu Gly Ala
100 105 110

Phe Gln Ser Ala Lys Met Val Glu Ser Val Asp Ala Glu Val Arg Arg
115 120 125

Ile Phe Thr Phe Pro Glu Phe Glu Ser Gly Lys Asn Gln Tyr Phe Gln
130 135 140

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

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

Tyr Tyr Arg Lys Ala Val Asp Leu Met Lys Glu Lys Val Asp Ser Pro
180 185 190

Ser Phe Tyr Val Phe Thr Asp Asn Pro Ala Trp Val Lys Glu Asn Leu
195 200 205

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

Gly Ser His Cys Asp Met Gln Leu Met Ser Leu Cys Lys His Asn Ile
225 230 235 240

Ile Ser Asn Ser Ser Tyr Ser Trp Trp Gly Ala Tyr Leu Asn Asn Thr
245 250 255

Leu Asn Lys Ile Val Val Cys Pro Arg Ile Trp Phe Asn Pro Glu Ser
260 265 270

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

Leu

<210> 192
<211> 309
<212> PRT
<213> Butyrivibrio fibrisolvens

<400> 192

Met Ile Ile Ile Lys Leu Gln Gly Gly Leu Gly Asn Gln Leu Phe Leu
1 5 10 15

```
Tyr Gly Leu Tyr Lys Asn Leu Lys His Leu Lys Arg Asp Val Lys Met
            20                  25                  30

Asp Ile Glu Ser Gly Phe Glu Gly Asp Glu Leu Arg Lys Pro Cys Leu
        35                  40                  45

Asp Cys Met Asn Leu Glu Tyr Ala Ile Ala Thr Arg Asp Glu Val Thr
    50                  55                  60

Asp Ile Arg Asp Ser Tyr Met Asp Ile Phe Ser Arg Ile Arg Arg Lys
65                  70                  75                  80

Ile Thr Gly Arg Lys Thr Phe Asp Tyr Tyr Glu Pro Glu Asp Gly Asn
                85                  90                  95

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

Phe Gln Ser Glu Lys Tyr Phe Gly Asp Glu Glu Ser Val Lys Ala Leu
        115                 120                 125

Lys Asp Glu Leu Thr Lys Gly Lys Glu Asp Ile Leu Thr Ser Thr Asp
    130                 135                 140

Leu Ile Thr Lys Ile Tyr His Asp Ile Lys Asn Ser Glu Ser Val Ser
145                 150                 155                 160

Leu His Ile Arg Arg Gly Asp Tyr Leu Thr Pro Gly Ile Ile Glu Thr
                165                 170                 175

Tyr Gly Gly Ile Cys Thr Asp Glu Tyr Tyr Asp Lys Ala Ile Ala Met
            180                 185                 190

Ile Arg Glu Thr Phe Pro Glu Ala Arg Phe Phe Ile Phe Ser Asn Asp
        195                 200                 205

Ile Glu Trp Cys Lys Glu Lys Phe Ala Gly Asp Lys Asn Ile Leu Phe
    210                 215                 220

Val Asn Thr Ile Gly Ile Asn Leu Asp Ser Glu Asp Asn Ile Lys Ile
225                 230                 235                 240

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

Tyr Leu Met Ser Ala Cys Lys His His Ile Leu Ala Asn Ser Ser Phe
            260                 265                 270

Ser Trp Trp Gly Ala Trp Leu Ser Asp His Glu Gly Met Thr Ile Ala
        275                 280                 285
```

Pro Ser Lys Trp Leu Asn Asn Lys Asn Met Thr Asp Ile Tyr Thr Lys
290 295 300

Asp Met Leu Leu Ile
305

<210> 193
<211> 282
<212> PRT
<213> Roseburia hominis

<400> 193

Met Val Thr Val Lys Ile Gly Asp Gly Met Gly Asn Gln Met Tyr Asn
1 5 10 15

Tyr Ala Cys Gly Tyr Ala Ala Ala Lys Arg Ser Gly Glu Lys Leu Arg
20 25 30

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

Asp His Phe Arg Val Val Tyr Asp Glu Lys Glu Ser Phe Pro Asn Arg
50 55 60

Thr Phe Trp Gln Lys Leu Tyr Lys Arg Leu Arg Arg Asp Ile Arg Tyr
65 70 75 80

His Val Ile Arg Glu Arg Asp Met Tyr Ala Val Asp Ala Arg Val Phe
85 90 95

Val Pro Ala Arg Arg Gly Arg Tyr Leu His Gly Tyr Trp Gln Cys Leu
100 105 110

Gly Tyr Phe Glu Glu Tyr Leu Asp Asp Leu Arg Glu Met Phe Thr Pro
115 120 125

Ala Tyr Glu Gln Thr Asp Ala Val Arg Glu Leu Met Gln Gln Phe Thr
130 135 140

Gln Thr Pro Thr Cys Ala Leu His Val Arg Gly Gly Asp Leu Gly Gly
145 150 155 160

Pro Asn Arg Ala Tyr Phe Gln Gln Ala Ile Ala Arg Met Gln Lys Glu
165 170 175

Lys Pro Asp Val Thr Phe Ile Val Phe Thr Asn Asp Leu Pro Lys Ala
180 185 190

Lys Glu Cys Leu Asp Asp Gly Glu Ala Arg Met Arg Tyr Ile Ala Glu
195 200 205

```
Phe Gly Glu Ala Leu Ser Asp Ile Asp Glu Phe Phe Leu Met Ser Ala
    210                 215                 220

Cys Gln Asn Gln Ile Ile Ser Asn Ser Thr Tyr Ser Thr Trp Ala Ala
225                 230                 235                 240

Tyr Leu Asn Thr Leu Pro Gly Arg Ile Val Ile Val Pro Lys Phe His
                245                 250                 255

Gly Val Glu Gln Met Ala Leu Pro Asp Trp Ile Val Leu Asp Gly Gly
            260                 265                 270

Ala Cys Gln Lys Gly Glu Ile Asp Ala Val
        275                 280
```

<210> 194
<211> 316
<212> PRT
<213> Rhodopirellula europaea

<400> 194

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

Asp Ser Lys Ala Ala Gln Gln Val Cys Ser Thr Gln Ala Ala Ser Ala
            20                  25                  30

Ser Asp Arg Ala Cys Thr Ile Ser Ile Ser Gly Gly Leu Gly Asn Gln
        35                  40                  45

Met Leu Gln Tyr Ala Ala Gly Arg Ala Leu Ser Ile His His Asp Cys
    50                  55                  60

Pro Leu Gln Leu Asp Leu Lys Phe Tyr Ser Ser Lys Arg His Arg Ser
65                  70                  75                  80

Tyr Glu Leu Asp Ala Phe Pro Ile Gln Ala Gln Arg Trp Ile Lys Pro
                85                  90                  95

Ser Phe Phe Ser Gln Val Leu Asp Lys Ile Gln Gly Glu Ser Lys Ser
            100                 105                 110

Ala Pro Thr Tyr Glu Glu Gln Ser Lys Arg Phe Asp Arg Ala Phe Phe
        115                 120                 125

Asp Ile Glu Leu Pro Ala Arg Ile Arg Gly Tyr Phe Phe Ser Glu Lys
    130                 135                 140

Tyr Phe Leu Pro Tyr Ala Asp Gln Ile Arg Thr Glu Leu Thr Pro Pro
145                 150                 155                 160
```

```
Val Pro Leu Asp Gln Pro Ala Arg Asp Met Ala Gln Arg Leu Ser Glu
                165                 170                 175

Gly Met Ser Thr Ser Leu His Val Arg Arg Gly Asp Tyr Val Ser Asn
            180                 185                 190

Ala Asn Ala Arg Gln Arg Phe Trp Ser Cys Thr Ser Glu Tyr Phe Glu
        195                 200                 205

Ala Ala Ile Glu Gln Met Pro Ala Asp Ser Thr Val Phe Val Phe Ser
    210                 215                 220

Asp Asp Ile Glu Trp Ala Lys Gln Asn Ile Arg Ser Ser Arg Pro Thr
225                 230                 235                 240

Val Tyr Val Asn Asp Glu Leu Lys Leu Ala Gly Ser Pro Glu Thr Gly
                245                 250                 255

Leu Arg Asp Leu Trp Leu Met Thr His Ala Lys Ser His Ile Ile Ala
            260                 265                 270

Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Ser Gly Ser Glu Ala
        275                 280                 285

Asn Leu Thr Ile Ala Pro Lys Lys Trp Phe Asn Asp Pro Glu Ile Asp
    290                 295                 300

Asp Ser Asp Ile Val Pro Thr Ser Trp Arg Arg Ile
305                 310                 315
```

<210> 195
<211> 289
<212> PRT
<213> Rudanella lutea

<400> 195

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

Tyr Ala Leu Gly Arg His Leu Ala Ile Gln Asn Gln Thr Arg Leu Trp
            20                  25                  30

Phe Asp Leu Arg Tyr Tyr His Arg Thr Tyr Glu Thr Asp Thr Pro Arg
        35                  40                  45

Gln Phe Lys Leu Asp Arg Phe Ser Ile Asp Tyr Asp Leu Leu Asp Tyr
    50                  55                  60

Ser Pro Trp Leu Tyr Val Ser Lys Ala Thr Arg Leu Leu Pro Gly Arg
65                  70                  75                  80

Ser Leu Arg Pro Leu Phe Asp Thr Arg Lys Glu Pro His Phe His Leu
```

85 90 95

Asp Pro Ala Val Pro Asn Ala Lys Gly Ala Phe Ile Thr Leu Asp Gly
100 105 110

Phe Trp Gln Ser Glu Gly Tyr Phe Ala Ser Asn Ala Ala Thr Ile Arg
115 120 125

Arg Glu Leu Thr Phe Thr Arg Gln Pro Gly Pro Met Tyr Ala Arg Tyr
130 135 140

Arg Gln Gln Ile Glu Gln Thr Gln Thr Pro Val Ser Val His Ile Arg
145 150 155 160

Arg Gly Asp Tyr Val Ser His Pro Glu Phe Ser Gln Ser Phe Gly Ala
165 170 175

Leu Asp Asp Thr Tyr Tyr Gln Thr Ala Leu Ala Gln Ile Asn Gly Gln
180 185 190

Phe Pro Asp Ala Thr Leu Leu Val Phe Ser Asp Asp Pro Glu Trp Val
195 200 205

Arg Gln His Met Arg Phe Glu Arg Pro His Val Leu Val Glu Asn Thr
210 215 220

Gly Pro Asp Ala Asp Val Asp Asp Leu Gln Leu Met Ser Leu Cys His
225 230 235 240

His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu
245 250 255

Asn Pro Arg Pro Asp Lys Arg Val Ile Ala Pro Lys Gln Trp Phe Arg
260 265 270

Asn Lys Pro Trp Asn Thr Ala Asp Leu Ile Pro Ala Gly Trp Val Arg
275 280 285

Leu

<210> 196
<211> 280
<212> PRT
<213> Paraprevotella clara YIT 11840

<400> 196

Met Arg Leu Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Met Tyr Leu Lys Met Lys Thr Ile Phe Pro Asp Val Arg Ile
20 25 30

```
Asp Leu Ser Asp Met Val His Tyr Gln Val His Tyr Gly Tyr Glu Met
        35                  40                  45

Asn Lys Val Phe His Leu Pro Arg Thr Glu Phe Cys Ile Asn Arg Ser
    50                  55                  60

Leu Lys Lys Ile Ile Glu Phe Leu Leu Phe Lys Thr Ile Leu Glu Arg
65                  70                  75                  80

Lys Gln Gly Gly Ser Leu Val Pro Tyr Thr Arg Lys Tyr His Trp Pro
                85                  90                  95

Trp Ile Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Lys Tyr Phe Ala Gly
            100                 105                 110

Ile Glu Lys Glu Val Arg Glu Ala Phe Val Phe Asp Ile Arg Arg Ala
        115                 120                 125

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

Ala Val Ser Ile His Val Arg Arg Gly Asp Tyr Leu Leu Glu Lys His
145                 150                 155                 160

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

Leu Ala Glu Leu Glu Lys Arg Val Lys His Pro His Tyr Tyr Val Phe
            180                 185                 190

Ser Glu Asp Leu Asn Trp Val Arg Gln Asn Leu Pro Leu Ile Lys Ala
        195                 200                 205

Glu Phe Ile Asp Trp Asn Lys Gly Glu Asp Ser Trp Gln Asp Met Met
    210                 215                 220

Leu Met Ser His Cys Arg His His Ile Ile Cys Asn Ser Thr Phe Ser
225                 230                 235                 240

Trp Trp Gly Ala Trp Leu Asn Pro Leu Pro Asp Lys Ile Val Ile Ala
                245                 250                 255

Pro Glu Arg Trp Thr Gln Thr Thr Asp Ser Ala Asp Val Val Pro Glu
            260                 265                 270

Ser Trp Leu Lys Val Ser Ile Gly
        275                 280

<210>  197
<211>  288
```

<212> PRT
<213> Smaragdicoccus niigatensis

<400> 197

```
Met Ala Asp Val Val Val Thr Leu Ala Gly Gly Leu Gly Asn Gln Leu
1               5                  10                  15

Phe Gln Thr Ala Tyr Ala Lys Asn Leu Glu Ala Arg Gly His Arg Val
            20                  25                  30

Thr Leu Asp Gly Thr Val Val Arg Trp Thr Arg Gly Leu His Ile Asp
        35                  40                  45

Pro Gln Ile Cys Gly Leu Lys Ile Leu Asn Ala Thr Pro Pro Ala Pro
    50                  55                  60

Val Pro Gly Arg Leu Ala Ala Thr Val Leu Arg Arg Ala Leu Ala Thr
65                  70                  75                  80

Arg Leu Arg Phe Gly Pro Asp Gly Arg Ile Val Arg Thr Gln Arg Thr
                85                  90                  95

Leu Glu Phe Asp Glu Gln Tyr Leu Asn Leu Asn Ser Pro Gly Arg Tyr
            100                 105                 110

Arg Val Glu Gly Tyr Trp Gln Cys Glu Arg Tyr Phe Ser Asp Val Gly
        115                 120                 125

Gln Thr Val Arg Lys Val Phe Leu Asp Met Leu Gly Arg His Val Ser
    130                 135                 140

Tyr Asn Gly Leu Ser Arg Leu Pro Ala Met Ala Asp Pro Ser Ser Ile
145                 150                 155                 160

Ser Leu His Val Arg Arg Gly Asp Tyr Val Thr Ala Asn Phe Ile Asp
                165                 170                 175

Pro Leu Ala Leu Glu Tyr Tyr Glu Arg Ala Leu Glu Glu Leu Ala Val
            180                 185                 190

Pro Ser Pro Arg Ile Phe Val Phe Ser Asp Asp Leu Asp Trp Ala Thr
        195                 200                 205

Arg Glu Leu Gly Arg Ile Cys Asp Val Ile Pro Val Glu Pro Asp Trp
    210                 215                 220

Thr Ser His Pro Gly Gly Glu Ile Phe Leu Met Ser Gln Cys Ser His
225                 230                 235                 240

His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Asp
                245                 250                 255
```

```
Gly Arg Thr Ser Ser Arg Val Val Ala Pro Arg Gln Trp Phe Ser Leu
            260                 265                 270


Glu Thr Tyr Ser Ala Arg Asp Ile Val Pro Asp Arg Trp Thr Lys Val
        275                 280                 285


<210>  198
<211>  304
<212>  PRT
<213>  Bacteroides fragilis CAG:558

<400>  198

Met Ile His Leu Ile Leu Gly Gly Gly Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15


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


Phe Asn Thr Ile Leu Tyr Lys Glu Leu Lys Asn Glu Glu Arg Ser Phe
        35                  40                  45


Ser Leu Gly His Leu Asn Ile Asn Thr Met Cys Ile Val Glu Thr Pro
    50                  55                  60


Asp Glu Asn Lys Arg Ile Trp Glu Leu Phe Asn Lys Gln Ile Phe His
65                  70                  75                  80


Gln Lys Ile Ala Arg Lys Ile Leu Pro Ala Ser Ile Arg Trp Trp Trp
                85                  90                  95


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


Tyr His Pro Arg His Arg Ser Gln Asn Thr Thr Ile Ile His Gly Gly
        115                 120                 125


Phe Gln Ser Trp Lys Tyr Phe Lys Glu His Gln Ser Met Ile Lys Ala
    130                 135                 140


Glu Leu Lys Val Ile Thr Pro Ile Ser Glu Pro Asn Lys Lys Ile Leu
145                 150                 155                 160


Lys Glu Ile Gln Asn Ser Asn Ser Ile Cys Val His Ile Arg Arg Gly
                165                 170                 175


Asp Phe Leu Ser Ala Gln Phe Ser Pro His Leu Glu Val Cys Asn Lys
            180                 185                 190


Asp Tyr Tyr Glu Lys Ala Ile Lys Met Ile Ser Ser Gln Ile Glu Asn
        195                 200                 205
```

```
Pro Thr Phe Phe Ile Phe Ser Asn Thr His Glu Asp Leu Val Trp Ile
    210                 215                 220

Arg Lys Asn Tyr Asn Ile Pro Gln Asn Ser Val Tyr Val Asp Leu Asn
225                 230                 235                 240

Asn Pro Asp Tyr Glu Glu Leu Arg Leu Met Tyr Asn Cys Lys His Phe
                245                 250                 255

Ile Leu Ser Asn Ser Ser Phe Ser Trp Trp Ala Gln Tyr Leu Ser Glu
            260                 265                 270

Ser Lys Asn Lys Ile Ile Ile Ala Pro Lys Ile Trp Asp Lys Arg Lys
        275                 280                 285

Gly Ile Asp Phe Ser Asp Ile Tyr Met Pro Glu Trp Ile Ile Ile Lys
    290                 295                 300
```

<210> 199
<211> 295
<212> PRT
<213> Desulfovibrio desulfuricans

<400> 199

```
Met Ser Phe Ser Ile Asp Val Ala Ala Ile Gln Arg Met Ala Leu Val
1               5                   10                  15

Lys Val Asp Gly Gly Leu Gly Ser Gln Met Trp Gln Tyr Ala Leu Ser
            20                  25                  30

Leu Ala Val Gly Lys Ser Ser Ser Phe Thr Val Lys His Asp Leu Ser
        35                  40                  45

Trp Phe Arg His Tyr Ala Lys Asp Ile Arg Gly Ile Glu Asn Arg Phe
    50                  55                  60

Phe Ile Leu Asn Ser Val Phe Thr Asn Ile Asn Leu Arg Leu Ala Ser
65                  70                  75                  80

Glu Asn Glu Arg Leu Phe Phe His Ile Ala Leu Asn Arg Tyr Pro Asp
                85                  90                  95

Ser Ile Cys Asn Phe Asp Pro Asp Ile Leu Ala Leu Lys Gln Pro Thr
            100                 105                 110

Tyr Leu Gly Gly Tyr Tyr Val Asn Ala Gln Tyr Val Thr Ser Ala Glu
        115                 120                 125

Lys Glu Ile Arg Glu Ala Tyr Val Phe Ala Pro Ala Val Glu Glu Ser
    130                 135                 140

Asn Gln Ala Met Leu Gln Thr Ile His Ala Ala Pro Met Pro Val Ala
```

145 150 155 160

Val His Val Arg Arg Gly Asp Tyr Ile Gly Ser Met His Glu Val Leu
165 170 175

Thr Pro Arg Tyr Phe Glu Arg Ala Phe Lys Ile Leu Ala Ala Ala Leu
180 185 190

Gln Pro Lys Pro Thr Phe Phe Val Phe Ser Asn Gly Met Glu Trp Thr
195 200 205

Lys Lys Ala Phe Ala Gly Leu Pro Tyr Asp Phe Val Tyr Val Asp Ala
210 215 220

Asn Asp Asn Asp Asn Val Ala Gly Asp Leu Phe Leu Met Thr Gln Cys
225 230 235 240

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

Leu Ser Gln Arg Ala Glu Asn Lys Thr Val Ile Met Pro Ser Lys Trp
260 265 270

Arg Gly Gly Lys Ser Pro Ile Pro Gly Glu Cys Met Arg Val Glu Gly
275 280 285

Trp His Met Cys Pro Val Glu
290 295

<210> 200
<211> 282
<212> PRT
<213> Hoeflea phototrophica

<400> 200

Met His Gly Gly Leu Gly Asn Gln Leu Phe Gln Tyr Ala Val Gly Arg
1 5 10 15

Ala Val Ala Leu Arg Thr Gly Ser Glu Leu Leu Leu Asp Thr Arg Glu
20 25 30

Phe Thr Ser Ser Asn Pro Phe Gln Tyr Asp Leu Gly His Phe Ser Ile
35 40 45

Gln Ala Lys Val Ala Asn Ser Ser Glu Leu Pro Pro Gly Lys Asn Arg
50 55 60

Pro Leu Ala Tyr Ala Trp Trp Arg Lys Phe Gly Arg Ser Pro Arg Phe
65 70 75 80

Val Arg Glu Gln Asp Leu Gly Tyr Asn Ala Arg Ile Glu Thr Ile Glu
85 90 95

```
Ala Asp Cys Tyr Leu His Gly Tyr Phe Gln Ser Gln Lys Tyr Phe Glu
            100                 105                 110

Asp Ile Ala Ser Ile Leu Trp Lys Asp Leu Ser Phe Arg Gln Ala Ile
        115                 120                 125

Ser Gly Glu Asn Ala Ser Met Ala Glu Arg Ile Gln Ser Ala Pro Ser
    130                 135                 140

Val Ser Met His Ile Arg Arg Gly Asp Tyr Leu Thr Ser Ala Lys Ala
145                 150                 155                 160

Arg Ser Thr His Gly Ala Pro Asp Leu Gly Tyr Tyr Gly Arg Ala Leu
                165                 170                 175

Gly Glu Ile Arg Ala Arg Ser Gly Ser Asp Pro Val Val Tyr Leu Phe
            180                 185                 190

Ser Asp Asp Pro Asp Trp Val Arg Asn Asn Met Arg Met Asp Ala Asn
        195                 200                 205

Leu Val Thr Val Ala Ile Asn Asp Gly Lys Thr Ala Phe Glu Asp Leu
    210                 215                 220

Arg Leu Met Ser Leu Cys Asp His Asn Ile Ile Val Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Ser Leu Asp Lys Ile Val Val
                245                 250                 255

Ala Pro Lys Arg Trp Phe Ala Asp Pro Lys Leu Ser Asn Pro Asp Ile
            260                 265                 270

Thr Pro Pro Gly Trp Leu Arg Leu Gly Asp
        275                 280
```

<210> 201
<211> 286
<212> PRT
<213> Vibrio cholerae

<400> 201

```
Met Lys Ile Ile Ser Phe Ser Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Phe Tyr Leu Tyr Leu Lys Asp Asn Ser Asp Phe Gly Asn Ile
            20                  25                  30

Phe Leu Asp Phe Ser Phe Tyr Glu Ser Gln Asn Lys Arg Asp Ala Val
        35                  40                  45
```

```
Ile Arg Asn Phe Tyr Gly Val Asp Ser Leu Asp Ile Ile Lys Gln Ser
    50                  55                  60

Ser Tyr Val Arg Gly Lys Phe Leu Ile Leu Lys Leu Ile Asn Lys Phe
65                  70                  75                  80

Arg Phe Phe Asn Asn Leu Leu Glu Phe Val Asp Lys Glu Asn Gly Leu
                85                  90                  95

Asp Glu Thr Leu Leu Ser Thr Asn Lys Val Phe Phe Asp Gly Tyr Trp
            100                 105                 110

Gln Ser Tyr Arg Tyr Val Lys Asp Tyr Lys Ser Asn Ile Lys Glu Leu
        115                 120                 125

Phe Ser Phe Tyr Asp Phe Lys Gly Asn Ile Leu Glu Val Arg Lys Lys
    130                 135                 140

Ile Cys Gln Ser Asn Ser Val Cys Met His Val Arg Arg Gly Asp Tyr
145                 150                 155                 160

Val Ala Glu Lys Asn Thr Lys Leu Val His Gly Val Cys Ser Leu Gln
                165                 170                 175

Tyr Tyr Arg Asp Ala Leu Asn Asn Ile Lys Asn Val Asp Asn Ser Ile
            180                 185                 190

Asp His Ile Phe Ile Phe Ser Asp Asp Ile Asp Trp Val Lys Asn Asn
        195                 200                 205

Ile Ser Phe Asp Ile Pro Val Thr Val Val Asp Phe Val Gly Gln Ser
    210                 215                 220

Val Pro Asp Tyr Ala Glu Met Leu Leu Phe Ser Cys Gly Lys His Lys
225                 230                 235                 240

Val Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Phe Leu Ser Asp
                245                 250                 255

Arg Asn Gly Val Ile Val Ser Pro Lys Lys Trp Phe Ala Lys Glu Glu
            260                 265                 270

Lys Asn Tyr Asp Glu Ile Phe Ile Glu Gly Ser Leu Arg Leu
        275                 280                 285
```

<210> 202
<211> 295
<212> PRT
<213> Lachnospiraceae bacterium NK4A179

<400> 202

```
Met Ile Ile Val Arg Phe Arg Gly Gly Met Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Phe Leu Arg Tyr Leu Glu Met Lys Gly Ala Thr Leu Lys Ala
            20                  25                  30

Asp Leu Ser Glu Phe Lys Cys Met Lys Thr His Ala Gly Tyr Glu Leu
        35                  40                  45

Asp Lys Ala Phe Asp Leu His Pro Ala Glu Ala Ser Tyr Lys Glu Ile
    50                  55                  60

Arg Ala Val Ala Asp Tyr Ile Pro Val Met His Arg Phe Pro Phe Ser
65                  70                  75                  80

Arg Lys Val Phe Glu Ile Leu Tyr Lys Lys Glu Thr Lys Arg Val Glu
                85                  90                  95

Ala Glu Gly Pro Lys Lys Ser His Ile Ser Glu Glu Lys Tyr Phe Asp
            100                 105                 110

Met Ser Glu Asp Glu Arg Leu His Leu Ala Ser Ser Ser Glu Asp Leu
        115                 120                 125

Tyr Met Asp Gly Phe Trp Ile Lys Pro Asp Met Tyr Asp Asp Glu Val
    130                 135                 140

Leu Lys Cys Phe Thr Phe Ser Lys Thr Leu Asp Glu Lys Tyr Lys Gly
145                 150                 155                 160

Thr Ile Glu Asp Glu His Ser Cys Ser Val His Val Arg Cys Gly Asp
                165                 170                 175

Tyr Thr Gly Thr Gly Leu Asp Ile Leu Gly Lys Glu Tyr Tyr Glu Lys
            180                 185                 190

Ala Ala Glu Lys Ile Leu Ser Glu Asp Ala Asp Val Lys Phe Tyr Val
        195                 200                 205

Phe Ser Asp Asp Arg Glu Lys Ala Glu Lys Leu Leu Ser Pro Phe Met
    210                 215                 220

Lys Lys Met Val Phe Cys Asp Thr Pro Ala Ser His Ala Tyr Asp Asp
225                 230                 235                 240

Met Tyr Leu Met Ser Arg Cys Arg His His Ile Ile Ala Asn Ser Thr
                245                 250                 255

Phe Ser Phe Trp Gly Ala Arg Leu Ser Ala Asp Lys Ser Gly Ile Thr
            260                 265                 270
```

```
Ile Cys Pro Lys Tyr Glu Asp Lys Asn Asn Thr Ala Asn Arg Leu Val
        275                 280                 285


His Glu Gly Trp Gln Met Leu
    290                 295


<210>  203
<211>  289
<212>  PRT
<213>  Cecembia lonarensis

<400>  203

Met Ile Ile Met Lys Phe Met Gly Gly Leu Gly Asn Gln Ile Tyr Gln
1               5                   10                  15


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


Ser Asp Ile His Ile Tyr Lys Asn Asp Pro Asp Arg Glu Phe Val Leu
        35                  40                  45


Asp Lys Phe Asn Ile Lys Val Lys His Leu Pro Trp Lys Val Ile Lys
    50                  55                  60


Leu Leu Asn Ser Asp Tyr Ala Leu Lys Phe Asp Lys Val Phe His Thr
65                  70                  75                  80


Glu Phe Tyr His Glu Leu Val Leu Glu Lys Ala Leu Glu Ser Lys Asp
                85                  90                  95


Ile Pro Arg Lys Asn Asn Leu Tyr Leu Arg Gly Ser Trp Gly Asn Arg
            100                 105                 110


Lys Tyr Tyr Glu Asp Tyr Ile Asp Lys Ile Ser Asp Glu Ile Thr Leu
        115                 120                 125


Lys Glu Lys Phe Lys Thr Lys Asp Phe Asn Thr Val Asn Lys Lys Val
    130                 135                 140


Lys Asn Ser Asp Ser Val Gly Ile His Ile Arg Arg Gly Asp Tyr Glu
145                 150                 155                 160


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


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


Phe Phe Ile Phe Ser Asp Asp Thr Asp Trp Val Lys Glu Asn Leu Pro
        195                 200                 205


Phe Leu Lys Asp Ser Phe Phe Val Ser Asp Ile Ile Gly Ser Val Asp
```

210 215 220

Tyr Leu Glu Phe Glu Leu Leu Lys Asn Cys Lys His Gln Ile Ile Ala
225 230 235 240

Asn Ser Thr Phe Ser Trp Trp Ala Ala Arg Leu Asn Ser Asn Pro Ala
245 250 255

Lys Ile Val Ile Lys Pro Lys Arg Trp Phe Ala Asp Asp Arg Gln Gln
260 265 270

Ala Val Tyr Glu Ile Glu Asp Ser Tyr Tyr Ile Lys Glu Ala Ile Lys
275 280 285

Leu

<210> 204
<211> 292
<212> PRT
<213> Bacteroides ovatus

<400> 204

Met Lys Ile Val Asn Ile Leu Gly Gly Leu Gly Asn Gln Met Phe Val
1 5 10 15

Tyr Ala Met Tyr Leu Ala Leu Lys Glu Ala His Pro Glu Glu Glu Ile
20 25 30

Leu Leu Cys Arg Arg Ser Tyr Lys Gly Tyr Pro Leu His Asn Gly Tyr
35 40 45

Glu Leu Glu Arg Ile Phe Gly Val Glu Ala Pro Glu Ala Ala Leu Ser
50 55 60

Gln Leu Ala Arg Val Ala Tyr Pro Phe Phe Asn Tyr Lys Ser Trp Gln
65 70 75 80

Leu Met Arg His Phe Leu Pro Leu Arg Lys Ser Met Ala Ser Gly Thr
85 90 95

Thr Gln Ile Pro Phe Asp Tyr Ser Glu Val Thr Arg Asn Asp Asn Val
100 105 110

Tyr Tyr Asp Gly Tyr Trp Gln Asn Glu Lys Asn Phe Leu Ser Ile Arg
115 120 125

Asp Lys Val Ile Lys Ala Phe Thr Phe Pro Glu Phe Arg Asp Glu Lys
130 135 140

Asn Lys Ala Leu Ser Asp Lys Leu Lys Ser Val Lys Thr Ala Ser Cys
145 150 155 160

```
His Ile Arg Arg Gly Asp Tyr Leu Lys Asp Pro Ile Tyr Gly Val Cys
                165                 170                 175

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

Asn Pro Asp Met Tyr Cys Ile Phe Ser Asp Asp Ile Gly Trp Cys Lys
        195                 200                 205

Glu Asn Phe Lys Phe Leu Ile Gly Asp Lys Glu Val Val Phe Val Asp
    210                 215                 220

Trp Asn Lys Gly Gln Glu Ser Phe Tyr Asp Met Gln Leu Met Ser Leu
225                 230                 235                 240

Cys His Tyr Asn Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
                245                 250                 255

Trp Leu Asn Asn Asn Asp Asp Lys Val Val Val Ala Pro Glu Arg Trp
            260                 265                 270

Met Asn Lys Thr Leu Glu Asn Asp Pro Ile Cys Asp Asn Trp Lys Arg
        275                 280                 285

Ile Lys Val Glu
    290
```

<210> 205
<211> 281
<212> PRT
<213> Bacteroides coprocola CAG:162

<400> 205

```
Met Arg Leu Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Phe Tyr Leu Lys Met Lys Lys Leu Phe Pro His Thr Lys Ile
            20                  25                  30

Asp Leu Ser Asp Met Met His Tyr His Val His His Gly Tyr Glu Met
        35                  40                  45

Asn Arg Val Phe Ala Leu Pro His Thr Glu Phe Cys Ile Asn Arg Thr
    50                  55                  60

Leu Lys Lys Leu Met Glu Phe Leu Leu Cys Lys Val Val Tyr Glu Arg
65                  70                  75                  80

Lys Gln Lys Asn Gly Ser Met Glu Ala Phe Glu Lys Lys Tyr Ala Trp
                85                  90                  95
```

```
Pro Leu Ile Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
            100                 105                 110

Asp Ile Glu Asp Asp Val Arg Lys Thr Phe Cys Phe Asn Met Glu Leu
        115                 120                 125

Ile Asn Ser Arg Ser Arg Glu Met Met Lys Ile Ile Asp Ala Asp Glu
    130                 135                 140

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

Phe Trp Ala Asn Ala Gly Cys Val Cys Gln Leu Pro Tyr Tyr Lys Asn
                165                 170                 175

Ala Ile Thr Glu Leu Glu Lys His Glu Ser Thr Pro Ser Phe Tyr Val
            180                 185                 190

Phe Ser Asp Asp Ile Glu Trp Val Lys Gln Asn Leu Ser Leu Pro Asn
        195                 200                 205

Ala His Tyr Ile Asp Trp Asn Gln Gly Asn Asp Ser Trp Gln Asp Met
    210                 215                 220

Met Leu Met Ser His Cys Arg Asn His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Arg Lys Asn Lys Thr Val Ile
                245                 250                 255

Val Pro Ser Arg Trp Phe Met Lys Glu Glu Thr Pro Tyr Ile Tyr Pro
            260                 265                 270

Val Ser Trp Ile Lys Val Pro Ile Asn
        275                 280


<210>  206
<211>  281
<212>  PRT
<213>  Bacteroides dorei

<400>  206

Met Arg Leu Ile Lys Val Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Phe Tyr Leu Arg Met Lys Lys Tyr Tyr Pro Lys Val Arg Ile
            20                  25                  30

Asp Leu Ser Asp Met Met His Tyr Lys Val His Tyr Gly Tyr Glu Met
        35                  40                  45
```

```
His Arg Val Phe Lys Leu Pro His Thr Glu Phe Cys Ile Asn Gln Pro
    50                  55                  60

Leu Lys Lys Ile Ile Glu Phe Leu Phe Phe Lys Lys Ile Tyr Glu Arg
65                  70                  75                  80

Lys Gln Ala Pro Asn Ser Leu Arg Ala Phe Glu Lys Lys Tyr Phe Trp
                85                  90                  95

Pro Leu Leu Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Arg Phe Phe Ala
            100                 105                 110

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

Ala Asn Ser Arg Ser Leu Asp Met Leu Asp Ile Leu Asp Lys Asp Glu
    130                 135                 140

Asn Ala Val Ser Leu His Ile Arg Arg Gly Asp Tyr Leu Gln Pro Lys
145                 150                 155                 160

His Trp Ala Thr Thr Gly Ser Val Cys Gln Leu Pro Tyr Tyr Gln Asn
                165                 170                 175

Ala Ile Ala Glu Met Ser Lys Arg Val Thr Ser Pro Ser Tyr Tyr Ile
            180                 185                 190

Phe Ser Asp Asp Ile Val Trp Val Arg Glu Asn Leu Pro Leu Gln Asn
        195                 200                 205

Ala Val Tyr Ile Asp Trp Asn Thr Gly Glu Asp Ser Trp Gln Asp Met
    210                 215                 220

Met Leu Met Ser His Cys Lys His His Ile Ile Cys Asn Ser Thr Phe
225                 230                 235                 240

Ser Trp Trp Gly Ala Trp Leu Asn Pro Ser Ile Asp Lys Thr Val Ile
                245                 250                 255

Val Pro Ser Arg Trp Phe Gln Tyr Ser Glu Thr Pro Asp Ile Tyr Pro
            260                 265                 270

Thr Gly Trp Ile Lys Val Pro Val Asp
        275                 280
```

<210> 207
<211> 276
<212> PRT
<213> Bacteroides intestinalis CAG:564

<400> 207

```
Met Ile Ile Val Arg Leu Trp Gly Gly Leu Gly Asn Gln Leu Phe Gln
```

```
1               5                   10                  15

Tyr Ser Phe Gly Gln Tyr Leu Glu Ile Glu Thr Asp Lys Lys Val Phe
            20                  25                  30

Tyr Asp Val Ala Ser Phe Gly Thr Ser Asp Gln Leu Arg Lys Leu Glu
        35                  40                  45

Leu Cys Ser Phe Ile Pro Asp Ile Pro Leu Tyr Asn Ala Tyr Phe Thr
    50                  55                  60

Arg Tyr Thr Gly Val Lys Asn Arg Leu Phe Lys Ala Leu Phe Gln Trp
65                  70                  75                  80

Ser Asn Thr Tyr Leu Ser Glu Ser Met Phe Asp Ile Cys Leu Leu Glu
                85                  90                  95

Lys Ala Arg Gly Lys Ile Phe Leu Gln Gly Tyr Trp Gln Glu Glu Lys
            100                 105                 110

Tyr Ala Thr Tyr Phe Pro Met Gln Lys Val Leu Ser Glu Trp Lys Asn
        115                 120                 125

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

Ser Val Ser Leu His Val Arg Arg Gly Asp Tyr Phe Ser Pro Lys Asn
145                 150                 155                 160

Ile Asn Val Tyr Gly Val Cys Thr Glu Lys Tyr Tyr Glu Gln Ala Ile
                165                 170                 175

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

Ser Asp Asp Ile Leu Trp Val Lys Asn His Val Ser Leu Pro Glu Ser
        195                 200                 205

Thr Val Phe Val Pro Asn His Glu Ile Ser Gln Phe Ala Tyr Ile Tyr
    210                 215                 220

Leu Met Ser Leu Cys Lys Val Asn Ile Ile Ser Asn Ser Thr Phe Ser
225                 230                 235                 240

Trp Trp Gly Ala Tyr Leu Asn Gln His Lys Asn Gln Leu Val Ile Ala
                245                 250                 255

Pro Ser Arg Trp Thr Phe Thr Ser Asn Lys Thr Leu Ala Leu Asp Ser
            260                 265                 270

Trp Thr Lys Ile
```

275

<210> 208
<211> 297
<212> PRT
<213> Lachnospiraceae bacterium A4

<400> 208

Met Ile Val Ile His Val Met Gly Gly Leu Gly Asn Gln Leu Tyr Gln
1 5 10 15

Tyr Ala Leu Tyr Glu Lys Leu Arg Ala Leu Gly Arg Glu Val Lys Leu
20 25 30

Asp Val Tyr Ala Tyr Arg Gln Ala Glu Gly Ala Glu Arg Glu Trp Arg
35 40 45

Ala Leu Glu Leu Glu Trp Leu Glu Gly Ile Arg Tyr Glu Val Cys Thr
50 55 60

Ala Ala Glu Arg Gln Gln Leu Leu Asp Asn Ser Met Arg Leu Ala Asp
65 70 75 80

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

Cys Ala Ala Tyr Met Pro Glu Ile Phe Glu Met Asp Asp Val Tyr Leu
100 105 110

Tyr Gly Phe Trp Gly Cys Glu Lys Tyr Tyr Glu Asp Ile Ile Pro Leu
115 120 125

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

Asp Val Leu Arg Ala Met Ala Gly Glu Asn Ala Val Ser Val His Ile
145 150 155 160

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

Ile Cys Thr Asp Ala Tyr Tyr Lys Gly Ala Phe Arg Tyr Ile Thr Glu
180 185 190

Arg Val Glu Arg Pro Val Phe Tyr Ile Phe Ser Asp Asp Pro Ala Phe
195 200 205

Ala Lys Thr Gln Phe Cys Glu Glu Asn Met His Val Val Asp Trp Asn
210 215 220

Thr Gly Arg Glu Ser Leu Gln Asp Met Ala Leu Met Ser Arg Cys Arg
225 230 235 240

```
His Asn Ile Cys Ala Asn Ser Thr Phe Ser Ile Trp Gly Ala Arg Leu
                245                 250                 255

Asn Arg His Pro Asp Lys Ile Met Ile Arg Pro Leu His His Asp Asn
            260                 265                 270

Tyr Glu Ala Leu Asp Ala Arg Thr Val His Glu Tyr Trp Lys Gly Trp
        275                 280                 285

Val Leu Ile Asp Ala Asp Gly Lys Val
    290                 295
```

<210> 209
<211> 285
<212> PRT
<213> Phaeobacter gallaeciensis

<400> 209

```
Met Ile Ile Thr Arg Leu His Gly Arg Leu Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Arg Ala Leu Ala Asp Arg Leu Gly Val Ser Val Ala
            20                  25                  30

Leu Asp Ser Arg Gly Ala Glu Leu Arg Gly Glu Gly Val Leu Thr Arg
        35                  40                  45

Val Phe Asp Leu Asp Leu Ala Thr Pro Asp Ile Leu Pro Pro Leu Arg
    50                  55                  60

Gln Arg Ala Pro Leu Gly Tyr Ala Leu Trp Arg Gly Leu Gly Gln His
65                  70                  75                  80

Leu Gly Thr Gly Pro Lys Leu Arg Arg Glu Val Gly Leu Gly Tyr Asn
                85                  90                  95

Pro Asp Phe Val Asp Trp Ser Asp Asn Ser Tyr Leu His Gly Tyr Trp
            100                 105                 110

Gln Ser Glu Arg Tyr Phe Ala Gln Ser Ala Glu Arg Ile Arg Arg Asp
        115                 120                 125

Phe Thr Phe Pro Glu Tyr Ser Asn Gln Gln Asn Ala Glu Met Ala Ala
    130                 135                 140

Arg Ile Gly Glu Thr Asn Ala Ile Ser Leu His Val Arg Arg Gly Asp
145                 150                 155                 160

Tyr Leu Thr Leu Ala Ala His Val Leu Cys Asp Gln Ala Tyr Tyr Glu
                165                 170                 175
```

```
Ala Ala Leu Ala Gln Val Leu Asp Gly Leu Glu Gly Gln Pro Thr Val
            180                 185                 190

Tyr Val Phe Ser Asp Asp Pro Gln Trp Ala Lys Glu Asn Leu Pro Leu
        195                 200                 205

Pro Cys Asp Lys Val Val Val Asp Phe Asn Gly Ala Asp Thr Asp Tyr
    210                 215                 220

Glu Asp Met Arg Leu Met Ser Leu Cys Lys His Asn Ile Ile Gly Asn
225                 230                 235                 240

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

Arg Val Ala Gly Pro Thr Lys Trp Phe Gly Asp Pro Lys Leu Asn Asn
            260                 265                 270

Pro Asp Ile Leu Pro Pro Asp Trp Leu Arg Ile Ser Val
        275                 280                 285
```

<210> 210
<211> 686
<212> PRT
<213> Firmicutes bacterium CAG:791

<400> 210

```
Met Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr Ala Leu Tyr Leu
1               5                   10                  15

Lys Leu Arg Ser Leu Gly Arg Glu Val Cys Phe Asp Asp Lys Ser Gln
            20                  25                  30

Tyr Asp Glu Glu Thr Phe Arg Asn Ser Ser Gln Lys Arg Arg Pro Lys
        35                  40                  45

His Leu Asp Ile Phe Gly Ile Thr Tyr Pro Ser Ala Gly Lys Glu Glu
    50                  55                  60

Leu Glu Lys Leu Thr Asp Gly Ala Met Asp Leu Pro Ser Arg Ile Arg
65                  70                  75                  80

Arg Lys Ile Leu Gly Arg Lys Ser Leu Glu Lys Asn Asp Arg Asp Phe
                85                  90                  95

Met Phe Asp Pro Ser Phe Leu Glu Glu Thr Glu Gly Tyr Phe Cys Gly
            100                 105                 110

Gly Phe Gln Ser Pro Arg Tyr Phe Ala Gly Ala Glu Glu Glu Val Arg
        115                 120                 125
```

```
Lys Ala Phe Thr Phe Pro Glu Glu Leu Leu Cys Pro Lys Glu Gly Cys
    130                 135                 140

Ser Arg Gln Glu Gln Lys Met Leu Glu Gln Ser Ala Ser Tyr Ala Glu
145                 150                 155                 160

Arg Ile Arg Lys Ala Asn Cys Glu Ala Ala Asp Arg Gly Val Pro Gly
                165                 170                 175

Gly Gly Ser Ala Ser Ile His Leu Arg Phe Gly Asp Tyr Val Asp Lys
            180                 185                 190

Gly Asp Ile Tyr Gly Gly Ile Cys Thr Asp Ala Tyr Tyr Asp Thr Ala
        195                 200                 205

Ile Arg Cys Leu Lys Glu Arg Asp Pro Gly Met Ile Phe Phe Val Phe
    210                 215                 220

Ser Asn Asp Glu Glu Lys Ala Gly Glu Trp Ile Arg Tyr Gln Ala Glu
225                 230                 235                 240

Arg Ser Glu Asn Leu Gly Arg Gly His Phe Val Leu Val Lys Gly Cys
                245                 250                 255

Asp Glu Asp His Gly Tyr Leu Asp Leu Tyr Leu Met Thr Leu Cys Arg
            260                 265                 270

Asn His Val Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ser Phe Met
        275                 280                 285

Cys Asp Ala Pro Asp Lys Met Val Phe Ala Pro Ser Ile Trp Asn Asn
    290                 295                 300

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

Met Gln Arg Ile Ser Pro Arg Gly Thr Arg Leu Ser Asp Arg Pro Leu
                325                 330                 335

Ile Ser Val Ile Val Thr Ala Tyr Asn Val Ala Pro Tyr Ile Gly Arg
            340                 345                 350

Ala Leu Asp Ser Val Cys Gly Gln Thr Trp Lys Asn Leu Glu Ile Ile
        355                 360                 365

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

Tyr Ala Ala Gly Asp Ser Arg Ile Gln Val Val His Thr Glu Asn Arg
385                 390                 395                 400
```

```
Gly Val Ser Ala Ala Arg Asn Glu Gly Ile Ala His Ala Arg Gly Glu
                405                 410                 415

Tyr Ile Gly Phe Val Asp Gly Asp Asp Arg Ala His Pro Ala Met Tyr
            420                 425                 430

Glu Ala Met Ile Arg Gly Ile Leu Ser Ser Gly Ala Asp Met Ala Val
        435                 440                 445

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

Glu Gln Val Ala Ser Phe Asp Pro Val Leu Arg Ala Ser Val Leu Leu
465                 470                 475                 480

Gln Gln Arg Asp Ala Val Gln Cys Phe Ile Arg Ala Gly Met Ala Glu
                485                 490                 495

Glu Glu Gly Lys Ile Val Leu Arg Ser Ala Val Trp Asn Lys Leu Phe
            500                 505                 510

His Arg Arg Leu Leu Arg Asp Asn Arg Phe Pro Glu Gly Thr Ser Ala
        515                 520                 525

Glu Asp Ile Pro Phe Thr Thr Arg Ala Leu Cys Leu Ser Lys Lys Val
    530                 535                 540

Leu Cys Val Pro Glu Ile Leu Tyr Asp Tyr Val Val Asn Arg Gln Glu
545                 550                 555                 560

Ser Ile Met Asn Thr Gly Arg Ala Glu Arg Thr Leu Thr Gln Glu Ile
                565                 570                 575

Pro Ala Trp Arg Thr His Leu Glu Leu Leu Lys Glu Ser Gly Leu Ser
            580                 585                 590

Asp Leu Ala Glu Glu Ser Glu Tyr Trp Phe Tyr Arg Arg Met Leu Ser
        595                 600                 605

Tyr Glu Glu Glu Tyr Arg Arg Cys Ser Glu Thr Ala Lys Glu Ala Lys
    610                 615                 620

Glu Leu Gln Glu Arg Ile Leu Lys His Arg Asp Arg Ile Leu Glu Leu
625                 630                 635                 640

Ala Glu Glu His Ser Phe Gly Arg Arg Gly Asp Arg Glu Arg Leu Lys
                645                 650                 655

Leu Tyr Val Asn Ser Pro Arg Gln Tyr Phe Leu Leu Ser Asp Leu Tyr
            660                 665                 670
```

Glu Lys Thr Val Val Asn Trp Lys Asn Arg Pro Asp Lys Thr
675 680 685

<210> 211
<211> 290
<212> PRT
<213> Butyrivibrio proteoclasticus

<400> 211

Met Arg Lys Arg Ile Ile Ala Leu Asn Gly Gly Leu Gly Asn Gln Met
1 5 10 15

Phe Gln Tyr Ala Phe Ala Arg Met Leu Glu Asp Arg Lys His Cys Leu
20 25 30

Ile Glu Phe Asp Thr Gly Phe Tyr Ser Thr Val Asn Asp Arg Lys Leu
35 40 45

Ala Ile Gln Asn Tyr Asn Ile His Lys Tyr Asp Phe Cys Asn His Glu
50 55 60

Tyr Tyr Asn Lys Ile Arg Leu Leu Phe Gln Lys Ile Pro Phe Val Ala
65 70 75 80

Trp Leu Ala Gly Thr Tyr Lys Glu Tyr Ser Glu Tyr Gln Leu Asp Pro
85 90 95

Arg Val Phe Leu Phe Asn Tyr Arg Phe Tyr Tyr Gly Tyr Trp Gln Asn
100 105 110

Lys Gln Tyr Phe Glu Asn Ile Ser Asn Asp Ile Arg Asn Glu Leu Ser
115 120 125

Tyr Ile Gly Asn Val Ser Glu Lys Glu Asn Ala Leu Leu Asn Met Leu
130 135 140

Glu Ala His Asn Ala Ile Ala Ile His Val Arg Arg Gly Asp Tyr Thr
145 150 155 160

Gln Glu Gly Tyr Asn Lys Ile Tyr Ile Ser Leu Ser Lys Glu Tyr Tyr
165 170 175

Lys Arg Ala Val Ser Ile Ala Cys Lys Glu Leu Gly Asp Asn Asn Ile
180 185 190

Pro Leu Tyr Val Phe Ser Asp Asp Ile Asp Trp Cys Lys Ala Asn Leu
195 200 205

Ala Asp Ile Gly Asn Val Thr Phe Val Asp Asn Thr Ile Ser Ser Ser
210 215 220

Ala Asp Ile Asp Met Leu Met Met Lys Lys Ser Arg Cys Leu Ile Thr

225 230 235 240

Ala Asn Ser Thr Phe Ser Trp Trp Ser Ala Trp Leu Ser Asp Arg Asp
245 250 255

Asp Lys Ile Val Leu Val Pro Asp Lys Trp Leu Gln Asp Glu Glu Lys
260 265 270

Asn Thr Lys Leu Met Lys Ala Phe Ile Cys Asp Lys Trp Lys Ile Val
275 280 285

Pro Val
290

<210> 212
<211> 286
<212> PRT
<213> Bacteroides sp. 2_1_16

<400> 212

Met Gln Val Val Ala Arg Ile Ile Gly Gly Leu Gly Asn Gln Met Phe
1 5 10 15

Ile Tyr Ala Thr Ala Arg Ala Leu Ala Leu Arg Ile Asp Ala Asp Leu
20 25 30

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

Phe Leu Leu Asp Ser Phe Cys Ile Ser Tyr Arg Lys Ala Asn Cys Phe
50 55 60

Gln Lys Tyr Asp Tyr Tyr Leu Gly Glu Lys Val Lys Ser Leu Gly Lys
65 70 75 80

Lys Thr His Phe Ser Val Ile Pro Phe Met Lys Tyr Ile Ser Glu Asn
85 90 95

Thr Ser Cys Asp Phe Val Asp Gly Leu Leu Lys Lys His Ile Leu Ser
100 105 110

Val Tyr Leu Asp Gly Tyr Trp Gln Asn Glu Ala Tyr Phe Lys Asp Tyr
115 120 125

Ala Ser Ile Ile Lys Lys Asp Phe Gln Phe Cys Gln Val Asn Asp Leu
130 135 140

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

Ala Ile Gly Val Arg Arg Tyr Gln Glu Leu Asn Ser His Gln Asn Thr
165 170 175

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

Ser Lys Val Asp Asn Pro Thr Phe Phe Ile Phe Ser Glu Asp Gln Glu
        195                 200                 205

Trp Val Lys Asn Asn Leu Glu Gln Lys Ser Asn Phe Ile Met Ile Ser
    210                 215                 220

Pro Lys Glu Gly Asn Tyr Ser Ala Leu Asn Asp Met Tyr Leu Ile Ser
225                 230                 235                 240

Leu Cys Lys His His Ile Val Ser Asn Ser Ser Phe Tyr Trp Trp Gly
                245                 250                 255

Ala Trp Leu Ala Asn Asn Lys Asn Lys Ile Val Val Ala Ser Asp Cys
            260                 265                 270

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


<210>  213
<211>  300
<212>  PRT
<213>  Desulfomicrobium baculatum

<400>  213

Met Ala Lys Ile Val Thr Arg Ile Met Gly Gly Ile Gly Asn Gln Leu
1               5                   10                  15

Phe Cys Tyr Ala Ala Ala Arg Arg Leu Ala Leu Val Asn His Ala Glu
            20                  25                  30

Leu Val Ile Asp Asp Val Thr Gly Phe Ser Arg Asp Arg Val Tyr Arg
        35                  40                  45

Arg Arg Tyr Met Leu Asp His Phe Asn Ile Ser Ala Arg Lys Ala Thr
    50                  55                  60

Asn Tyr Glu Arg Met Glu Pro Phe Glu Arg Tyr Arg Arg Gly Leu Ala
65                  70                  75                  80

Lys Tyr Ile Ser Lys Lys Leu Pro Phe Phe Glu Arg Glu Tyr Ile Glu
                85                  90                  95

Gln Glu Arg Ile Glu Phe Asp Pro Arg Phe Leu Glu Tyr Arg Thr Tyr
            100                 105                 110

Asn Asn Ile Tyr Ile Asp Gly Leu Trp Gln Ser Glu Asn Tyr Phe Lys
        115                 120                 125
```

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

Asp Leu Glu Asn Ile Asn Ile Ala Lys Lys Ile Lys Asn Ile Gln Asn
145                 150                 155                 160

Thr Ile Ala Met His Val Arg Trp Phe Asp Leu Pro Gly Ile Asn Leu
                165                 170                 175

Gly Asn Asn Val Ser Thr Tyr Tyr Tyr His Arg Ala Ile Ala Met Met
            180                 185                 190

Glu Gln Arg Ile Asn Ala Pro His Tyr Phe Leu Phe Ser Asp Asn Leu
        195                 200                 205

Glu Ala Val His Ser Lys Leu Asp Leu Pro Glu Gly Arg Val Thr Phe
    210                 215                 220

Val Ser Asn Asn Asp Gly Asp Asp Asn Ala Tyr Ala Asp Leu Trp Leu
225                 230                 235                 240

Met Ser Gln Cys Lys His Phe Ile Thr Ala Asn Ser Thr Phe Ser Trp
                245                 250                 255

Trp Gly Ala Trp Leu Gly Glu Ser Arg Asp Ser Val Val Leu Val Pro
            260                 265                 270

Arg Phe Ser Pro Asp Gly Gly Val Thr Ser Trp Cys Phe Thr Gly Leu
        275                 280                 285

Ile Pro Glu Arg Trp Glu Gln Val Ser Ser Ile Arg
    290                 295                 300
```

<210> 214
<211> 287
<212> PRT
<213> Prevotella pleuritidis

<400> 214

```
Met Asp Ile Val Leu Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                   10                  15

Tyr Ala Phe Tyr Leu Ala Lys Arg Gln Arg Asn Asn His Thr Val Tyr
            20                  25                  30

Cys Val Phe Gly Pro Arg Thr Gln Tyr Ser Leu Asp Lys Leu Phe Asp
        35                  40                  45

Ile Pro Tyr Arg His Asn Ala Val Leu Val Leu Leu Tyr Arg Ala Leu
    50                  55                  60
```

```
Asp Lys Ala His Phe Ser Asn His Arg Trp Leu Arg Arg Leu Leu Arg
65                  70                  75                  80

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

Arg Asp Phe Asp Met Arg His Phe Thr His Gln Lys Gly Ile Val Phe
            100                 105                 110

Tyr Arg Gly Gly Trp His Ser Glu Leu Asn Phe Thr Ala Val Ala Asp
        115                 120                 125

Ala Val Lys Arg Arg Phe Arg Phe Pro Glu Ile Gln Asp Ala Ala Val
    130                 135                 140

Leu Ala Val Ile Asp Arg Ile Lys Ser Cys Gln Ser Val Ser Leu His
145                 150                 155                 160

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

Thr Glu Ala Tyr Tyr Glu His Ala Ile Ala Tyr Phe Glu Ser Gln Ile
            180                 185                 190

Glu Ser Pro Glu Tyr Phe Val Phe Ser Asp Asp Pro Thr Tyr Ala Arg
        195                 200                 205

Glu Gln Phe Gly Ala Asp Pro Asn Phe His Ile Ile Asp Leu Asn His
    210                 215                 220

Gly Glu Asp Ala Trp Cys Asp Leu Leu Met Met Thr Gln Cys Arg Tyr
225                 230                 235                 240

Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Asn
                245                 250                 255

Asp Asn Pro Ser Lys Ile Val Val His Pro Arg Tyr His Leu Asn Gly
            260                 265                 270

Val Glu Thr Arg Asp Phe Tyr Pro Arg Asn Trp Ile Cys Ile Glu
        275                 280                 285


<210>  215
<211>  277
<212>  PRT
<213>  Bacteroides sp. 1_1_14

<400>  215

Met Lys Val Ile Trp Phe Asn Gly Asn Leu Gly Asn Gln Val Phe Tyr
1               5                   10                  15

Cys Lys Tyr Lys Glu Phe Leu His Asn Lys Tyr Pro Asn Glu Thr Ile
```

```
            20                  25                  30

Lys Tyr Tyr Ser Asn Ser Arg Ser Pro Lys Ile Cys Val Glu Gln Tyr
        35                  40                  45

Phe Arg Leu Ser Leu Pro Asp Arg Ile Asp Ser Phe Lys Val Arg Phe
    50                  55                  60

Val Phe Glu Phe Leu Gly Lys Phe Phe Arg Arg Ile Pro Leu Lys Phe
65                  70                  75                  80

Val Pro Lys Trp Tyr Cys Thr Arg Lys Ser Leu Asn Tyr Glu Ala Ser
                85                  90                  95

Tyr Phe Glu His Tyr Leu Gln Asp Lys Ser Phe Phe Glu Lys Glu Asp
            100                 105                 110

Ser Ser Trp Leu Lys Ala Lys Lys Pro Asp Asn Phe Ser Glu Lys Tyr
        115                 120                 125

Leu Ile Phe Glu Asn Leu Ile Cys Asn Thr Asn Ser Val Ala Val His
    130                 135                 140

Ile Arg Arg Gly Asp Tyr Ile Lys Pro Gly Ser Asp Tyr Glu Asp Leu
145                 150                 155                 160

Ser Ala Thr Asp Tyr Tyr Glu Gln Ala Ile Lys Lys Ala Thr Glu Val
                165                 170                 175

Tyr Leu Asp Ser Gln Phe Phe Phe Phe Ser Asp Asp Leu Glu Phe Val
            180                 185                 190

Lys Asn Asn Phe Lys Gly Asp Asn Ile Tyr Tyr Val Asp Cys Asn Arg
        195                 200                 205

Gly Ala Asp Ser Tyr Leu Asp Ile Leu Leu Met Ser Gln Ala Lys Ile
    210                 215                 220

Asn Ile Ile Ala Asn Ser Thr Phe Ser Tyr Trp Gly Ala Tyr Met Asn
225                 230                 235                 240

His Glu Lys Lys Lys Val Met Tyr Ser Asp Leu Trp Phe Arg Asn Glu
                245                 250                 255

Ser Gly Arg Gln Met Pro Asn Ile Met Leu Asp Ser Trp Ile Cys Ile
            260                 265                 270

Glu Thr Lys Arg Lys
        275
```

<210> 216

<211> 314
<212> PRT
<213> Agromyces subbeticus

<400> 216

```
Met Val Gly Arg Val Gly Ile Ala Arg Arg Gln Ala Ala Asp Val Ser
1               5                   10                  15

Cys Thr Asp Gly Glu Gly Leu Val Ala Trp Arg Ile Arg Thr Gly Glu
            20                  25                  30

Ile Val Leu Gly Leu Gln Gly Gly Ile Gly Asn Gln Leu Phe Glu Trp
        35                  40                  45

Ala Phe Ala Met Ala Leu Arg Ser Ile Gly Arg Arg Val Leu Phe Asp
    50                  55                  60

Ala Val Arg Cys Arg Gly Asp Arg Pro Leu Met Ile Gly Pro Leu Leu
65                  70                  75                  80

Pro Ala Ser Asp Trp Leu Ala Ala Pro Val Gly Leu Ala Leu Ala Gly
                85                  90                  95

Ala Thr Lys Ala Gly Leu Leu Ser Asp Arg Ser Trp Pro Arg Leu Val
            100                 105                 110

Arg Gln Arg Arg Ser Gly Tyr Asp Pro Ser Val Leu Glu Arg Leu Gly
        115                 120                 125

Gly Thr Ser Tyr Leu Leu Gly Thr Phe Gln Ser Ala Arg Tyr Phe Asp
    130                 135                 140

Gly Val Glu His Glu Val Arg Ala Ala Val Arg Ala Leu Leu Glu Gly
145                 150                 155                 160

Met Leu Thr Pro Ser Gly Arg Arg Phe Ala Asp Glu Leu Arg Ala Asp
                165                 170                 175

Pro His Arg Val Ala Val His Val Arg Arg Gly Asp Tyr Val Ser Asp
            180                 185                 190

Pro Asn Ala Ala Val Arg His Gly Val Leu Gly Ala Gly Tyr Tyr Asp
        195                 200                 205

Gln Ala Leu Glu His Ala Ala Ala Leu Gly His Val Arg Arg Val Trp
    210                 215                 220

Phe Ser Asp Asp Leu Asp Trp Val Arg Glu His Leu Ala Arg Asp Asp
225                 230                 235                 240

Asp Leu Leu Cys Pro Ala Asp Ala Thr Arg His Asp Gly Gly Glu Ile
                245                 250                 255
```

```
Ala Leu Ile Ala Ser Cys Ala Thr Arg Ile Ile Ala Asn Ser Ser Phe
            260                 265                 270

Ser Trp Trp Gly Gly Trp Leu Gly Ala Pro Ser Ser Pro Ala His Pro
        275                 280                 285

Val Ile Ala Pro Ser Thr Trp Phe Ala Asp Gly His Ser Asp Ala Ala
    290                 295                 300

Glu Leu Val Pro Arg Asp Trp Val Arg Leu
305                 310
```

<210> 217
<211> 291
<212> PRT
<213> Prevotella salivae

<400> 217

```
Met Ile Ala Thr Thr Leu Phe Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Thr Ala Lys Ala Leu Ser Leu His Tyr Arg Thr Pro Met Ala
            20                  25                  30

Phe Asn Leu Arg Gln Gly Phe Glu Gln Asp Tyr Lys Tyr Gln Arg His
        35                  40                  45

Leu Glu Leu Asn His Phe Lys Cys Gln Leu Pro Thr Ala Lys Trp Ile
    50                  55                  60

Thr Phe Asn Tyr Lys Gly Glu Leu Asn Ile Lys Arg Ile Ser Arg Arg
65                  70                  75                  80

Ile Gly Arg Asn Leu Leu Cys Pro His Tyr Gln Phe Ile Lys Glu Lys
                85                  90                  95

Glu Pro Phe His Tyr Glu Lys Arg Leu Phe Glu Phe Thr Asn Lys Asn
            100                 105                 110

Ile Phe Leu Glu Gly Tyr Trp Gln Ser Pro Arg Tyr Phe Glu Asn Tyr
        115                 120                 125

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

Thr Ile Thr Asp Glu Leu Gln Met Leu Lys Gly Thr Gly Lys Pro Leu
145                 150                 155                 160

Val Met Leu Gly Ile Arg Arg Tyr Gln Glu Val Lys Asp Lys Lys Asp
                165                 170                 175
```

Ser Pro Tyr Pro Leu Cys Asn Lys Asp Tyr Tyr Ala Lys Ala Ile Ser
180 185 190

His Val Gln Glu Gln Leu Pro Ala Pro Leu Phe Val Val Phe Thr Gln
195 200 205

Glu Gln Ala Trp Ala Met Asn Asn Leu Pro Thr Asn Ala Asn Leu Tyr
210 215 220

Phe Val Lys Glu Lys Asp Asn Ala Trp Ala Thr Ile Ala Asp Met Tyr
225 230 235 240

Leu Met Thr Gln Cys Gln His Ala Ile Ile Ser Asn Ser Thr Phe Tyr
245 250 255

Trp Trp Gly Ala Trp Leu Gln His Pro Ile Glu Asn His Ile Val Val
260 265 270

Ala Pro Asn Asn Phe Ile Asn Arg Asp Cys Val Cys Asp Asn Trp Ile
275 280 285

Ile Leu Asp
290

<210> 218
<211> 304
<212> PRT
<213> Carnobacterium sp. WN1359

<400> 218

Met Ile Phe Val Asp Leu Ser Glu Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Tyr Ser Arg Tyr Leu Gln Glu Leu Tyr Gly Gly Thr Leu Tyr
20 25 30

Leu Asn Thr Ser Ser Phe Lys Arg Lys Asn Ser Thr Arg Ser Tyr Ser
35 40 45

Leu Asn Asn Phe Tyr Leu Tyr Glu Asn Val Lys Leu Pro Ser Lys Phe
50 55 60

Arg Arg Val Ile Tyr Asn Phe Tyr Ser Lys Thr Ile Arg Met Phe Ile
65 70 75 80

Lys Lys Val Ile Arg Met Asn Pro Tyr Ser Asp Lys Tyr Tyr Phe Ser
85 90 95

Met Ile Pro Tyr Gly Phe Tyr Val Ser Ser Gln Val Phe Lys Tyr Leu
100 105 110

```
Thr Val Pro Thr Thr Lys Arg His Asn Ile Phe Val Met Gly Thr Trp
        115                 120                 125

Gln Thr Asn Lys Tyr Phe Gln Ser Ile Asn Asp Lys Ile Lys Asp Glu
    130                 135                 140

Leu Lys Val Lys Thr Glu Pro Asn Glu Leu Asn Lys Lys Leu Ile Thr
145                 150                 155                 160

Glu Ile Asn Ser Asn Gln Ser Val Cys Val His Ile Arg Leu Gly Asp
                165                 170                 175

Tyr Thr Asn Pro Glu Phe Asp Tyr Leu His Val Cys Thr Ser Asp Tyr
            180                 185                 190

Tyr Leu Lys Gly Met Asp Tyr Ile Val Ser Lys Val Lys Glu Pro Asn
        195                 200                 205

Phe Tyr Ile Phe Ser Asn Ser Ser Ser Asp Ile Glu Trp Ile Lys Asn
    210                 215                 220

Asn Tyr Asn Phe Lys Tyr Lys Val Lys Tyr Ile Asp Leu Asn Asn Pro
225                 230                 235                 240

Asp Phe Glu Asp Phe Arg Leu Met Tyr Asn Cys Lys His Phe Ile Ile
                245                 250                 255

Ser Asn Ser Thr Phe Ser Trp Trp Ala Gln Phe Leu Ser Asn Asn Asp
            260                 265                 270

Lys Lys Ile Ile Val Ala Pro Ser Lys Trp Gln Lys Ser Asn Glu Asn
        275                 280                 285

Glu Ala Lys Asp Ile Tyr Leu Asp His Trp Lys Leu Ile Glu Ile Glu
    290                 295                 300
```

<210> 219
<211> 304
<212> PRT
<213> Butyrivibrio sp. AD3002

<400> 219

```
Met Leu Ile Ile Gln Ile Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                   10                  15

Tyr Ala Met Tyr Arg Lys Leu Leu Lys Ala Gly Ala Asp Arg Asn Ile
            20                  25                  30

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

Ala Lys Arg Lys Leu Glu Leu Glu Tyr Phe Thr Gly Leu Pro Leu Pro
```

50 55 60

Val Cys Ser Glu Ser Glu Arg Ala Arg Phe Thr Asp Arg Ser Val Ala
65 70 75 80

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

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

Ile Glu Gly Tyr Phe Ala Cys Gln Lys Tyr Tyr Asp Asp Ile Met Gly
115 120 125

Glu Leu Gln Glu Leu Phe Val Phe Pro Thr His Pro Asp Glu Glu Ile
130 135 140

Asn Ile Lys Asn Met Asn Leu Met Asn Glu Met Glu Met Val Pro Ser
145 150 155 160

Val Ser Val His Ile Arg Arg Gly Asp Tyr Leu Asp Pro Glu Asn Ala
165 170 175

Ala Leu Phe Gly Asn Ile Ala Thr Asp Ala Tyr Tyr Asp Ser Ala Met
180 185 190

Glu Tyr Phe Lys Ala Ile Asp Pro Asp Thr His Phe Tyr Ile Phe Thr
195 200 205

Asn Asp Pro Glu Tyr Ala Arg Glu Lys Tyr Ala Asp Pro Gly Arg Tyr
210 215 220

Thr Ile Val Asp His Asn Thr Gly Lys Tyr Ser Leu Leu Asp Ile Gln
225 230 235 240

Leu Met Ser His Cys Arg Gly Asn Ile Cys Ala Asn Ser Thr Phe Ser
245 250 255

Phe Trp Gly Ala Arg Leu Asn Arg Arg Lys Asp Lys Ile Pro Val Arg
260 265 270

Thr Leu Val Met Arg Asn Asn Gln Pro Val Thr Pro Glu Leu Met His
275 280 285

Glu Tyr Trp Pro Gly Trp Val Leu Val Asp Lys Asp Gly Lys Val Arg
290 295 300

<210> 220
<211> 299
<212> PRT
<213> Clostridium sp. KLE 1755

<400> 220

Met Ile Val Ile Arg Val Met Gly Gly Leu Gly Asn Gln Met Gln Gln
1 5 10 15

Tyr Ala Leu Tyr Glu Lys Phe Lys Ala Leu Gly Lys Glu Thr Arg Leu
20 25 30

Asp Thr Ser Trp Phe Asp Asn Ala Ser Met Gln Glu Asn Val Leu Ala
35 40 45

Arg Arg Ser Leu Glu Leu Arg Phe Phe Asp Asn Leu Thr Tyr Glu Ala
50 55 60

Cys Thr Pro Gln Glu Arg Glu Ala Leu Leu Gly Lys Glu Gly Phe Phe
65 70 75 80

Asn Lys Leu Glu Arg Lys Leu Phe Pro Ser Lys Asn Lys His Phe Tyr
85 90 95

Glu Ser Glu Met Phe His Pro Glu Ile Phe Lys Leu Asp Asn Val Tyr
100 105 110

Leu Glu Gly His Trp Ala Cys Glu Lys Tyr Tyr His Asp Ile Met Pro
115 120 125

Leu Leu Gln Ser Lys Ile Ile Phe Pro Lys Thr Asp Asn Ile Gln Asn
130 135 140

Asn Met Leu Lys Asn Lys Met Asn Ser Glu Asn Ser Val Ser Ile His
145 150 155 160

Ile Arg Arg Gly Asp Tyr Leu Asp Pro Glu Asn Ala Ala Met Phe Gly
165 170 175

Gly Ile Cys Thr Asp Ser Tyr Tyr Lys Ser Ala Glu Gly Tyr Ile Arg
180 185 190

Asn Arg Val Thr Asn Pro His Phe Tyr Leu Phe Ser Asp Asp Pro Ala
195 200 205

Tyr Leu Arg Glu His Tyr Lys Gly Glu Glu Tyr Thr Val Val Asp Trp
210 215 220

Asn His Gly Ala Asp Ser Phe Tyr Asp Met Glu Leu Met Ser Cys Cys
225 230 235 240

Lys His Asn Val Cys Ala Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg
245 250 255

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

Asn Ser Gln Gln Ala Glu Pro Glu Arg Met His Glu Leu Trp Glu Asn
275 280 285

Trp Val Ile Ile Asp Glu Glu Gly Arg Ile Val
290 295

<210> 221
<211> 275
<212> PRT
<213> Bacteroides vulgatus

<400> 221

Met Lys Phe Phe Val Phe Gly Gly Gly Leu Gly Asn Gln Leu Phe Gln
1 5 10 15

Tyr Ser Tyr Tyr Arg Tyr Leu Lys Lys Lys Tyr Pro Ser Glu Arg Ile
20 25 30

Leu Gly Ile Tyr Pro Asp Ser Leu Lys Ala His Asn Gly Ile Glu Ile
35 40 45

Asp Lys Trp Phe Asp Ile Glu Leu Pro Pro Thr Ser Tyr Leu Tyr Asn
50 55 60

Lys Leu Gly Ile Leu Leu Tyr Arg Val Asn Arg Phe Leu Tyr Asn His
65 70 75 80

Gly Tyr Arg Leu Leu Phe Cys Asn Arg Val Tyr Pro Gln Ser Met Lys
85 90 95

His Phe Phe Gln Trp Gly Asp Trp Gln Asp Tyr Ser Ile Ile Lys Gln
100 105 110

Ile Asn Ile Phe Glu Phe Arg Ser Glu Leu Pro Ile Gly Lys Glu Asn
115 120 125

Met Glu Phe Leu Lys Lys Met Glu Thr Cys Asn Ser Ile Ser Val His
130 135 140

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

Gly Ile Cys Thr Ser Lys Tyr Tyr Arg Glu Ala Ile Lys Phe Met Glu
165 170 175

Gln Glu Val Glu Glu Pro Phe Phe Phe Phe Phe Ser Asp Asp Cys Leu
180 185 190

Tyr Val Glu Thr Glu Phe Ala Asp Ile Arg Asn Lys Ile Ile Ile Ser
195 200 205

```
His Asn Arg Asp Asp Arg Ser Phe Phe Asp Met Tyr Leu Met Ala His
    210                 215                 220

Ala Lys Asn Met Ile Leu Ala Asn Ser Thr Phe Ser Cys Trp Ala Ala
225                 230                 235                 240

Tyr Leu Asn Arg Thr Ala Lys Ile Ile Ile Thr Pro Asp Arg Trp Val
                245                 250                 255

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

Ile Arg Val
        275
```

<210> 222
<211> 280
<212> PRT
<213> Paraprevotella xylaniphila

<400> 222

```
Met Arg Leu Ile Lys Met Thr Gly Gly Leu Gly Asn Gln Met Phe Ile
1               5                   10                  15

Tyr Ala Met Tyr Leu Lys Met Arg Ala Val Phe Pro Asp Thr Arg Ile
            20                  25                  30

Asp Leu Ser Asp Met Val His Tyr Arg Val His Tyr Gly Tyr Glu Met
        35                  40                  45

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

Leu Lys Lys Ile Ile Glu Phe Leu Leu Phe Lys Thr Ile Leu Glu Arg
65                  70                  75                  80

Lys Gln Gly Gly Ser Leu Val Pro Tyr Ile Arg Lys Tyr His Trp Pro
                85                  90                  95

Trp Ile Tyr Phe Lys Gly Phe Tyr Gln Ser Glu Glu Tyr Phe Ala Gly
            100                 105                 110

Val Glu Lys Glu Val Arg Glu Ala Phe Val Phe Asp Val Arg Arg Val
        115                 120                 125

Asn Arg Lys Ser Leu Cys Ala Met Gln Glu Ile Met Ala Asp Pro Asp
    130                 135                 140

Ala Val Ser Ile His Val Arg Arg Gly Asp Tyr Leu Gln Gly Lys His
145                 150                 155                 160
```

```
Trp Lys Ser Leu Gly Cys Ile Cys Gln Arg Ser Tyr Tyr Leu Asn Ala
                165                 170                 175

Leu Ser Glu Leu Glu Lys Arg Ile Val His Pro His Tyr Tyr Val Phe
            180                 185                 190

Ser Glu Asp Leu Asp Trp Val Arg Gln Tyr Leu Pro Leu Glu Asn Ala
        195                 200                 205

Val Phe Ile Asp Trp Asn Lys Gly Glu Asp Ser Trp Gln Asp Met Met
    210                 215                 220

Leu Met Ser His Cys Arg His His Ile Ile Cys Asn Ser Thr Phe Ser
225                 230                 235                 240

Trp Trp Gly Ala Trp Leu Asn Pro Ser Pro Asp Lys Ile Val Ile Ala
                245                 250                 255

Pro Glu Arg Trp Thr Gln Thr Thr Asn Ser Ala Asp Val Val Pro Glu
            260                 265                 270

Ser Trp Leu Lys Val Ser Ile Gly
        275                 280


<210>  223
<211>  290
<212>  PRT
<213>  Thauera sp. 28

<400>  223

Met Thr Asp Arg Ala Leu Ile Ala Ile Val Lys Gly Gly Leu Gly Asn
1               5                   10                  15

Gln Leu Phe Ile Tyr Ala Ala Ala Arg Ala Met Ala Leu Arg Thr Gly
            20                  25                  30

Arg Gln Leu Tyr Leu Asp Ala Val Arg Gly Tyr Leu Ala Asp Asp Tyr
        35                  40                  45

Gly Arg Ser Phe Arg Leu Asn Arg Phe Pro Ile Glu Ala Glu Leu Met
    50                  55                  60

Pro Glu Gln Trp Arg Val Ala Ser Thr Leu Arg His Pro Arg Ala Lys
65                  70                  75                  80

Leu Val Arg Ala Leu Asn Lys Tyr Leu Pro Glu Ala Trp Arg Phe Tyr
                85                  90                  95

Val Ala Glu Arg Gly Asp Thr Arg Pro Gly Ala Leu Trp Asn His Gly
            100                 105                 110

Arg Asn Val Lys Arg Val Thr Leu Met Gly Tyr Trp Gln Asp Glu Ala
```

115 120 125

Tyr Phe Leu Asp Tyr Ala Glu Leu Leu Arg Arg Glu Leu Gly Pro Pro
130 135 140

Met Pro Asp Ala Pro Glu Val Arg Ala Arg Gly Glu Arg Phe Ala Gly
145 150 155 160

Thr Glu Ser Val Phe Leu His Val Arg Arg Cys Arg Tyr Ser Pro Leu
165 170 175

Leu Asp Ala Gly Tyr Tyr Gln Lys Ala Val Asp Leu Ala Cys Ala Glu
180 185 190

Leu Asn Lys Pro Val Phe Met Ile Phe Gly Asp Asp Ile Glu Trp Val
195 200 205

Val Asn Asn Ile Asp Phe Arg Gly Ala Gly Tyr Glu Arg Gln Asp Tyr
210 215 220

Asp Glu Ser Asp Glu Leu Ala Asp Leu Trp Leu Met Thr Arg Cys Arg
225 230 235 240

His Ala Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu
245 250 255

Gly Gly Ala Ala Gly Ser Gly Arg His Val Trp Ala Pro Gly Gln Ser
260 265 270

Gly Leu Ala Leu Lys Cys Ala Lys Ser Trp Glu Ala Val Asp Ala Gln
275 280 285

Pro Glu
290

<210> 224
<211> 305
<212> PRT
<213> Subdoligranulum variabile

<400> 224

Met Ile Tyr Ala Glu Leu Ala Gly Gly Leu Gly Asn Gln Met Phe Ile
1 5 10 15

Tyr Ala Phe Ala Arg Ala Leu Gly Leu Arg Cys Gly Glu Ala Val Thr
20 25 30

Leu Leu Asp Arg Gln Asp Trp Arg Asp Gly Ala Pro Ala His Thr Ala
35 40 45

Cys Ala Leu Glu Gly Leu Asn Leu Val Pro Glu Val Lys Ile Leu Ala
50 55 60

```
Glu Pro Gly Phe Ala Lys Arg His Leu Pro Arg Gln Asn Thr Ala Lys
65                  70                  75                  80

Ala Leu Met Ile Lys Tyr Glu Gln Arg Gln Gly Leu Met Ala Arg Asp
                85                  90                  95

Trp His Asp Trp Glu Arg Arg Cys Ala Pro Val Leu Asn Leu Leu Gly
            100                 105                 110

Leu His Phe Ala Thr Asp Gly Tyr Thr Pro Val Arg Arg Gly Pro Ala
        115                 120                 125

Arg Asp Phe Leu Ala Trp Gly Tyr Phe Gln Ser Glu Ala Tyr Phe Ala
    130                 135                 140

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

Ala Gly Val Trp Ala Glu Lys Ile Arg Ala Ala Ala Cys Pro Val Ala
                165                 170                 175

Leu His Leu Arg Arg Gly Asp Tyr Cys Arg Pro Glu Asn Glu Ile Leu
            180                 185                 190

Gln Val Cys Ser Pro Ala Tyr Tyr Ala Arg Ala Ala Ala Ala Ala Ala
        195                 200                 205

Ala Ala Tyr Pro Glu Ala Thr Leu Phe Val Phe Ser Asp Asp Ile Asp
    210                 215                 220

Trp Ala Lys Glu His Leu Asp Thr Ala Gly Leu Pro Ala Val Trp Met
225                 230                 235                 240

Pro Arg Gly Asp Ala Val Gly Asp Leu Asn Leu Met Ala Leu Cys Arg
                245                 250                 255

Gly Phe Ile Leu Ser Asn Ser Thr Tyr Ser Trp Trp Ala Gln Tyr Leu
            260                 265                 270

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

Thr Lys Gln Thr Ala Leu Tyr Gln Pro Gly Trp His Leu Ile Glu Thr
    290                 295                 300

Arg
305
```

<210> 225
<211> 308

<212> PRT
<213> Firmicutes bacterium CAG:24

<400> 225

```
Met Ile Ile Val Glu Val Met Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                  10                  15

Tyr Ala Leu Tyr Arg Lys Leu Glu Ser Leu Gly Lys Asp Ala Arg Leu
            20                  25                  30

Asp Val Ser Trp Phe Leu Asp Lys Glu Arg Gln Thr Lys Val Leu Ala
        35                  40                  45

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

Cys Thr Gln Glu Glu Lys Gln Ala Ile Leu Gly Lys Asn Asn Leu Ile
65                  70                  75                  80

Gly Lys Leu Lys Lys Lys Leu Leu Gly Gly Ser Asn Arg His Phe Thr
                85                  90                  95

Glu Ser Asp Met Tyr His Pro Glu Ile Phe Asp Leu Glu Asp Ala Tyr
            100                 105                 110

Leu Ser Gly Phe Trp Ala Cys Glu Ala Tyr Tyr Ala Asp Ile Leu Pro
        115                 120                 125

Met Leu Arg Ser Gln Ile His Phe Pro Asp Pro Glu Lys Gly Glu Gly
    130                 135                 140

Trp Asp Leu Glu Ala Ala Ala Lys Asn Lys Glu Thr Met Glu Arg Met
145                 150                 155                 160

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

Asp Ala Lys Asn Ala Glu Met Phe Gly Gly Ile Cys Thr Asp Ala Tyr
            180                 185                 190

Tyr Glu Ala Ala Ile Ser Tyr Ile Lys Glu Gln Thr Pro Asp Ala His
        195                 200                 205

Phe Tyr Val Phe Ser Asp Asp Ser Ala Tyr Val Lys Asn Ala Tyr Pro
    210                 215                 220

Gly Lys Glu Phe Thr Val Val Asp Trp Asn Thr Gly Lys Asn Ser Leu
225                 230                 235                 240

Phe Asp Met Gln Leu Met Ser Cys Cys Asn His Asn Ile Cys Ala Asn
                245                 250                 255
```

```
Ser Thr Phe Ser Phe Trp Gly Ala Arg Leu Asn Pro Ser Pro Asp Lys
            260                 265                 270

Val Met Ile Arg Pro Ser Lys His Lys Asn Ser Gln Asn Ile Val Pro
        275                 280                 285

Glu Glu Met Lys Arg Leu Trp Asp Gly Trp Val Leu Ile Asp Gly Lys
    290                 295                 300

Gly Arg Ile Ile
305
```

<210> 226
<211> 283
<212> PRT
<213> Prevotella sp. CAG:474

<400> 226

```
Met Ile Ile Thr Lys Leu Asn Gly Gly Leu Gly Asn Gln Leu Phe Glu
1               5                   10                  15

Tyr Ala Cys Ala Arg Asn Leu Gln Leu Lys Tyr Asn Asp Val Leu Tyr
            20                  25                  30

Leu Asp Ile Glu Gly Phe Lys Arg Ser Pro Arg His Tyr Ser Leu Glu
        35                  40                  45

Lys Phe Lys Leu Ser Ser Asp Val Arg Met Leu Pro Glu Lys Asp Ser
    50                  55                  60

Lys Ser Leu Ile Leu Leu Gln Ala Ile Ser Lys Leu Asn Arg Asn Leu
65                  70                  75                  80

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

Asn Tyr Arg Pro Leu Lys Ile Lys Asn Thr Arg Gly Lys Lys Leu Tyr
            100                 105                 110

Leu Tyr Gly Tyr Trp Gln Ser Tyr Glu Tyr Phe Lys Glu Asn Glu Ala
        115                 120                 125

Ile Ile Lys Gln Glu Leu Asn Val Lys Thr Glu Ile Pro Ile Glu Cys
    130                 135                 140

Ser Glu Leu Leu Lys Glu Ile Asn Lys Pro His Ser Ile Cys Val His
145                 150                 155                 160

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

```
Ala Tyr Tyr Asn Arg Gly Ile Asn His Ile Phe Asp Lys His Pro Asp
            180                 185                 190

Ser Asn Val Val Val Phe Ser Asp Asp Ile Lys Trp Val Lys Ala Asn
        195                 200                 205

Met Asn Phe Asp His Pro Val Ala Tyr Val Glu Val Asp Val Pro Asp
    210                 215                 220

Tyr Glu Thr Leu Arg Leu Met Tyr Met Cys Lys His Phe Val Met Ser
225                 230                 235                 240

Asn Ser Ser Phe Ser Trp Trp Ala Ser Tyr Leu Ser Asp Asn Lys Glu
                245                 250                 255

Lys Ile Val Val Ala Pro Ser Tyr Trp Leu Pro Ala Asn Lys Asp Asn
            260                 265                 270

Lys Ser Met Tyr Leu Asp Asn Trp Thr Ile Leu
        275                 280
```

<210> 227
<211> 298
<212> PRT
<213> Roseburia intestinalis

<400> 227

```
Met Arg Gly Asn Arg Gly Met Ile Ala Val Lys Ile Gly Asp Gly Met
1               5                   10                  15

Gly Asn Gln Leu Phe Asn Tyr Ala Cys Gly Tyr Ala Gln Ala Arg Arg
            20                  25                  30

Asp Gly Asp Ser Leu Val Leu Asp Ile Ser Glu Cys Asp Asn Ser Thr
        35                  40                  45

Leu Arg Asp Phe Glu Leu Asp Lys Phe His Leu Lys Tyr Asp Lys Lys
    50                  55                  60

Glu Ser Phe Pro Asn Arg Asn Leu Gly Gln Lys Ile Tyr Lys Asn Leu
65                  70                  75                  80

Arg Arg Ala Leu Lys Tyr His Val Ile Lys Glu Arg Glu Val Tyr His
                85                  90                  95

Asn Arg Asp His Arg Tyr Asp Val Asn Asp Ile Asp Pro Arg Val Tyr
            100                 105                 110

Lys Lys Lys Gly Leu Arg Asn Lys Tyr Leu Tyr Gly Tyr Trp Gln His
        115                 120                 125

Leu Ala Tyr Phe Glu Asp Tyr Leu Asp Glu Ile Thr Ala Met Met Thr
```

130 135 140

Pro Ala Tyr Glu Gln Ser Glu Thr Val Lys Lys Leu Gln Glu Glu Phe
145 150 155 160

Lys Lys Thr Pro Thr Cys Ala Val His Val Arg Gly Gly Asp Ile Met
165 170 175

Gly Pro Ala Gly Ala Tyr Phe Lys His Ala Met Glu Arg Met Glu Gln
180 185 190

Glu Lys Pro Gly Val Arg Tyr Ile Val Phe Thr Asn Asp Met Glu Arg
195 200 205

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

Val Gly Gln Ala Glu Asn Arg Leu Glu Phe Val Ser Glu Met Gly Glu
225 230 235 240

Phe Ser Asp Val Asp Glu Phe Phe Leu Met Ala Ala Cys Gln Asn Gln
245 250 255

Ile Leu Ser Asn Ser Thr Phe Ser Thr Trp Ala Ala Tyr Leu Asn Gln
260 265 270

Asn Pro Asp Lys Thr Val Ile Met Pro Asp Asp Leu Leu Ser Glu Arg
275 280 285

Met Arg Gln Lys Asn Trp Ile Ile Leu Lys
290 295

<210> 228
<211> 265
<212> PRT
<213> Bacteroides ovatus

<400> 228

Met Lys Ile Val Leu Phe Thr Pro Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Leu Phe Tyr Leu Tyr Leu Arg Asp Asn Tyr Pro Asn Gln Asn Ile
20 25 30

Tyr Gly Tyr Tyr Asn Arg Asn Ile Leu Asn Lys His Asn Gly Leu Glu
35 40 45

Val Asp Lys Val Phe Asp Ile Gln Leu Pro Pro His Thr Val Ile Ser
50 55 60

Asp Ala Ser Ala Phe Phe Ile Arg Ala Leu Gly Gly Leu Gly Leu Lys
65 70 75 80

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

Gly Tyr Trp Gln Asn Lys Glu Tyr Phe Gln Asn Asn Val Asp Lys Met
            100                 105                 110

Arg Phe Arg Glu Gly Phe Leu Asn Lys Lys Asn Asp Asp Ile Leu Ser
        115                 120                 125

Leu Ile Arg Asn Thr Asn Ser Val Ser Val His Val Arg Arg Gly Asp
    130                 135                 140

Tyr Cys Asp Ser Cys Arg Lys Asp Leu Phe Leu Gln Ser Cys Thr Pro
145                 150                 155                 160

Gln Tyr Tyr Glu Ser Ala Ile Ser Val Met Lys Glu Lys Phe Gln Lys
                165                 170                 175

Pro Val Phe Phe Val Phe Ser Asp Asp Ile Pro Trp Val Lys Val Asn
            180                 185                 190

Leu Asn Ile Pro Asn Ala Tyr Tyr Ile Asp Trp Asn Lys Lys Glu Asn
        195                 200                 205

Ser Tyr Leu Asp Met Tyr Leu Met Ser Leu Cys Thr Ala Ser Ile Ile
    210                 215                 220

Ala Asn Ser Thr Phe Ser Phe Trp Gly Ala Met Leu Gly Asn Lys Lys
225                 230                 235                 240

Glu Leu Val Ile Lys Pro Lys Lys Trp Ile Gly Asp Glu Ile Pro Glu
                245                 250                 255

Ile Phe Pro Pro Ser Trp Leu Ser Leu
            260                 265


<210>  229
<211>  310
<212>  PRT
<213>  Butyrivibrio sp. AE3009

<400>  229

Met Leu Ile Ile Gln Ile Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                   10                  15

Tyr Ala Leu Tyr Arg Lys Leu Leu Lys Tyr His Pro Asp Gly Val Arg
            20                  25                  30

Leu Asp Leu Ser Trp Phe Asp Ser Glu Val Gln Lys Asn Met Leu Ala
        35                  40                  45
```

```
Lys Arg Glu Phe Glu Leu Ala Leu Phe Lys Gly Leu Pro Tyr Ile Glu
    50                  55                  60

Cys Lys Pro Glu Glu Arg Ala Ala Phe Leu Asp Arg Asn Ala Ala Gln
65                  70                  75                  80

Lys Leu Ser Gly Lys Val Leu Lys Lys Leu Gly Leu Arg Asp Asn Ala
                85                  90                  95

Asn Pro Asn Val Phe Glu Glu Ser Arg Met Phe His Pro Glu Ile Phe
            100                 105                 110

Glu Leu Asp Asn Lys Tyr Ile Ile Gly Tyr Phe Ala Cys Gln Lys Tyr
        115                 120                 125

Tyr Asp Asp Ile Met Gly Asp Leu Cys Asn Leu Phe Glu Phe Pro Glu
    130                 135                 140

His Leu Asp Pro Glu Leu Glu Lys Lys Asn Leu Glu Leu Ile Ser Lys
145                 150                 155                 160

Met Glu Lys Glu Asn Ser Val Ser Val His Ile Arg Arg Gly Asp Tyr
                165                 170                 175

Leu Asp Pro Glu Asn Phe Lys Ile Leu Gly Asn Ile Ala Thr Asp Glu
            180                 185                 190

Tyr Tyr Glu Ser Ala Met Lys Tyr Phe Glu Asp Arg Tyr Glu Lys Val
        195                 200                 205

His Phe Tyr Ile Phe Thr Ser Asp His Glu Tyr Ala Arg Glu His Phe
    210                 215                 220

Ala Asp Glu Ser Lys Tyr Thr Ile Val Asp Trp Asn Thr Gly Lys Asp
225                 230                 235                 240

Ser Leu Gln Asp Val Arg Leu Met Asn His Cys Leu Gly Asn Ile Cys
                245                 250                 255

Ala Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg Leu Asn Gln Arg Gln
            260                 265                 270

Asp Lys Val Met Ile Arg Thr Tyr Lys Met Arg Asn Asn Gln Pro Val
        275                 280                 285

Asp Pro Asp Thr Met His Asp Tyr Trp Lys Gly Trp Ile Leu Ile Asp
    290                 295                 300

Glu Thr Gly Arg Glu Val
305                 310
```

<210> 230
<211> 300
<212> PRT
<213> Butyrivibrio proteoclasticus

<400> 230

```
Met Thr Lys Asn Glu Lys Lys Leu Ile Val Lys Phe Gln Gly Gly Leu
1               5                  10                  15

Gly Asn Gln Leu Tyr Glu Tyr Ala Phe Cys Glu Trp Leu Arg Gln Gln
            20                  25                  30

Tyr Ser Asp Tyr Glu Val Leu Ala Asp Leu Ser Tyr Tyr Lys Ile Arg
        35                  40                  45

Ser Ala His Gly Glu Leu Gly Ile Trp Asn Ile Phe Pro Asn Ile Asn
    50                  55                  60

Ile Glu Val Ala Ser Asn Trp Asp Ile Ile Lys Tyr Ser Asp Gln Ile
65                  70                  75                  80

Pro Ile Met Tyr Gly Gly Lys Gly Ala Asp Arg Leu Asn Ser Val Arg
                85                  90                  95

Thr Asn Val Asn Asp Arg Phe Phe Ser Lys Arg Lys His Ser Tyr Tyr
            100                 105                 110

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

Asn Gly Ile Arg Tyr Phe Asp Gly Tyr Trp Gln Asn Ile Asp Tyr Phe
    130                 135                 140

Lys Gly Asn Ile Glu Asp Leu Arg Asn Lys Leu Lys Phe Ser Glu Lys
145                 150                 155                 160

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

Leu His Val Arg Arg Gly Asp Tyr Val Gly Ser Glu Tyr Glu Lys Glu
            180                 185                 190

Val Gly Leu Ser Tyr Tyr Lys Lys Ala Val Glu Tyr Val Leu Asp Arg
        195                 200                 205

Val Asp Gln Ala Lys Phe Phe Ile Phe Ser Asp Asp Lys Tyr Tyr Ala
    210                 215                 220

Glu Thr Ala Phe Glu Trp Ile Asp Asn Lys Thr Val Val Ala Gly Tyr
225                 230                 235                 240
```

```
Asp Asn Glu Leu Ala His Val Asp Met Leu Leu Met Ser Arg Met Lys
                245                 250                 255

Asn Asn Ile Ile Ala Asn Ser Thr Phe Ser Leu Trp Ala Ala Tyr Leu
            260                 265                 270

Asn Asp Ser Met Asn Pro Leu Ile Val Tyr Pro Asp Val Glu Ser Leu
        275                 280                 285

Asp Lys Lys Thr Phe Ser Asp Trp Asn Gly Ile Lys
    290                 295                 300


<210>  231
<211>  292
<212>  PRT
<213>  Prevotella nanceiensis

<400>  231

Met Asp Ser Gln Phe Leu Lys His Ile Lys Leu Ser Gly Gly Phe Gly
1               5                   10                  15

Asn Gln Leu Phe Gln Tyr Phe Phe Gly Glu Tyr Leu Lys Glu Lys Tyr
            20                  25                  30

Asn Cys Ser Ile Ser Phe Phe Ser Glu Pro Ala Leu Asp Ile Asn Gln
        35                  40                  45

Leu Gln Ile His Arg Phe Phe Pro Ala Leu Arg Ile Ser His Asn Thr
    50                  55                  60

Glu Leu Arg Pro Tyr His Tyr Ser Phe Thr Gln Gln Leu Ala Tyr Arg
65                  70                  75                  80

Cys Met Arg Lys Leu Leu Leu Leu Phe Pro Phe Leu Asn Arg Lys Val
                85                  90                  95

Lys Ile Glu Asn Gly Ser Asn Tyr Gln Asn Gln Ser Phe Asn Asp Thr
            100                 105                 110

Tyr Cys Phe Asp Gly Tyr Trp Gln Ser Tyr Arg Tyr Leu Ser Ala Phe
        115                 120                 125

Thr Pro Ser Leu Gln Phe Glu Asp Gln Leu Ile Asn Asp Ile Ser Ala
    130                 135                 140

Asp Tyr Ile Asn Ala Ile Glu Gln Ser Glu Ala Val Phe Leu His Ile
145                 150                 155                 160

Arg Arg Gly Asp Tyr Leu Asn Lys Glu Asn Gln Lys Val Phe Ala Glu
                165                 170                 175

Cys Pro Leu Asn Tyr Phe Glu Asn Ala Ala Asn Arg Ile Lys Glu Asp
```

180 185 190

Ile Lys Asn Val His Phe Phe Val Phe Ser Asn Asp Ile Gln Trp Val
195 200 205

Lys Ser His Leu Lys Leu Asn Asp Asn Glu Val Thr Phe Ile Gln Asn
210 215 220

Glu Gly Asn Ser Cys Asp Leu Lys Asp Phe Tyr Leu Met Thr Arg Cys
225 230 235 240

Lys His Ala Ile Ile Ser Asn Ser Thr Phe Ser Trp Trp Ala Ala Tyr
245 250 255

Leu Ile Asn Asn Ser Asp Lys Lys Val Ile Ala Pro Lys His Trp Tyr
260 265 270

Asn Asp Ile Ser Met Asn Asn Ala Thr Lys Asp Leu Ile Pro Pro Thr
275 280 285

Trp Ile Arg Leu
290

<210> 232
<211> 285
<212> PRT
<213> Bacteroides ovatus

<400> 232

Met Ile Ile Thr Arg Leu His Gly Arg Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Ala Gly Arg Ala Leu Ala Asp Arg Ala Gly Val Pro Leu Ala
20 25 30

Leu Asp Ser Arg Gly Ala Ile Leu Arg Gly Glu Gly Val Leu Thr Arg
35 40 45

Val Phe Asp Leu Glu Leu Ala Asp Pro Val His Leu Pro Pro Leu Lys
50 55 60

Gln Thr Asn Pro Leu Arg Tyr Ala Ile Trp Arg Gly Ile Gly Gln Lys
65 70 75 80

Val Gly Ala Lys Pro Tyr Phe Arg Arg Glu Arg Gly Leu Gly Tyr Asn
85 90 95

Pro Ala Phe Glu Asp Trp Gly Asp Asn Ser Tyr Leu His Gly Tyr Trp
100 105 110

Gln Ser Gln Lys Tyr Phe Gln Asn Ser Ala Glu Arg Ile Arg Ser Asp
115 120 125

```
Phe Thr Phe Pro Ala Phe Ser Asn Gln Gln Asn Ala Glu Met Ala Ala
    130                 135                 140

Arg Ile Ala Glu Ser Thr Ala Ile Ser Leu His Val Arg Arg Gly Asp
145                 150                 155                 160

Tyr Leu Thr Phe Ala Ala His Val Leu Cys Asp Gln Ala Tyr Tyr Asp
                165                 170                 175

Ala Ala Leu Ala Lys Val Leu Asp Gly Leu Gln Gly Asp Pro Ile Val
            180                 185                 190

Tyr Val Phe Ser Asp Asp Pro Gln Trp Ala Lys Asp Asn Leu Ser Leu
        195                 200                 205

Pro Cys Glu Lys Val Val Val Asp Phe Asn Gly Pro Glu Thr Asp Phe
    210                 215                 220

Glu Asp Met Arg Leu Met Ser Leu Cys Gln His Asn Ile Ile Gly Asn
225                 230                 235                 240

Ser Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Gln Thr Pro Gly Arg
                245                 250                 255

Arg Val Ala Gly Pro Ala Lys Trp Phe Gly Asp Pro Lys Leu Ser Asn
            260                 265                 270

Pro Asp Ile Phe Pro His Asp Trp Leu Arg Ile Ser Val
        275                 280                 285
```

<210> 233
<211> 283
<212> PRT
<213> Winogradskyella psychrotolerans

<400> 233

```
Met Gly Asn Gln Leu Tyr Glu Tyr Ala Thr Ala Lys Ala Met Ala Val
1               5                   10                  15

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

Ala Pro Gln Arg His Tyr Asp Leu Gly Leu Phe Asn Ile Gln Asp Glu
        35                  40                  45

Asp Phe Gly Ser Pro Phe Val Gln Trp Leu Val Arg Trp Val Ala Ser
    50                  55                  60

Val Arg Leu Gly Lys Phe Phe Lys Thr Ile Met Pro Phe Ala Trp Ser
65                  70                  75                  80
```

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

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

Lys Tyr Phe Glu Ser Ile Arg Pro Thr Leu Leu Lys Glu Leu Ser Phe
        115                 120                 125

Lys Asp Lys Pro Asn Ala Ile Asn Gln Lys Tyr Leu Asp Glu Ile Glu
    130                 135                 140

Ser Val Asn Ala Val Ala Val His Ile Arg Arg Gly Asp Tyr Val Ala
145                 150                 155                 160

Asn Pro Val Ala Asn Ala Val His Gly Leu Cys Asp Met Asp Tyr Tyr
                165                 170                 175

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

Phe Ile Phe Thr Asp Asp Pro Asp Trp Ala Glu Asp Asn Phe Lys Ile
        195                 200                 205

Ser Glu His Gln Lys Ile Ile Lys His Asn Ile Gly Lys Gln Asp His
    210                 215                 220

Glu Asp Phe Arg Leu Leu Thr Asn Cys Lys Tyr Phe Ile Ile Ala Asn
225                 230                 235                 240

Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Ser Asp Tyr Lys Asn Lys
                245                 250                 255

Ile Val Ile Ser Pro Asn Lys Trp Phe Asn Val Asp Ala Val Pro Ile
            260                 265                 270

Thr Glu Arg Ile Pro Glu Ser Trp Ile Arg Val
        275                 280


<210>  234
<211>  302
<212>  PRT
<213>  Lachnospiraceae bacterium NK4A179

<400>  234

Met Ile Thr Val Arg Ile Asp Gly Gly Phe Gly Asn Gln Met Phe Gln
1               5                   10                  15

Tyr Ala Phe Phe Leu His Leu Lys Lys Thr Ile Thr Asp Asn Lys Ile
            20                  25                  30
```

```
Ser Val Asp Leu Asn Cys Tyr Asn Pro His Gly Ser Gly Asp Ile Phe
        35                  40                  45

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

Arg Phe His Arg Asn Ser Ile Tyr His Leu Leu Arg Pro Leu Asp Ser
65                  70                  75                  80

Ala Gly Ile Thr Thr Asn Pro Tyr Tyr Arg Glu Glu Asp Ile Asp Asp
                85                  90                  95

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

Gln Asp Lys Arg Tyr Pro Phe Ser Val Lys Asp Gln Leu Ile Asp Cys
        115                 120                 125

Phe Asp Leu Gly Lys Met Asp Met Thr Gly Ala Ser Ala Glu Asn Asn
    130                 135                 140

Val Ile Leu Glu Gln Ile Ala Ser Glu Glu Ser Arg Ser Val Gly Val
145                 150                 155                 160

His Leu Arg Gly Gly Asp Tyr Ile Gly Asp Pro Val Tyr Ser Gly Ile
                165                 170                 175

Cys Thr Pro Glu Tyr Tyr Glu Ala Ala Phe Lys His Val Ser Glu Lys
            180                 185                 190

Ile Lys Asp Pro Val Phe His Ile Phe Thr Asn Asp Ile Ser Met Ile
        195                 200                 205

Glu Lys Cys Gly Leu Ser Gly Lys Tyr Asp Leu Lys Ile Thr Asp Ile
    210                 215                 220

Asn Asp Glu Ala His Gly Trp Ala Asp Leu Lys Leu Met Ser Ala Cys
225                 230                 235                 240

Arg His His Ile Ile Ser Asn Ser Ser Phe Ser Trp Trp Ala Ala Phe
                245                 250                 255

Leu Gly Glu Ala Thr Thr Glu Ala Ser Ala Asp Val Ile Asn Val Ile
            260                 265                 270

Pro Glu Tyr Met Arg Gln Gly Val Ser Ala Glu Thr Leu Arg Cys Pro
        275                 280                 285

Cys Trp Thr Thr Val Thr Ser Asp Gly Arg Val Tyr Pro Ser
    290                 295                 300
```

<210> 235
<211> 263
<212> PRT
<213> Prevotella sp. oral taxon 317

<400> 235

Met Lys Ile Val Cys Ile Lys Gly Gly Leu Gly Asn Gln Leu Phe Glu
1 5 10 15

Tyr Cys Arg Tyr Arg Ser Leu His Arg His Asp Asn Arg Gly Val Tyr
20 25 30

Leu His Tyr Asp Arg Arg Arg Thr Lys Gln His Gly Gly Val Trp Leu
35 40 45

Asp Lys Ala Phe His Ile Thr Leu Pro Asn Glu Pro Leu Arg Val Lys
50 55 60

Leu Leu Val Met Val Leu Lys Thr Leu Arg Arg Leu His Leu Phe Lys
65 70 75 80

Arg Leu Tyr Arg Glu Glu Asp Pro Arg Ala Val Leu Ile Asp Asp Tyr
85 90 95

Ser Gln His Lys Gln Tyr Ile Thr Asn Ala Ala Glu Ile Leu Asn Phe
100 105 110

Arg Pro Phe Glu Gln Leu Asp Tyr Ala Glu Glu Ile Gln Thr Thr Pro
115 120 125

Phe Ala Val Ser Val His Val Arg Arg Gly Asp Tyr Leu Leu Leu Ala
130 135 140

Asn Lys Ser Asn Phe Gly Val Cys Ser Val His Tyr Tyr Leu Ser Ala
145 150 155 160

Ala Val Ala Val Arg Glu Arg His Pro Glu Ser Arg Phe Phe Val Phe
165 170 175

Ser Asp Asp Met Glu Trp Ala Lys Glu Asn Leu Asn Leu Pro Asn Cys
180 185 190

Val Phe Val Glu His Ala Gln Ala Gln Pro Asp His Ala Asp Leu Tyr
195 200 205

Leu Met Ser Leu Cys Lys Gly His Ile Ile Ala Asn Ser Thr Phe Ser
210 215 220

Phe Trp Gly Ala Tyr Leu Ser Lys Gly Ser Ser Ala Ile Ala Ile Tyr
225 230 235 240

Pro Lys Gln Trp Phe Ala Glu Pro Thr Trp Asn Val Pro Asp Ile Phe

245 250 255

Pro Ala His Trp Met Ala Leu
260

<210> 236
<211> 309
<212> PRT
<213> Butyrivibrio sp. XPD2006

<400> 236

Met Leu Ile Ile Gln Ile Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1 5 10 15

Tyr Ala Val Tyr Thr Lys Leu Arg Gly Met Gly Lys Asp Val Arg Leu
20 25 30

Asp Leu Ser Trp Phe Asp Pro Ser Val Gln Lys Asn Met Leu Ala Pro
35 40 45

Arg Glu Phe Glu Leu Ser Met Phe Glu Gly Val Asp Tyr Thr Glu Cys
50 55 60

Thr Ala Glu Glu Arg Asp Ser Phe Leu Lys Gln Gly Met Ile Ala Asn
65 70 75 80

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

Pro Lys Val Phe Ser Glu Lys Glu Met Tyr His Pro Glu Ile Phe Glu
100 105 110

Leu Glu Asp Arg Tyr Ile Lys Gly Tyr Phe Ala Cys Gln Lys Tyr Tyr
115 120 125

Asp Asp Ile Met Gly Glu Leu Trp Glu Lys Tyr Thr Phe Pro Ala His
130 135 140

Ser Asp Pro Asp Leu His Thr Arg Asn Met Ala Leu Val Glu Arg Met
145 150 155 160

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

Asp Pro Ser Asn Val Glu Ile Leu Gly Asn Ile Ala Thr Glu Glu Tyr
180 185 190

Tyr Gln Gly Ala Met Asp Tyr Phe Ser Val Lys Asp Pro Asp Thr His
195 200 205

Phe Tyr Ile Phe Thr Ser Asp His Glu Tyr Ala Arg Glu Lys Phe Ser
210 215 220

```
Asp Glu Ser Lys Tyr Thr Ile Val Asp Trp Asn Ser Gly Arg Asn Ser
225                 230                 235                 240

Val Gln Asp Leu Met Leu Met Ser His Cys Lys Gly Asn Ile Cys Ala
                245                 250                 255

Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg Leu Asn Arg Arg Pro Asp
            260                 265                 270

Lys Thr Val Ile Arg Thr Tyr Lys Met Arg Asn Asn Gln Pro Val Asn
        275                 280                 285

Pro Asp Ile Met His Asp Tyr Trp Lys Gly Trp Ile Leu Met Asp Glu
    290                 295                 300

Lys Gly Ser Ile Ile
305
```

<210> 237
<211> 317
<212> PRT
<213> Butyrivibrio fibrisolvens

<400> 237

```
Met Ile Ile Ile Lys Leu Gln Gly Gly Leu Gly Asn Gln Leu Phe Leu
1               5                   10                  15

Tyr Gly Leu Tyr Lys Asn Leu Lys His Leu Lys Arg Asp Val Lys Met
            20                  25                  30

Asp Ile Glu Ser Gly Phe Glu Glu Asp Lys Leu Arg Val Pro Cys Leu
        35                  40                  45

Lys Ser Met Gly Leu Asp Tyr Glu Val Ala Thr Arg Asp Glu Ile Val
    50                  55                  60

Ala Ile Arg Asp Ser Tyr Met Asp Ile Phe Ser Arg Ile Arg Arg Lys
65                  70                  75                  80

Ile Thr Gly Arg Lys Thr Phe Asp Tyr Tyr Glu Pro Glu Asp Gly Asn
                85                  90                  95

Phe Asp Pro Arg Val Leu Glu Gln Thr His Ala Tyr Leu Asp Gly Tyr
            100                 105                 110

Phe Gln Ser Glu Lys Tyr Phe Gly Asp Ser Asp Asp Arg Lys Lys Leu
        115                 120                 125

Lys Asp Glu Leu Leu Lys Glu Lys Ile Arg Val Leu Asp Ser Ser Asp
    130                 135                 140
```

```
Thr Leu Lys Asp Leu Tyr Asn Met Met Ser Ser Gly Ser Ser Val Ser
145                 150                 155                 160

Leu His Ile Arg Arg Gly Asp Tyr Leu Thr Pro Gly Ile Met Glu Thr
                165                 170                 175

Tyr Gly Gly Ile Cys Thr Asp Glu Tyr Tyr Asp Ile Ala Met Asn Arg
            180                 185                 190

Ile Lys Asn Glu Tyr Pro Asp Ser Lys Phe Phe Ile Phe Ser Asn Asp
        195                 200                 205

Ile Asp Trp Cys Lys Glu Lys Tyr Gly Ser Arg Asp Asp Val Ile Phe
    210                 215                 220

Val Asp Ser Cys Asp Glu His Glu Gly Leu Thr Asn Val Ser Gly Asp
225                 230                 235                 240

Gln Asp Asp Ile Gln Val Gln Gly Asp Ile Lys Glu His Gly Asn Asn
                245                 250                 255

Ser Leu Arg Asp Ala Ala Glu Leu Tyr Leu Met Ser Ala Cys Lys His
            260                 265                 270

His Ile Leu Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Ser
        275                 280                 285

Asp His Glu Gly Met Thr Ile Ala Pro Ser Lys Trp Leu Asn Asn Lys
    290                 295                 300

Asn Met Thr Asp Ile Tyr Thr Lys Asp Met Leu Leu Ile
305                 310                 315


<210>  238
<211>  297
<212>  PRT
<213>  Cylindrospermopsis raciborskii

<400>  238

Met Lys Lys Thr Val Val Leu Leu Lys Gly Gly Leu Gly Asn Gln Met
1               5                   10                  15

Phe Gln Tyr Ala Phe Ala Arg Ser Ile Ser Leu Lys Asn Ser Ser Lys
            20                  25                  30

Leu Val Ile Asp Asn Trp Ser Gly Phe Thr Phe Asp Tyr Lys Tyr His
        35                  40                  45

Arg Gln Tyr Glu Leu Gly Thr Phe Ser Ile Val Gly Arg Pro Ala Asn
    50                  55                  60
```

Leu Thr Glu Lys Phe Pro Phe Trp Phe Tyr Glu Leu Lys Ser Lys Phe
65 70 75 80

Phe Pro Arg Leu Pro Lys Val Phe Gln Gln Gln Phe Tyr Gly Leu Leu
85 90 95

Ile Asn Glu Val Gly Gly Glu Tyr Ile Pro Glu Ile Glu Glu Thr Lys
100 105 110

Ile Ser Gln Asn Cys Trp Leu Asn Gly Tyr Trp Gln Ser Pro Leu Tyr
115 120 125

Phe Gln Lys His Ser Asp Ser Ile Thr Arg Glu Leu Met Pro Pro Glu
130 135 140

Pro Met Glu Lys His Phe Leu Glu Leu Gly Lys Leu Leu Arg Glu Thr
145 150 155 160

Glu Ser Val Ala Leu Gly Ile Arg Leu Tyr Glu Glu Ser Lys Asn Pro
165 170 175

Gly Ser His Ser Ser Ser Gly Glu Leu Lys Ser His Phe Glu Ile Asn
180 185 190

Gln Ala Ile Leu Lys Leu Arg Glu Leu Cys Asn Gly Ala Lys Phe Phe
195 200 205

Val Phe Cys Thr His Arg Ser Pro Leu Leu Gln Glu Leu Ala Leu Pro
210 215 220

Glu Asn Thr Ile Phe Val Thr His Asp Asp Gly Tyr Val Gly Ser Met
225 230 235 240

Glu Arg Met Trp Leu Leu Thr Gln Cys Lys His His Ile Phe Thr Asn
245 250 255

Ser Thr Phe Tyr Trp Trp Gly Ala Trp Leu Ser Gln Lys Phe Tyr Ile
260 265 270

Gln Gly Ser Gln Ile Val Phe Ala Ala Asp Asn Phe Ile Asn Ser Asp
275 280 285

Ala Ile Pro Lys His Trp Lys Pro Phe
290 295

<210> 239
<211> 273
<212> PRT
<213> Prevotella multiformis

<400> 239

Met Lys Ile Val Asn Phe Gln Gly Gly Leu Gly Asn Gln Met Phe Ile

```
1               5                   10                  15

Tyr Ala Phe Ser Arg Tyr Leu Ser Arg Leu Tyr Pro Gln Glu Lys Ile
            20                  25                  30

Tyr Gly Ser Tyr Trp Ser Arg Ser Leu Tyr Val His Ser Ala Phe Gln
        35                  40                  45

Leu Asp Arg Ile Phe Ser Leu Gln Leu Pro Pro His Asn Leu Phe Thr
    50                  55                  60

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

Pro Val Glu Glu Thr Pro Gly Ser Met Phe Tyr Asn Gly Tyr Trp Leu
                85                  90                  95

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

Arg Asn Pro Asp Leu Ser Ala Glu Ala Gly Ala Val Leu Ser Met Ile
        115                 120                 125

Glu Arg Ser Asn Ala Val Ser Val His Ile Arg Arg Gly Asp Tyr Gln
    130                 135                 140

Ser Glu Glu His Ile Glu Lys Phe Gly Arg Phe Cys Pro Pro Asp Tyr
145                 150                 155                 160

Tyr Arg Ile Ala Thr Glu Arg Ile Arg Gln Arg Glu Asp Asp Pro Leu
                165                 170                 175

Phe Phe Val Phe Ser Asp Asp Met Met Trp Val Lys Ser Asn Met Asp
            180                 185                 190

Val Pro Asn Ala Val Tyr Val Asp Cys His His Gly Asp Asp Ser Trp
        195                 200                 205

Lys Asp Met Phe Leu Met Ala Lys Cys Arg His Asn Ile Ile Ala Asn
    210                 215                 220

Ser Thr Phe Ser Phe Trp Ala Ala Met Leu Asn Ala Asn Pro Asp Lys
225                 230                 235                 240

Val Val Val Tyr Pro Gln Arg Trp Phe Cys Trp Pro Ser Pro Asp Ile
                245                 250                 255

Phe Pro Glu Met Trp Leu Pro Val Thr Glu Lys Glu Ile Lys Ser Ser
            260                 265                 270

Phe
```

<210> 240
<211> 290
<212> PRT
<213> Bacteroides sp. CAG:462

<400> 240

```
Met Ile Ile Val Asn Met Ala Cys Gly Leu Ala Asn Arg Met Phe Gln
1               5                   10                  15

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

Asp Phe Tyr Lys Ser Ala Thr Leu Pro His Glu Asn Val Pro Trp Asn
        35                  40                  45

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

Leu Ile Leu Gly Gly Gly Ala Asn Leu Leu Ser Lys Leu Arg Arg Lys
65                  70                  75                  80

Tyr Leu Pro Ser Leu Thr Asn Val Ile Thr Met Ser Thr Ala Phe Asp
                85                  90                  95

Thr Asp Leu Gln Ile Asp Asp Asp Arg Lys Asp Lys Tyr Ile Ile Gly
            100                 105                 110

Val Phe Gln Ser Ala Ala Met Val Glu Gly Val Cys Lys Lys Val Lys
        115                 120                 125

Gln Cys Phe Ser Phe Leu Pro Phe Thr Asp Leu Arg His Leu Gln Leu
    130                 135                 140

Glu Lys Glu Met Gln Glu Cys Glu Ser Val Ala Ile His Val Arg Lys
145                 150                 155                 160

Gly Asn Asp Tyr Gln Gln Arg Ile Trp Tyr Gln Asn Thr Cys Thr Met
                165                 170                 175

Asp Tyr Tyr Arg Lys Ala Ile Ala Glu Ile Lys Gly Lys Val Lys Asp
            180                 185                 190

Pro Arg Phe Tyr Val Phe Thr Asp Asn Ala Asp Trp Val Arg Arg Asn
        195                 200                 205

Phe Thr Asp Phe Asp Tyr Lys Met Val Glu Gly Asn Pro Val Tyr Gly
    210                 215                 220

Trp Gly Ser His Phe Asp Met Gln Leu Met Ser Arg Cys Lys Tyr Asn
225                 230                 235                 240
```

```
Ile Ile Ser Asn Ser Thr Tyr Ser Trp Trp Gly Ala Tyr Leu Asn Ala
                245                 250                 255

Asn Arg Asn Lys Ile Val Ile Cys Pro Asn Ile Trp Phe Asn Pro Glu
            260                 265                 270

Ser Cys Asn Glu Tyr Thr Ser Cys Lys Leu Leu Cys Lys Gly Trp Ile
        275                 280                 285

Ala Leu
    290
```

<210> 241
<211> 557
<212> PRT
<213> Desulfovibrio africanus

<400> 241

```
Met Arg Ile Gly Ile Leu Tyr Ile Cys Thr Gly Lys Tyr Thr Val Phe
1               5                   10                  15

Trp Asn His Phe Phe Thr Ser Cys Glu Gln His Phe Leu Arg Glu His
            20                  25                  30

Glu Lys His Tyr Tyr Ile Phe Thr Asp Gly Glu Ile Ala His Leu Asn
        35                  40                  45

Cys Asn Arg Val His Arg Ile Glu Gln Gln His Leu Gly Trp Pro Asp
    50                  55                  60

Ser Thr Leu Lys Arg Phe His Met Phe Glu Arg Ile Ala Asp Thr Leu
65                  70                  75                  80

Arg Gln Asn Ser Asp Phe Ile Val Phe Phe Asn Ala Asn Met Val Phe
                85                  90                  95

Leu Arg Asp Val Gly Lys Glu Phe Leu Pro Thr Arg Glu Gln Ala Leu
            100                 105                 110

Val Phe His Arg His Pro Gly Leu Phe Arg Arg Pro Ala Trp Leu Leu
        115                 120                 125

Pro Tyr Glu Arg Arg Pro Glu Ser Thr Ala Tyr Ile Pro Tyr Gly Ser
    130                 135                 140

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

Tyr Leu Asp Phe Val Ala Met Leu Arg Arg Asn Ile Asp Ile Asp Val
                165                 170                 175
```

```
Glu Arg Gly Ile Ile Ala Arg Trp His Asp Glu Ser His Ile Asn Arg
            180                 185                 190

Phe Val Ile Gly Arg His Tyr Lys Ile Gly His Pro Gly Tyr Val Tyr
        195                 200                 205

Pro Asp Arg Arg Asn Leu Pro Phe Pro Arg Ile Ile Arg Val Ile Asp
    210                 215                 220

Lys Ala Ser Val Gly Gly His Thr Phe Leu Arg Gly Gln Thr Pro Glu
225                 230                 235                 240

Pro Ala Pro Glu Glu Gln Ser Lys Thr Val Ala Lys Lys Leu Arg Ser
                245                 250                 255

Gln Leu Lys Arg Pro Cys Met Pro Arg Ala Ala Gln Asp Glu Pro Ile
            260                 265                 270

Ile Leu Ala Arg Met Met Gly Gly Leu Gly Asn Gln Met Phe Ile Tyr
        275                 280                 285

Ala Ala Ala Arg Val Leu Ala Glu Arg Gln Gly Ala Gln Leu His Leu
    290                 295                 300

Asp Thr Gly Lys Leu Ser Gly Asp Ser Ile Arg Gln Tyr Asp Leu Pro
305                 310                 315                 320

Ala Phe Ser Ile Asp Ala Pro Leu Trp His Ile Pro Cys Gly Cys Asp
                325                 330                 335

Arg Ile Val Gln Ala Trp Phe Ala Leu Arg His Val Ala Ala Gly Cys
            340                 345                 350

Gly Met Pro Lys Pro Thr Met Gln Val Leu Arg Ser Gly Phe His Leu
        355                 360                 365

Asp Gln Arg Phe Phe Ser Ile Arg His Ser Ala Tyr Leu Ile Gly Tyr
    370                 375                 380

Trp Gln Ser Pro His Tyr Trp Arg Gly His Glu Asp Arg Val Arg Ser
385                 390                 395                 400

Ser Phe Asp Leu Thr Arg Phe Glu Arg Pro His Leu Arg Glu Ala Leu
                405                 410                 415

Ala Ala Val Ser Gln Pro Asn Thr Ile Ser Val His Leu Arg Arg Gly
            420                 425                 430

Asp Phe Arg Ala Pro Lys Asn Ser Asp Lys His Leu Leu Ile Asp Gly
        435                 440                 445
```

```
Ser Tyr Tyr Glu Arg Ala Arg Lys Leu Leu Leu Glu Met Thr Pro Gln
    450                 455                 460

Ser His Phe Tyr Ile Phe Ser Asp Glu Pro Glu Glu Ala Gln Arg Leu
465                 470                 475                 480

Phe Ala His Trp Glu Asn Thr Ser Phe Gln Pro Arg Arg Ser Gln Glu
                485                 490                 495

Glu Asp Leu Leu Leu Met Ser Arg Cys Ser Ala Ser Ile Ile Ala Asn
            500                 505                 510

Ser Ser Phe Ser Trp Trp Gly Ala Trp Leu Gly Arg Pro Lys Gln His
        515                 520                 525

Val Ile Ala Pro Arg Met Trp Phe Thr Arg Asp Val Leu Met His Thr
    530                 535                 540

Tyr Thr Leu Asp Leu Phe Pro Glu Lys Trp Ile Leu Leu
545                 550                 555


<210>  242
<211>  299
<212>  PRT
<213>  Roseburia sp. CAG:100

<400>  242

Met Ile Leu Ile His Val Met Gly Gly Leu Gly Asn Gln Leu Tyr Gln
1               5                   10                  15

Tyr Ala Leu Tyr Glu Lys Met Lys Ser Leu Gly Lys Lys Val Lys Leu
            20                  25                  30

Asp Thr Tyr Ala Tyr Asn Asp Ala Ala Gly Glu Asp Lys Glu Trp Arg
        35                  40                  45

Ser Leu Glu Leu Asp Arg Phe Pro Ala Ile Glu Tyr Asp Lys Ala Thr
    50                  55                  60

Ser Glu Asp Arg Thr Lys Leu Leu Asp Asn Ser Gly Leu Leu Thr Ala
65                  70                  75                  80

Lys Ile Arg Arg Lys Leu Leu Gly Arg Lys Asp Lys Thr Ile Arg Glu
                85                  90                  95

Ser Lys Glu Tyr Met Pro Glu Ile Phe His Met Asp Asp Val Tyr Leu
            100                 105                 110

Tyr Gly Phe Trp Asn Cys Glu Arg Tyr Tyr Glu Asp Ile Ile Pro Leu
        115                 120                 125
```

```
Leu Gln Asp Lys Leu Gln Phe Pro Ile Ser Asn Asn Pro Arg Asn Gln
    130                 135                 140

Gln Cys Ile Glu Gln Met Gln Lys Glu Asn Ala Val Ser Ile His Ile
145                 150                 155                 160

Arg Arg Thr Asp Tyr Leu Thr Val Ala Asp Gly Ala Arg Tyr Met Gly
                165                 170                 175

Ile Cys Thr Glu Asp Tyr Tyr Lys Gly Ala Met Ala Tyr Ile Glu Glu
            180                 185                 190

Arg Val Ser Asn Pro Val Tyr Tyr Ile Phe Ser Asp Asp Val Glu Tyr
        195                 200                 205

Ala Lys Gln His Tyr His Gln Asp Asn Met His Val Val Asp Trp Asn
    210                 215                 220

Ser Lys Ala Asp Ser Ile Tyr Asp Met Gln Leu Met Ser Lys Cys Lys
225                 230                 235                 240

His Asn Ile Cys Ala Asn Ser Thr Phe Ser Met Trp Ala Ala Arg Leu
                245                 250                 255

Asn Gln Asn Lys Glu Lys Ile Met Ile Arg Pro Leu His His Asp Asn
            260                 265                 270

Tyr Glu Thr Thr Thr Ala Thr Gln Val Lys Gln Asn Trp Lys Asn Trp
        275                 280                 285

Ile Leu Leu Asp Gln Asn Gly Gln Val Cys Glu
    290                 295

<210>  243
<211>  326
<212>  PRT
<213>  Desulfovibrio africanus

<400>  243

Met Thr Met Asn Ile Ile Arg Met Ser Gly Gly Leu Gly Ser Gln Met
1               5                   10                  15

Phe Gln Tyr Ala Leu Tyr Leu Lys Leu Lys Ser Met Gly Lys Glu Val
            20                  25                  30

Lys Phe Asp Asp Ile Asn Glu Tyr Arg Gly Glu Lys Ala Arg Pro Ile
        35                  40                  45

Met Leu Ala Val Phe Gly Ile Glu Tyr Pro Arg Ala Thr Trp Asp Glu
    50                  55                  60

Ile Thr Ser Phe Thr Asp Gly Ser Met Asp Leu Leu Lys Arg Leu Arg
```

65 70 75 80

Arg Lys Ile Phe Gly Arg Lys Ala Ile Glu Tyr Glu Glu Gln Gly Phe
85 90 95

Tyr Asp Pro Asn Val Leu Asn Phe Asp Ser Met Tyr Leu Arg Gly Asn
100 105 110

Phe Gln Ser Glu Lys Tyr Phe Gln Asp Ile Lys Glu Glu Val Arg Lys
115 120 125

Leu Tyr Arg Phe Ser Thr Leu Glu Asp Met Arg Leu Pro Glu Arg Leu
130 135 140

Tyr Lys Ala Thr Lys Ala Cys Leu Asp Gly Ile Glu Ser Ser Glu Ser
145 150 155 160

Val Gly Leu His Met Tyr Arg Ser Asp Ser Arg Val Asp Gly Glu Leu
165 170 175

Tyr Asp Gly Ile Cys Thr Gly Asn Tyr Tyr Lys Gly Ala Val Arg Phe
180 185 190

Ile Gln Asp Lys Val Pro Asp Ala Lys Phe Tyr Ile Phe Ser Asn Glu
195 200 205

Pro Lys Trp Val Arg Gly Trp Val Val Asp Leu Ile Gln Ser Gln Ile
210 215 220

Gln Glu Gly Met Ser Pro Ser Gln Val Lys Glu Met Glu Lys Arg Phe
225 230 235 240

Val Met Val Glu Ala Asn Thr Glu Tyr Thr Gly Tyr Leu Asp Met Met
245 250 255

Leu Met Ser Lys Cys Lys His Asn Ile Ile Ser Asn Ser Ser Phe Ser
260 265 270

Trp Trp Ser Ala Trp Met Asn Asp His Pro Glu Lys Val Val Val Ala
275 280 285

Pro Asp Arg Trp Ser Ser Asp Lys Glu Gly Asn Glu Ile Tyr Thr Thr
290 295 300

Gly Met Thr Leu Val Asn Glu Lys Gly Arg Val Asn Tyr Thr Ile His
305 310 315 320

Glu Asn Ser Thr Val Lys
325

<210> 244

<211> 311
<212> PRT
<213> Prevotella nigrescens

<400> 244

Met Ile Leu Ser Tyr Ile Thr Gly Arg Leu Gly Asn Gln Leu Phe Glu
1 5 10 15

Tyr Ala Tyr Ala Arg Ser Leu Leu Leu Lys Arg Gly Lys Asn Glu Glu
20 25 30

Leu Ile Leu Asn Phe Ser Leu Val Arg Ala Ala Gly Lys Glu Ile Glu
35 40 45

Gly Phe Asp Asp Asn Leu Arg Tyr Phe Asn Val Tyr Ser Tyr Thr Glu
50 55 60

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

Ile Tyr Ile Leu Phe Lys Leu Asp Gln Lys Leu Phe Arg Ile Ile Lys
85 90 95

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

Asp Tyr Leu Asp Asn Ile Ser Asn Leu Ile Ile Pro Arg Thr Lys Asn
115 120 125

Val Phe Cys Tyr Gly Lys Tyr Glu Asn Pro Lys Tyr Phe Asp Asp Ile
130 135 140

Arg Ser Ile Leu Leu Lys Glu Phe Thr Pro Arg Ile Pro Pro Leu Lys
145 150 155 160

Asn Asn Asp Gln Leu Tyr Ser Val Ile Glu Ser Thr Asn Ser Val Cys
165 170 175

Ile Ser Ile Arg Arg Gly Asp Phe Leu Cys Asp Lys Phe Lys Asp Arg
180 185 190

Phe Leu Val Cys Asp Lys Glu Tyr Phe Leu Glu Ala Met Glu Glu Ala
195 200 205

Lys Lys Arg Ile Ser Asn Ser Thr Phe Ile Phe Phe Ser Asp Asp Ile
210 215 220

Glu Trp Val Arg Glu Asn Ile His Ser Asp Val Pro Cys Tyr Tyr Glu
225 230 235 240

Ser Gly Lys Asp Pro Val Trp Glu Lys Leu Arg Leu Met Tyr Ser Cys
245 250 255

```
Lys His Phe Ile Ile Ser Asn Ser Thr Phe Ser Trp Trp Ala Gln Tyr
            260                 265                 270

Leu Ser Arg Asn Glu Glu Lys Val Val Ile Ala Pro Asp Arg Trp Ser
        275                 280                 285

Asn Val Pro Gly Glu Lys Ser Phe Leu Leu Ser Asn Ser Phe Ile Lys
    290                 295                 300

Ile Pro Ile Gly Ile Leu Pro
305                 310
```

<210> 245
<211> 279
<212> PRT
<213> Bacteroides sp. CAG:875

<400> 245

```
Met Ile Tyr Val Glu Ile Asn Gly Arg Leu Gly Asn Asn Met Phe Glu
1               5                   10                  15

Ile Ala Ala Ala Lys Ser Leu Thr Asp Glu Val Thr Leu Trp Cys Lys
            20                  25                  30

Gly Asp Trp Gln Leu Asn Cys Ile Lys Met Tyr Ser Asp Thr Leu Phe
        35                  40                  45

Lys Asn Tyr Pro Ile Val Lys Ser Leu Pro Asn Asn Ile Arg Ile Tyr
    50                  55                  60

Glu Glu Pro Glu Phe Thr Phe His Pro Ile Pro Tyr Lys Glu Asn Gln
65                  70                  75                  80

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

Glu Lys Val Leu Lys Leu Tyr Pro Cys Pro Met Pro Val Lys Leu Asp
            100                 105                 110

Ile Glu Lys Arg Phe Gly Asp Ile Leu Ser Gln Tyr Thr Val Val Ser
        115                 120                 125

Ile Asn Val Arg Arg Gly Asp Tyr Leu Asn Leu Pro His Arg His Pro
    130                 135                 140

Phe Val Gly Lys Lys Phe Leu Glu Arg Ala Met Leu Trp Phe Gly Asp
145                 150                 155                 160

Lys Val His Tyr Ile Ile Ser Ser Asp Asp Ile Glu Trp Cys Lys Ala
                165                 170                 175
```

```
His Phe Lys Gln Phe Asp Asn Val His Tyr Leu Thr Asn Ser Tyr Pro
            180                 185                 190

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

Asn Ser Ser Phe Ser Trp Trp Gly Ala Tyr Leu Asn Asn His Pro Gln
    210                 215                 220

Lys Ile Val Ile Ala Pro His Arg Trp Phe Gly Met Ser Thr Asn Ile
225                 230                 235                 240

Asn Thr Gln Asp Leu Leu Pro Pro Glu Trp Met Ile Glu Gln Cys Val
                245                 250                 255

Tyr Glu Pro Lys Val Phe Leu Lys Ala Leu Pro Leu His Ala Lys Tyr
            260                 265                 270

Leu Leu Lys Arg Val Leu Lys
        275
```

<210> 246
<211> 292
<212> PRT
<213> Prevotella sp. oral taxon 299

<400> 246

```
Met Asp Ser Gln Leu Leu Lys His Ile Lys Leu Ser Gly Gly Phe Gly
1               5                   10                  15

Asn Gln Leu Phe Gln Tyr Phe Phe Gly Glu Tyr Leu Lys Glu Lys Tyr
            20                  25                  30

Asn Cys Ser Ile Ser Phe Phe Ser Glu Pro Ala Leu Asp Ile Asn Gln
        35                  40                  45

Leu Gln Ile His Arg Phe Phe Pro Thr Leu Arg Ile Ser His Asn Thr
    50                  55                  60

Glu Leu Arg Arg Phe His Tyr Ala Phe Thr Gln Gln Leu Ala Tyr Arg
65                  70                  75                  80

Cys Met Arg Lys Leu Leu Leu Leu Phe Pro Phe Leu Asn Arg Lys Val
                85                  90                  95

Lys Ile Glu Asn Gly Ser Asn Tyr Gln Asn Gln Ser Phe Asn Asp Thr
            100                 105                 110

Tyr Cys Phe Asp Gly Tyr Trp Gln Ser Tyr Arg Tyr Leu Ser Ala Phe
        115                 120                 125
```

```
Thr Pro Ser Leu Gln Phe Glu Asp Gln Leu Ile Asn Asp Ile Ser Ala
    130                 135                 140

Asp Tyr Ile Asn Ala Ile Glu Gln Ser Glu Ala Val Phe Leu His Ile
145                 150                 155                 160

Arg Arg Gly Asp Tyr Leu Asn Lys Glu Asn Gln Lys Val Phe Ala Glu
                165                 170                 175

Cys Pro Leu Asn Tyr Phe Glu Asn Ala Val Asn Lys Ile Lys Glu Gly
            180                 185                 190

Asn Lys Thr Tyr His Phe Phe Val Phe Ser Asn Asp Ile Glu Trp Val
        195                 200                 205

Lys Cys His Leu Lys Leu Asn Asn Asn Glu Val Thr Phe Ile Gln Asn
    210                 215                 220

Glu Gly Ser Ser Cys Asp Leu Lys Asp Phe Tyr Leu Met Thr Arg Cys
225                 230                 235                 240

Lys His Ala Ile Ile Ser Asn Ser Thr Phe Ser Trp Trp Ala Ala Tyr
                245                 250                 255

Leu Ile Asn Asn Asn Asp Lys Lys Val Ile Ala Pro Lys Arg Trp Tyr
            260                 265                 270

Asn Asp Leu Ser Met Asn Asn Ala Thr Lys Asp Leu Ile Pro Pro Thr
        275                 280                 285

Trp Ile Arg Leu
    290


<210>  247
<211>  265
<212>  PRT
<213>  Paraprevotella xylaniphila

<400>  247

Met Lys Ile Val Cys Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Cys Arg Phe Arg Asp Leu Met Asp Ser Gly Asn Gly Lys Val Tyr
            20                  25                  30

Leu Phe Tyr Asp Arg Arg Arg Leu Lys Gln His Asp Gly Leu Arg Leu
        35                  40                  45

Ser Asp Cys Phe Glu Leu Glu Leu Pro Ser Cys Pro Trp Gly Ile Arg
    50                  55                  60

Leu Val Val Trp Gly Leu Lys Ile Cys Arg Ala Ile Gly Val Leu Lys
```

65 70 75 80

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

Ser Gln His Arg Arg Phe Ile Pro Asn Ala Arg Arg Tyr Phe Ser Phe
100 105 110

Arg Gln Phe Leu Ala Glu Leu Gln Ser Gly Phe Val Gln Met Ile Arg
115 120 125

Ala Val Asp Tyr Pro Val Ser Val His Val Arg Arg Gly Asp Tyr Leu
130 135 140

His Pro Ser Asn Ser Ser Phe Val Leu Cys Gly Val Asp Tyr Phe Arg
145 150 155 160

Gln Ala Ile Ala Tyr Val Arg Lys Lys Arg Pro Asp Ala Arg Phe Phe
165 170 175

Phe Phe Ser Asp Asp Met Glu Trp Val Arg Glu Asn Leu Trp Met Glu
180 185 190

Asp Ala Val Tyr Val Glu His Thr Glu Leu Met Pro Asp Tyr Met Asp
195 200 205

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

Phe Ser Phe Trp Gly Ala Tyr Leu Ala Val Asp Gly Asn Gly Met Lys
225 230 235 240

Ile Tyr Pro Arg Arg Trp Phe Arg Asp Pro Thr Trp Ile Thr Pro Pro
245 250 255

Ile Phe Ser Glu Glu Trp Val Gly Leu
260 265

<210> 248
<211> 281
<212> PRT
<213> Dethiosulfovibrio peptidovorans

<400> 248

Met Phe Gln Tyr Ala Phe Gly Arg Ala Leu Ala Leu Asp Leu Gly Leu
1 5 10 15

Asp Leu Lys Leu Asp Ile Ser Asn Phe Gly Ser Asp Ser Arg Pro Phe
20 25 30

Ser Leu Gly Ile Tyr Ser Leu Thr Lys Asn Ile Pro Phe Gly Cys Tyr
35 40 45

```
Leu Ser Thr Ser Thr Arg Leu Lys Val Lys Met Thr Lys Lys Leu Arg
    50                  55                  60

Arg Trp Gly Val Trp Gly Met Asp Lys Asn Met Pro Gly Val Leu Val
65                  70                  75                  80

Glu Pro Phe Pro Pro Val Leu Val Ser Leu Asp Glu Val Leu Ser Glu
                85                  90                  95

Lys Leu Ser His Leu Phe Val Asp Gly Tyr Trp Gln Ser Glu Lys Tyr
            100                 105                 110

Phe Ser Arg Tyr Ser Asp Val Ile Arg Ser Asp Phe Arg Val Ile Glu
        115                 120                 125

Glu Ser Ser Ala Phe Leu Ala Trp Lys Lys Arg Met Leu Ser Glu Pro
    130                 135                 140

Gly Gly Ser Ile Ser Val His Val Arg Arg Gly Asp Tyr Val Thr Asp
145                 150                 155                 160

Ser Ser Ala Asn Arg Val His Gly Val Leu Pro Ile Glu Tyr Tyr Leu
                165                 170                 175

Arg Ala Lys Glu Ile Leu Asn Thr Ile Ser Asp Gly Leu Val Phe Tyr
            180                 185                 190

Val Phe Thr Asp Asp Pro Val Trp Ala Arg Asn Asn Leu Cys Leu Gly
        195                 200                 205

Asp Lys Thr Ile Tyr Val Ser Gly Glu Asp Leu Lys Asp Tyr Glu Glu
    210                 215                 220

Leu Ala Leu Met Ser Cys Cys Asp His His Val Val Ala Asn Ser Ser
225                 230                 235                 240

Phe Ser Trp Trp Gly Ala Trp Leu Gly Gln Asp Thr Ser Thr Val Thr
                245                 250                 255

Ile Ala Pro Gly Arg Trp Phe Arg Lys Met Asp Ser Ser Phe Val Ile
            260                 265                 270

Pro Asp Asn Trp Ile Lys Ile Trp Thr
        275                 280
```

<210> 249
<211> 299
<212> PRT
<213> Lachnospiraceae bacterium 10-1

<400> 249

```
Met Ile Ile Ile Gln Val Met Gly Gly Leu Gly Asn Gln Leu Gln Gln
1               5                  10                  15

Tyr Ala Leu Tyr Arg Lys Phe Val Arg Met Gly Lys Glu Ala Arg Leu
            20                  25                  30

Asp Ile Ser Trp Phe Leu Asp Lys Glu Lys Arg Gly Glu Val Leu Ala
        35                  40                  45

Glu Arg Glu Leu Glu Leu Asp Tyr Phe Asp Arg Leu Ile Tyr Glu Thr
    50                  55                  60

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

Gly Lys Leu Lys Arg Lys Phe Leu Pro Gly Arg Ile Arg Trp Phe His
                85                  90                  95

Glu Ser Lys Ile Tyr His Pro Glu Leu Leu Gln Met Glu Asn Met Tyr
            100                 105                 110

Leu Ser Gly Tyr Phe Ala Cys Glu Lys Tyr Tyr Ala Asp Ile Leu Tyr
        115                 120                 125

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

Ile Lys Met Ala Gln Glu Met Gln Glu Arg Glu Ser Val Ser Val His
145                 150                 155                 160

Leu Arg Arg Gly Asp Tyr Leu Asp Glu Lys Asn Thr Ala Met Phe Gly
                165                 170                 175

Asn Ile Cys Thr Asp Ala Tyr Tyr Cys Lys Ala Ile Glu Tyr Met Lys
            180                 185                 190

Thr Leu Cys Ser Lys Pro His Phe Tyr Ile Phe Ser Asp Asp Ile Pro
        195                 200                 205

Tyr Val Arg Gln Arg Phe Thr Gly Glu Glu Tyr Thr Val Val Asp Ile
    210                 215                 220

Asn His Gly Arg Asp Ser Phe Phe Asp Met Trp Leu Met Ser Arg Cys
225                 230                 235                 240

Arg His Asn Ile Cys Ala Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg
                245                 250                 255

Leu Asn Ser Asn Asp Asn Lys Ile Met Ile Arg Pro Thr Ile His Lys
            260                 265                 270
```

```
Asn Ser Gln Val Phe Val Lys Glu Glu Met Glu Gln Leu Trp Pro Gly
        275                 280                 285


Trp Lys Phe Ile Ser Pro Asp Gly Gly Ile Lys
    290                 295


<210>  250
<211>  292
<212>  PRT
<213>  Treponema maltophilum

<400>  250

Met Phe Cys Ala Ala Phe Val Glu Ala Leu Lys His Ala Gly Gln Lys
1               5                   10                  15


Val Phe Val Asp Thr Ser Leu Tyr Asn Lys Gly Thr Val Arg Ser Gly
            20                  25                  30


Ile Asp Phe Cys His Asn Gly Leu Glu Thr Glu His Leu Phe Gly Ile
        35                  40                  45


Lys Phe Asp Glu Ala Asp Lys Ala Asp Val His Arg Leu Ser Thr Ser
    50                  55                  60


Ala Glu Gly Leu Leu Asn Arg Ile Arg Arg Lys Tyr Phe Thr Lys Lys
65                  70                  75                  80


Thr His Tyr Ile Asp Thr Val Phe Arg Tyr Thr Pro Glu Val Leu Ser
                85                  90                  95


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


Phe Leu Pro Ile Glu Ser Asp Ile Arg Thr Leu Phe Arg Phe Arg Gln
        115                 120                 125


Pro Leu Ser Glu Lys Ser Ala Ala Val Gln Ser Ala Leu Gln Ala Gln
    130                 135                 140


Glu Pro Ala Ser Leu Ser Ala Ser Ile His Val Arg Arg Gly Asp Phe
145                 150                 155                 160


Leu His Thr Lys Thr Leu Asn Val Cys Thr Glu Thr Tyr Tyr Asn Asn
                165                 170                 175


Ala Ile Glu Tyr Ala Ala Lys Lys Tyr Ala Val Ser Ala Phe Tyr Val
            180                 185                 190


Phe Ser Asp Asp Ile Gln Trp Cys Arg Glu His Leu Asn Phe Phe Gly
        195                 200                 205
```

```
Ala Arg Ser Val Phe Ile Asp Trp Asn Ile Gly Ala Asp Ser Trp Gln
    210                 215                 220

Asp Met Val Leu Met Ser Met Cys Arg Cys Asn Ile Ile Ala Asn Ser
225                 230                 235                 240

Ser Phe Ser Trp Trp Ala Ala Trp Leu Asn Ala Ala Ser Asp Lys Ile
                245                 250                 255

Val Leu Ala Pro Ala Ile Trp Asn Arg Arg Gln Leu Glu Tyr Ala Asp
            260                 265                 270

Arg Tyr Tyr Gly Tyr Asp Tyr Ser Asp Val Ile Pro Glu Thr Trp Ile
        275                 280                 285

Arg Ile Pro Ile
    290
```

<210> 251
<211> 266
<212> PRT
<213> Bacteroides massiliensis

<400> 251

```
Met Lys Leu Val Ser Phe Thr Ala Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Cys Phe Tyr Arg Tyr Leu Leu Asn Lys Phe Pro Asn Glu Lys Ile
            20                  25                  30

Tyr Gly Tyr Tyr Asn Lys Lys Trp Leu Lys Lys His Gly Gly Ile Ile
        35                  40                  45

Ile Glu His Phe Phe Asp Val Lys Leu Pro Arg Ser Thr Arg Trp Ile
    50                  55                  60

Asn Leu Tyr Gly Gln Tyr Leu Arg Ile Ile Tyr Lys Cys Phe Ser Cys
65                  70                  75                  80

Gly Val Ser Lys Asp Asp Asp Phe Glu Met Asn Arg Thr Met Phe Val
                85                  90                  95

Gly Tyr Trp Gln Asp Gln Cys Phe Phe Ser Gly Ile Asn Ile Ser Tyr
            100                 105                 110

Lys Lys Asn Leu Val Ile Ser Glu Lys Asn Thr Trp Leu Leu Gly Glu
        115                 120                 125

Ile Leu Lys Cys Asn Ser Val Ala Ile His Phe Arg Arg Gly Asp Tyr
    130                 135                 140

Met Leu Pro Gln Phe Lys Lys Ile Phe Gly Glu Val Cys Thr Val Lys
```

145 150 155 160

Tyr Tyr Leu Lys Ser Ile Arg Lys Val Glu Glu Lys Ile Ser Glu Pro
165 170 175

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

Thr Phe Asn Lys Val Tyr Phe Val Asp Trp Asn Lys Gly Gln Asn Ser
195 200 205

Phe Trp Asp Met Tyr Leu Met Ser Gln Cys Ser Ala Asn Ile Ile Ala
210 215 220

Asn Ser Thr Phe Ser Phe Trp Gly Ala Tyr Leu Asn Lys Asn Asn Pro
225 230 235 240

Phe Val Ile Tyr Pro Gln Lys Trp Val Arg Thr Asn Leu Lys Gln Pro
245 250 255

Asn Ile Phe Pro Lys Thr Trp Met Ala Leu
260 265

<210> 252
<211> 303
<212> PRT
<213> Enterococcus faecium

<400> 252

Met Ile Val Leu Thr Leu Gly Gly Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Gly Tyr Ala Arg Tyr Ile Gln Lys Ile His Arg Glu Lys Phe Ile
20 25 30

Tyr Ile Asn Asp Ser Glu Val Ile Lys Glu Ala Asp Arg Phe Asn Ser
35 40 45

Leu Gly Asn Leu Asn Thr Val Asn Ile Lys Val Leu Pro Arg Ile Ile
50 55 60

Ser Lys Pro Leu Asn Glu Thr Glu Arg Leu Val Arg Lys Ile Met Val
65 70 75 80

Arg Leu Phe Gly Val Ala Gly Phe Asn Glu Ser Ala Ile Phe Gln Ser
85 90 95

Leu Asn Lys Phe Gly Ile Tyr Tyr His Pro Ser Val Tyr Lys Phe Tyr
100 105 110

Glu Ser Leu Lys Thr Gly Phe Pro Ile Lys Ile Ile Glu Gly Gly Phe
115 120 125

```
Gln Ser Trp Lys Tyr Leu Glu Thr Cys Pro Glu Ile Lys Gln Glu Leu
    130                 135                 140

Arg Val Lys Tyr Glu Pro Met Gly Glu Asn Leu Arg Leu Leu Asn Leu
145                 150                 155                 160

Ile Ser Gln Ser Glu Ser Val Cys Val His Ile Arg Arg Gly Asp Tyr
                165                 170                 175

Leu Ser Pro Lys Tyr Lys His Leu Asn Val Cys Asp Tyr Gln Tyr Tyr
            180                 185                 190

Phe Glu Ser Met Asn Tyr Ile Ile Ser Lys Leu Asn Asn Pro Thr Phe
        195                 200                 205

Phe Ile Phe Ser Asn Thr Ser Asp Asp Leu Asp Trp Ile Lys Glu Asn
    210                 215                 220

Tyr Ser Leu Pro Gly Lys Ile Val Tyr Val Lys Asn Asp Asn Pro Asp
225                 230                 235                 240

Tyr Glu Glu Leu Arg Leu Met Tyr Ser Cys Lys His Phe Ile Ile Ser
                245                 250                 255

Asn Ser Thr Phe Ser Trp Trp Ala Gln Tyr Leu Ser Asn Asn Ser Gly
            260                 265                 270

Ile Val Ile Ala Pro Glu Ile Trp Asn Arg Leu Asn His Asp Gly Ile
        275                 280                 285

Ala Asp Leu Tyr Met Pro Asn Trp Ile Thr Met Lys Val Asn Arg
    290                 295                 300


<210>  253
<211>  290
<212>  PRT
<213>  Bacteroides ovatus

<400>  253

Met Asp Val Val Val Ile Phe Asn Gly Leu Gly Asn Gln Met Ser Gln
1               5                   10                  15

Tyr Ala Tyr Tyr Leu Ala Lys Lys Lys Val Asn Pro Asn Thr Lys Val
            20                  25                  30

Ile Phe Asp Ile Met Ser Lys His Asn His Tyr Gly Tyr Asp Leu Glu
        35                  40                  45

Arg Ala Phe Gly Ile Glu Val Asn Lys Thr Leu Leu Ile Lys Val Leu
    50                  55                  60
```

```
Gln Ile Ile Tyr Val Leu Ser Arg Lys Phe Arg Leu Phe Lys Ser Val
65                  70                  75                  80

Gly Val Arg Thr Ile Tyr Glu Pro Leu Asn Tyr Asp Tyr Thr Pro Leu
                85                  90                  95

Leu Met Gln Lys Gly Pro Trp Gly Ile Asn Tyr Tyr Val Gly Gly Trp
            100                 105                 110

His Ser Glu Lys Asn Phe Met Asn Val Pro Asp Glu Val Lys Lys Ala
        115                 120                 125

Phe Met Phe Arg Glu Gln Pro Asn Glu Asp Arg Phe Asn Glu Trp Leu
    130                 135                 140

Gln Val Ile Arg Gly Asp Asn Ser Ser Val Ser Val His Ile Arg Arg
145                 150                 155                 160

Gly Asp Tyr Met Asn Ile Glu Pro Thr Gly Tyr Tyr Gln Leu Asn Gly
                165                 170                 175

Val Ala Thr Leu Asp Tyr Tyr His Glu Ala Ile Asp Tyr Ile Arg Gln
            180                 185                 190

Tyr Val Asp Thr Pro His Phe Tyr Val Phe Ser Asn Asp Leu Asp Trp
        195                 200                 205

Cys Lys Glu Gln Phe Gly Val Glu Asn Phe Phe Tyr Ile Glu Cys Asn
    210                 215                 220

Gln Gly Val Asn Ser Trp Arg Asp Met Tyr Leu Met Ser Glu Cys His
225                 230                 235                 240

Tyr His Ile Asn Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu
                245                 250                 255

Cys Lys Phe Glu Asp Ser Ile Thr Val Cys Pro Glu Arg Phe Ile Arg
            260                 265                 270

Asn Val Val Thr Lys Asp Phe Tyr Pro Glu Arg Trp His Lys Ile Lys
        275                 280                 285

Ser Cys
    290
```

<210> 254
<211> 271
<212> PRT
<213> Synechococcus phage S-SM2

<400> 254

```
Met Ile Gly Phe Asn Ala Leu Gly Arg Met Gly Arg Leu Ala Asn Gln
1               5                   10                  15

Met Phe Gln Tyr Ala Ser Leu Lys Gly Ile Ala Arg Asn Thr Gly Val
            20                  25                  30

Asp Phe Cys Val Pro Tyr His Glu Glu Ala Val Asn Asp Gly Ile Gly
        35                  40                  45

Asn Met Leu Arg Thr Glu Ile Phe Asp Ser Phe Asp Leu Gln Val Asn
    50                  55                  60

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

Phe His Phe Asp Glu Glu Leu Phe Arg Met Cys Pro Asp His Val Asp
                85                  90                  95

Ile Arg Gly Tyr Phe Gln Thr Glu Lys Tyr Phe Lys His Ile Glu Asp
            100                 105                 110

Glu Ile Arg Glu Asp Phe Thr Phe Lys Asp Glu Ile Leu Asn Pro Cys
        115                 120                 125

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

Arg Thr Asp Tyr Val Thr Asn Ser Ala Asn His Pro Pro Cys Thr Leu
145                 150                 155                 160

Glu Tyr Tyr Glu Ala Ala Leu Lys His Phe Asp Asp Asp Arg Asn Val
                165                 170                 175

Ile Val Phe Ser Asp Asp Pro Ala Trp Cys Lys Glu Gln Glu Leu Phe
            180                 185                 190

Ser Asp Asp Arg Phe Met Ile Ser Glu Asn Glu Asp Asn Arg Ile Asp
        195                 200                 205

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

Tyr Ser Trp Trp Gly Ala Trp Leu Ser Ala Asn Lys Asp Lys Lys Val
225                 230                 235                 240

Ile Ala Pro Val Gln Trp Phe Gly Thr Gly Tyr Thr Lys Asp His Asp
                245                 250                 255

Thr Ser Asp Leu Ile Pro Asp Gly Trp Thr Arg Ile Ala Thr Ala
            260                 265                 270
```

<210> 255
<211> 294
<212> PRT
<213> Geobacter metallireducens

<400> 255

Met Asp Ile His Val Leu Ser Tyr Gly Leu Gly Asn Gln Leu Ser Gln
1 5 10 15

Tyr Ala Phe Phe Ile Asn Arg Arg Gln Leu Met Gln Arg Ala Tyr Ala
20 25 30

Phe Tyr Ala Phe Lys Gln His Asn Gly Tyr Glu Leu Asp Arg Ile Phe
35 40 45

Gly Leu Lys Glu Gly Leu Pro Trp Tyr Leu Gln Phe Val Arg Val Val
50 55 60

Phe Arg Leu Gly Ile Ser Arg Arg Phe Tyr Ser Lys Arg Thr Ala Asp
65 70 75 80

Phe Val Leu Ser Leu Phe Arg Ile Lys Val Ile Asp Glu Ala Tyr Asn
85 90 95

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

Leu Tyr Gly Gly Trp His Asp Ser Arg Tyr Phe His Pro Ser Glu Ala
115 120 125

Ala Val Arg Thr Ala Phe Ser Phe Pro Pro Leu Asp Asp Val Asn Asp
130 135 140

Ala Ile Leu Gln Gln Ile Asp Ala Val Tyr Gly Val Ser Ile His Val
145 150 155 160

Arg Arg Gly Asp Tyr Leu Lys Gly Ile Asn Ser Asn Leu Phe Gly Gly
165 170 175

Ile Ala Thr Leu Glu Tyr Tyr Arg Asn Ala Ile Gly Trp Ala Ile Thr
180 185 190

Tyr Cys Lys His Arg Ser Leu Glu Ile Lys Phe Tyr Val Phe Ser Asp
195 200 205

Asp Ile Asp Trp Cys Lys Gln Asn Leu Gly Leu Arg Asp Ala Val Tyr
210 215 220

Val Ser Gly Asn Ser Lys Thr Asp Ser Trp Lys Asp Ile Leu Leu Met
225 230 235 240

Ser His Cys Arg Ala Asn Ile Ile Ala Asn Ser Thr Phe Ser Trp Trp

245 250 255

Ala Ala Trp Leu Asn Gln Gln Pro Asn Lys Val Val Ile Cys Pro Thr
260 265 270

Lys Phe Ile Asn Thr Asp Ser Pro Asn Gln Thr Ile Tyr Pro Ala Ala
275 280 285

Trp His Gln Ile Glu Gly
290

<210> 256
<211> 299
<212> PRT
<213> Lachnospiraceae bacterium NK4A136

<400> 256

Met Ile Ile Val Arg Phe His Gly Gly Leu Gly Asn Gln Met Phe Glu
1 5 10 15

Tyr Ala Phe Tyr Arg Tyr Met Thr Asn Lys Tyr Gly Ala Asp Asn Val
20 25 30

Ile Gly Asp Met Thr Trp Phe Asp Arg Asn Tyr Ser Glu His Gln Gly
35 40 45

Tyr Glu Leu Lys Lys Val Phe Asp Ile Asp Ile Pro Ala Ile Asp Tyr
50 55 60

Lys Thr Leu Ala Lys Ile His Glu Tyr Tyr Pro Arg Tyr His Arg Phe
65 70 75 80

Ala Gly Leu Arg Tyr Leu Ser Arg Met Tyr Ala Lys Tyr Lys Asn Lys
85 90 95

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

Tyr Ile His Asn Asp Ala Phe Asp Lys Leu Asp Thr Asn Lys Asp Tyr
115 120 125

Tyr Ile Glu Gly Val Phe Cys Ser Asp Ala Tyr Ile Lys Tyr Tyr Glu
130 135 140

Asn Gln Ile Lys Lys Asp Leu Thr Phe Lys Pro Asn Tyr Ser Gln His
145 150 155 160

Thr Lys Asp Met Leu Pro Lys Ile Glu Glu Thr Asn Ser Val Ala Ile
165 170 175

His Val Arg Arg Gly Asp Tyr Val Gly Asn Val Phe Asp Ile Val Thr
180 185 190

```
Pro Asp Tyr Tyr Arg Gln Ala Val Asn Tyr Ile Arg Glu Arg Val Glu
        195                 200                 205

Asn Pro Val Phe Phe Val Phe Ser Asp Asp Met Asp Tyr Ile Lys Ala
    210                 215                 220

Asn Phe Asp Phe Leu Gly Asp Phe Val Pro Val His Asn Cys Gly Lys
225                 230                 235                 240

Asp Ser Phe Gln Asp Met Tyr Leu Ile Ser Arg Cys Arg His Met Ile
                245                 250                 255

Ile Ala Asn Ser Ser Phe Ser Tyr Phe Gly Ala Leu Leu Gly Glu Lys
            260                 265                 270

Asp Ser Thr Ile Val Ile Ala Pro Lys Lys Tyr Lys Ala Asp Glu Asp
        275                 280                 285

Leu Ala Leu Ala Arg Glu Asn Trp Val Leu Leu
    290                 295


<210>  257
<211>  290
<212>  PRT
<213>  Bacteroides coprophilus

<400>  257

Met Gly Phe Ile Val Asn Met Ala Cys Gly Leu Ala Asn Arg Met Phe
1               5                   10                  15

Gln Tyr Ser Tyr Tyr Leu Phe Leu Lys Lys Gln Gly Tyr Lys Val Thr
            20                  25                  30

Val Asp Phe Tyr Arg Ser Ala Lys Leu Ala His Glu Lys Val Ala Trp
        35                  40                  45

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

Val Phe Leu Trp Gly Gly Gly Ser Asp Leu Cys Ser Lys Val Arg Arg
65                  70                  75                  80

Arg Tyr Phe Pro Ser Ser Thr Asn Val Arg Thr Thr Thr Gly Ala Phe
                85                  90                  95

Asp Ala Ser Leu Pro Ala Asn Thr Ala Arg Asn Glu Tyr Ile Ile Gly
            100                 105                 110

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

```
Lys Cys Phe Thr Phe Leu Pro Phe Thr Asp Glu Met Asn Leu Arg Leu
    130                 135                 140

Lys Lys Glu Ile Glu Glu Cys Glu Ser Val Ala Ile His Val Arg Lys
145                 150                 155                 160

Gly Lys Asp Tyr Gln Ser Arg Ile Trp Tyr Gln Asn Thr Cys Ser Met
                165                 170                 175

Glu Tyr Tyr Arg Lys Ala Ile Leu Gln Met Lys Glu Lys Leu Gln His
            180                 185                 190

Ser Lys Phe Tyr Val Phe Thr Asp Asn Val Asp Trp Val Lys Glu Asn
        195                 200                 205

Phe Gln Glu Ile Asp Tyr Thr Leu Val Glu Gly Asn Pro Ala Asp Gly
    210                 215                 220

Tyr Gly Ser His Phe Asp Met Gln Leu Met Ser Leu Cys Lys His Asn
225                 230                 235                 240

Ile Ile Ser Asn Ser Thr Tyr Ser Trp Trp Ser Ala Phe Leu Asn Arg
                245                 250                 255

Asn Pro Glu Lys Val Val Ile Ala Pro Glu Ile Trp Phe Asn Pro Asp
            260                 265                 270

Ser Cys Asp Glu Phe Arg Ser Asp Arg Ala Leu Cys Lys Gly Trp Ile
        275                 280                 285

Val Leu
    290
```

<210> 258
<211> 265
<212> PRT
<213> Paraprevotella clara YIT 11840

<400> 258

```
Met Lys Ile Val Cys Leu Lys Gly Gly Leu Gly Asn Gln Met Phe Glu
1               5                   10                  15

Tyr Cys Arg Phe Arg Asp Leu Met Glu Ser Gly His Asp Glu Val Tyr
            20                  25                  30

Leu Phe Tyr Asp His Arg Arg Leu Lys Gln His Asn Gly Leu Arg Leu
        35                  40                  45

Ser Asp Cys Phe Glu Leu Glu Leu Pro Ser Cys Pro Trp Gly Ile Lys
    50                  55                  60
```

```
Leu Val Val Trp Gly Leu Lys Ile Cys Arg Ala Val Gly Val Leu Lys
65                  70                  75                  80

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

Ser Gln His Arg Arg Phe Ile Pro Asn Ala Arg Arg Tyr Phe Phe Phe
            100                 105                 110

Arg Gln Phe Leu Ala Glu Leu Gln Ser Gly Phe Val Gln Met Ile Arg
        115                 120                 125

Ala Val Asp Tyr Pro Val Ser Val His Val Arg Arg Gly Asp Tyr Leu
    130                 135                 140

His Pro Ser Asn Ser Ser Phe Gly Leu Cys Gly Val Asp Tyr Phe Gln
145                 150                 155                 160

Gln Ala Ile Ala Tyr Val Arg Lys Lys Arg Pro Asp Ala Arg Phe Phe
                165                 170                 175

Phe Phe Ser Asp Asp Met Glu Trp Val Arg Glu Asn Leu Trp Met Glu
            180                 185                 190

Asp Ala Val Tyr Val Glu His Thr Glu Leu Leu Pro Asp Tyr Val Asp
        195                 200                 205

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

Phe Ser Phe Trp Gly Ala Tyr Leu Ala Val Asp Gly Asn Gly Met Lys
225                 230                 235                 240

Ile Tyr Pro Arg Arg Trp Phe Arg Asp Pro Thr Trp Thr Ser Pro Pro
                245                 250                 255

Ile Phe Ser Glu Glu Trp Val Gly Leu
            260                 265
```

<210> 259
<211> 309
<212> PRT
<213> Butyrivibrio sp. NC2007

<400> 259

```
Met Leu Ile Ile Gln Ile Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                   10                  15

Tyr Ala Val Tyr Thr Lys Leu Arg Glu Met Gly Lys Asp Val Lys Leu
            20                  25                  30

Asp Leu Ser Trp Phe Asp Pro Gln Val Gln Lys Asn Met Leu Ala Pro
```

35 40 45

Arg Glu Phe Glu Leu Pro Ile Phe Gly Gly Thr Asp Tyr Glu Glu Cys
50 55 60

Ser Ala Tyr Glu Arg Asp Ala Leu Leu Lys Gln Gly Ala Phe Ala Ala
65 70 75 80

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

Pro Lys Val Phe Ser Glu Lys Glu Met Tyr His Pro Glu Val Phe Glu
100 105 110

Leu Glu Asp Lys Tyr Ile Lys Gly Tyr Phe Ala Cys Gln Lys Tyr Tyr
115 120 125

Gly Asp Ile Met Asp Lys Leu Gln Glu Lys Phe Ile Phe Pro Glu His
130 135 140

Ser Asp Pro Asp Leu His Ala Arg Asn Met Ala Leu Val Glu Arg Met
145 150 155 160

Glu Arg Glu Pro Ser Val Ser Val His Ile Arg Arg Gly Asp Tyr Leu
165 170 175

Asp Pro Ser Asn Val Glu Ile Leu Gly Asn Ile Ala Thr Glu Gln Tyr
180 185 190

Tyr Gln Gly Ala Met Asp Tyr Phe Thr Val Lys Glu Pro Asp Thr His
195 200 205

Phe Tyr Ile Phe Thr Ser Asp His Glu Tyr Ala Arg Glu Lys Phe Ser
210 215 220

Asp Glu Ser Lys Tyr Thr Ile Val Asp Trp Asn Asn Gly Lys Asn Ser
225 230 235 240

Val Gln Asp Leu Met Leu Met Ser His Cys Lys Gly Asn Ile Cys Ala
245 250 255

Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg Leu Asn Lys Arg Pro Asp
260 265 270

Lys Thr Val Ile Arg Thr Tyr Lys Met Arg Asn Asn Gln Pro Val Asn
275 280 285

Pro Gln Ile Met His Asp Tyr Trp Lys Gly Trp Ile Leu Met Asp Glu
290 295 300

Lys Gly Ser Ile Ile

305

<210> 260
<211> 273
<212> PRT
<213> Paraprevotella xylaniphila

<400> 260

Met Lys Ile Leu Val Phe Thr Gly Gly Leu Gly Asn Gln Met Phe Ala
1 5 10 15

Tyr Ala Phe Tyr Leu Tyr Leu Lys Arg Leu Phe Pro Gln Glu Arg Phe
20 25 30

Tyr Gly Leu Tyr Gly Lys Lys Leu Ser Glu His Tyr Gly Leu Glu Ile
35 40 45

Asp Lys Trp Phe Lys Val Ser Leu Pro Arg Gln Pro Trp Trp Val Leu
50 55 60

Pro Val Thr Gly Leu Phe Tyr Leu Tyr Lys Gln Cys Val Pro Asn Ser
65 70 75 80

Lys Trp Leu Asp Leu Asn Gln Glu Ile Cys Lys Asn Pro Arg Ala Ile
85 90 95

Val Phe Phe Pro Phe Lys Phe Thr Lys Lys Tyr Ile Pro Asp Asp Asn
100 105 110

Ile Trp Leu Glu Trp Lys Val Asp Glu Ser Gly Leu Ser Glu Lys Asn
115 120 125

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

Val Arg Arg Gly Asp Tyr Leu Ser Pro Thr Phe Lys Ser Leu Phe Glu
145 150 155 160

Gly Cys Cys Thr Leu Ser Tyr Tyr Gln Arg Ala Leu Lys Ser Met Lys
165 170 175

Glu Ile Ser Pro Phe Val Lys Phe Val Cys Phe Ser Asp Asp Ile Gln
180 185 190

Trp Val Lys Gln Asn Leu Glu Leu Gly Asn Arg Ala Val Phe Val Asp
195 200 205

Trp Asn Ser Gly Thr Asp Ser Pro Leu Asp Met Tyr Leu Met Ser Gln
210 215 220

Cys Arg Tyr Gly Ile Met Ala Asn Ser Thr Phe Ser Tyr Trp Gly Ala
225 230 235 240

```
Arg Leu Gly Arg Lys Lys Lys Arg Ile Tyr Tyr Pro Gln Lys Trp Trp
                245                 250                 255

Asn His Gly Thr Gly Leu Pro Asp Ile Phe Pro Asn Thr Trp Val Lys
            260                 265                 270

Ile
```

<210> 261
<211> 310
<212> PRT
<213> Blautia hydrogenotrophica DSM 10507

<400> 261

```
Met Glu Ile His Val Tyr Leu Thr Gly Arg Leu Gly Asn Gln Leu Phe
1               5                   10                  15

Gln Tyr Ala Phe Ala Arg His Leu Gln Lys Glu Tyr Gly Gly Lys Ile
            20                  25                  30

Ile Cys Asn Ile Tyr Glu Leu Glu His Arg Ser Glu Lys Ala Ala Trp
        35                  40                  45

Val Pro Gly Lys Phe Asn Tyr Glu Met Ser Asn Tyr Lys Leu Asn Asp
    50                  55                  60

Ser Ile Leu Ile Glu Asp Ile Lys Leu Pro Trp Phe Ala Asp Phe Ser
65                  70                  75                  80

Asn Pro Ile Ile Arg Ile Val Lys Lys Val Ile Pro Arg Ile Tyr Phe
                85                  90                  95

Asn Leu Met Ala Ser Lys Gly Tyr Leu Leu Trp Gln Lys Asn Ser Tyr
            100                 105                 110

Ile Asn Ile Pro Ala Ile Arg Asn Asn Glu Ile Ile Val Asn Gly Trp
        115                 120                 125

Trp Gln Asp Val Arg Phe Phe His Asp Val Glu Ala Glu Leu Ser Asn
    130                 135                 140

Glu Ile Val Pro Thr Thr Lys Pro Ile Ser Glu Asn Glu Tyr Leu Tyr
145                 150                 155                 160

Asn Ile Ala Glu Arg Glu Asn Ser Val Cys Val Ser Ile Arg Gly Gly
                165                 170                 175

Asn Tyr Leu Val Pro Lys Val Lys Lys Lys Leu Phe Val Cys Asp Lys
            180                 185                 190
```

```
Glu Tyr Phe Tyr Asn Ala Ile Glu Leu Ile Lys Ser Lys Val Arg Asn
        195                 200                 205

Ala Ile Phe Ile Val Phe Ser Asp Asp Leu Glu Trp Val Lys Ser Tyr
    210                 215                 220

Ile Lys Leu Glu Glu Lys Phe Pro Glu Cys Lys Phe Tyr Tyr Glu Ser
225                 230                 235                 240

Gly Lys Asp Thr Val Glu Glu Lys Leu Arg Met Met Thr Lys Cys Lys
                245                 250                 255

His Phe Ile Ile Ser Asn Ser Ser Phe Ser Trp Trp Ala Gln Tyr Leu
            260                 265                 270

Ala Lys Asn Glu Asn Lys Ile Val Ile Ala Pro Asp Ala Trp Phe Thr
        275                 280                 285

Asn Gly Asp Lys Asn Gly Leu Tyr Ile Asp Asp Trp Ile Leu Ile Pro
    290                 295                 300

Thr Gln Thr Lys Asp Met
305                 310
```

<210> 262
<211> 291
<212> PRT
<213> Geobacter lovleyi

<400> 262

```
Met Ile Thr Val Leu Leu Asn Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

Tyr Ala Ala Gly Arg Ala Leu Ala Glu Lys His Asp Val Glu Leu Leu
            20                  25                  30

Leu Asp Leu Ser Arg Leu Gln His Pro Lys Pro Gly Asp Thr Pro Arg
        35                  40                  45

Cys Phe Glu Leu Ala Pro Phe Asn Ile Lys Ala Ser Leu Leu Ala Glu
    50                  55                  60

Glu Gly Arg Gln Pro Leu Gly Ser Tyr Gln Ala Cys Met His Arg Leu
65                  70                  75                  80

Leu Leu Lys Ala Ser Ile Pro Leu Trp Gly Ser Ile Ile Leu Lys Glu
                85                  90                  95

Gln Gly Cys Gly Phe Asp Pro Leu Ile Phe Arg Ala Pro Ser Ser Cys
            100                 105                 110
```

```
Ile Leu Asp Gly Phe Trp Gln Ser Glu Cys Tyr Phe Lys Gln Ile Thr
        115                 120                 125

Ser Leu Leu Gln Gln Glu Leu Ser Leu Lys Ala Pro Ser Pro Ala Leu
    130                 135                 140

Arg Lys Ala Ser Ser Val Leu Ser Asp Ala Thr Val Ala Val His Val
145                 150                 155                 160

Arg Arg Gly Asp Tyr Val Thr Asn Pro Ala Ala Ala Ser Phe His Gly
                165                 170                 175

Ile Cys Ser Gln Asp Tyr Tyr Gln Ala Ala Val Ala Asn Ile Leu Thr
            180                 185                 190

Ser Tyr Pro Asp Ser Gln Phe Leu Val Phe Ser Asp Asp Pro Ala Trp
        195                 200                 205

Cys Gln Glu His Leu Asp Leu Gly Gln Pro Phe Arg Leu Ala Ala Asp
    210                 215                 220

Phe Gly Leu Asn Gly Ser Ala Glu Glu Leu Val Leu Ile Ser Arg Cys
225                 230                 235                 240

Ala His Gln Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala Trp
                245                 250                 255

Leu Asn Pro Ser Pro His Lys Leu Val Val Ala Pro Cys Arg Trp Phe
            260                 265                 270

Thr Asp Pro Ala Ile Thr Thr Asn Asp Leu Leu Pro Glu Thr Trp Val
        275                 280                 285

Arg Leu Pro
    290
```

<210> 263
<211> 290
<212> PRT
<213> Lachnospiraceae bacterium NK4A136

<400> 263

```
Met Val Ile Ser His Leu Ser Gly Gly Phe Gly Asn Gln Leu Tyr Ser
1               5                   10                  15

Tyr Ala Phe Ala Tyr Ala Val Ala Lys Ala Arg Lys Glu Glu Leu Trp
            20                  25                  30

Ile Asp Thr Ala Ile Gln Asp Ala Pro Trp Phe Phe Arg Asn Pro Asp
        35                  40                  45

Ile Leu Asn Leu Asn Ile Lys Tyr Asp Lys Arg Val Ser Tyr Lys Ile
```

50 55 60

Gly Glu Lys Lys Ile Asp Lys Ile Phe Asn Arg Ile Asn Phe Arg Asn
65 70 75 80

Ala Ile Gly Trp Asn Thr Lys Ile Ile Asn Glu Ser Asp Met Pro Asn
85 90 95

Ile Asp Asp Trp Phe Asp Thr Cys Val Asn Gln Lys Gly Asn Ile Tyr
100 105 110

Ile Lys Gly Asn Trp Ser Tyr Glu Lys Leu Phe Ile Ser Val Lys Gln
115 120 125

Glu Ile Ile Asp Met Phe Thr Phe Lys Asn Glu Leu Ser Lys Glu Ala
130 135 140

Asn Asp Ile Ala Gln Asp Ile Asn Ser Gln Glu Thr Ser Val Gly Ile
145 150 155 160

His Tyr Arg Leu Gly Asp Tyr Val Lys Ile Gly Ile Val Ile Asn Pro
165 170 175

Asp Tyr Phe Ile Ser Ala Met Thr Ser Met Val Glu Lys Tyr Gly Asn
180 185 190

Pro Val Phe Tyr Ser Phe Ser Glu Asp Asn Asp Trp Val Lys Lys Gln
195 200 205

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

Asp Lys Gly Leu Glu Asp Phe Arg Leu Tyr Ser Met Cys Lys His Gln
225 230 235 240

Ile Ala Ser Asn Ser Ser Tyr Ser Trp Trp Gly Ala Tyr Leu Asn Asn
245 250 255

Asn Pro Asn Lys Tyr Ile Ile Ala Pro Thr Asp Tyr Asn Gly Gly Trp
260 265 270

Lys Ser Glu Ile Tyr Pro Lys His Trp Asp Val Arg Pro Phe Glu Phe
275 280 285

Leu Lys
290

<210> 264
<211> 269
<212> PRT
<213> Bacteroides vulgatus

<400> 264

Met Phe His Tyr Lys Phe Leu Leu Phe Gly Gly Gly Leu Gly Asn Gln
1 5 10 15

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

Ile Val Phe Leu Gly Cys Tyr Arg Lys Ala Ser Phe Lys Ala His Asn
35 40 45

Gly Leu Glu Ile Ser Asp Val Phe Asp Val Asp Leu Pro Asn Asp Gly
50 55 60

Gly Leu Ser Gly Arg Phe Ile Ser Tyr Val Leu Ser Val Leu Ser Arg
65 70 75 80

Ile Ile Pro Ser Leu Ser Met Lys Ala Asn Thr Glu Tyr Ser Ser Lys
85 90 95

Tyr Leu Leu Ile Asn Ala Tyr Gln Pro Asn Leu Leu Phe Tyr Leu Asn
100 105 110

Glu Glu Lys Ile Lys Phe Arg Pro Phe Lys Leu Asp Glu Val Asn Arg
115 120 125

Arg Leu Leu Asn Ser Ile Lys Met Glu Ser Ser Val Ser Ile His Val
130 135 140

Arg Arg Gly Asp Tyr Leu Phe Gly Gln Tyr Arg Asp Ile Tyr Ser Asn
145 150 155 160

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

Ile Leu Glu Ser Pro Arg Phe Phe Val Phe Ser Asp Asp Ile Glu Trp
180 185 190

Ala Arg Asp Val Phe Val Gly Arg Glu Tyr Glu Phe Val Ser Asn Asn
195 200 205

Ile Gly Lys Asn Ser Phe Ile Asp Met Phe Leu Met Ser Asn Cys Lys
210 215 220

Ile Gln Ile Ile Ala Asn Ser Thr Phe Ser Tyr Trp Ala Ala Tyr Leu
225 230 235 240

Ser Asn Ser Leu Val Lys Ile Tyr Pro Ala Lys Trp Ile Asn Gly Ile
245 250 255

Glu Arg Pro Asn Ile Phe Pro Asp Asn Trp Ile Gly Leu
260 265

<210> 265
<211> 287
<212> PRT
<213> Planctomyces brasiliensis

<400> 265

```
Met Ile Ile Ala Arg Ile Glu Asn Gly Leu Gly Asn Gln Leu Phe Lys
1               5                   10                  15

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

Thr Ile Pro Gly Ser Val Arg Lys Pro His Glu Thr Phe Ile Leu Ser
        35                  40                  45

Lys Tyr Phe Asn Val Gln Ala Lys Ser Val Ser Pro Phe Leu Leu Gln
    50                  55                  60

Thr Gly Phe Arg Leu Arg Leu Leu Lys Gly Tyr Glu Asn His Ser Phe
65                  70                  75                  80

Gly Phe Asp Pro Arg Phe Glu Thr Thr Arg Asn Asn Thr Val Val Ser
                85                  90                  95

Gly Asn Phe Gln Ser Ala Arg Tyr Phe Leu Pro Phe Phe Asp Gln Ile
            100                 105                 110

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

Val Tyr Pro His Val Leu Glu Ser Leu Arg Thr Pro Asn Ser Val Cys
    130                 135                 140

Val His Ile Arg Leu Gly Asp Tyr Val Ser Ser Gly Tyr Asp Ile Cys
145                 150                 155                 160

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

Gly Glu Leu Arg Ala Phe Val Phe Ser Asp Thr Pro Gln Ala Ala Ser
            180                 185                 190

Arg Phe Leu Pro Ala Asp Ile Asp Ala Gln Ile Met Ser Glu Phe Pro
        195                 200                 205

Glu Val Arg Asp Ala Ala Arg Ser Leu Thr Val Glu Arg Ser Thr Ile
    210                 215                 220

Arg Asp Tyr Phe Leu Met Gln Gln Cys Arg His Phe Val Ile Pro Asn
225                 230                 235                 240
```

```
Ser Ser Phe Ser Tyr Trp Ala Ala Leu Leu Ser Ser Ser Asp Gly Asp
                245                 250                 255

Val Ile Tyr Pro Asn Arg Trp Tyr Ile Asp Ile Asp Thr Ser Pro Arg
            260                 265                 270

Asp Leu Gly Leu Ala Pro Ala Glu Trp Thr Pro Ile Pro Leu Thr
        275                 280                 285
```

<210> 266
<211> 309
<212> PRT
<213> Butyrivibrio sp. AE2015

<400> 266

```
Met Ile Ile Leu Gln Ile Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                   10                  15

Tyr Ala Leu Tyr Arg Lys Leu Leu Lys Cys Gly Lys Thr Val Lys Leu
            20                  25                  30

Asp Leu Ser Trp Phe Gly Pro Glu Ile Gln Lys Asn Met Leu Ala Pro
        35                  40                  45

Arg Glu Phe Glu Leu Val Leu Phe Lys Asp Leu Pro Phe Glu Ile Cys
    50                  55                  60

Thr Lys Glu Glu Lys Asp Ala Leu Ile Lys Gln Asn Leu Phe Gln Lys
65                  70                  75                  80

Ile Ala Gly Lys Val Ser Gln Lys Leu Gly Lys Ser Ala Ser Ser Asn
                85                  90                  95

Ala Lys Val Phe Val Glu Thr Lys Met Tyr His Glu Glu Ile Phe Asp
            100                 105                 110

Leu Asp Asp Val Tyr Ile Thr Gly Tyr Phe Ala Cys Gln Tyr Tyr Tyr
        115                 120                 125

Asp Asp Val Met Ala Glu Leu Gln Asp Leu Phe Val Phe Pro Ser His
    130                 135                 140

Ser Ile Pro Glu Leu Asp Gln Arg Asn Ala Val Leu Ala Ser Lys Met
145                 150                 155                 160

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

Ser Pro Glu Asn Val Gly Ile Leu Gly Asn Ile Ala Ser Asp Lys Tyr
            180                 185                 190
```

```
Tyr Glu Ser Ala Met Asn Tyr Phe Leu Glu Lys Asp Glu Asn Thr His
        195                 200                 205

Phe Tyr Ile Phe Thr Asn Asp His Glu Tyr Ala Arg Glu His Tyr Ser
    210                 215                 220

Asp Glu Ser Arg Tyr Thr Ile Ile Asp Trp Asn Thr Gly Lys Asn Ser
225                 230                 235                 240

Leu Gln Asp Leu Met Leu Met Ser His Cys Lys Gly Asn Ile Cys Ala
                245                 250                 255

Asn Ser Thr Phe Ser Phe Trp Gly Ala Arg Leu Asn Lys Arg Pro Asp
            260                 265                 270

Arg Glu Leu Val Arg Thr Leu Lys Met Arg Asn Asn Gln Glu Ala Gln
        275                 280                 285

Pro Glu Ile Met His Glu Tyr Trp Lys Asn Trp Ile Leu Ile Asp Glu
    290                 295                 300

Asn Gly Val Ile Val
305
```

<210> 267
<211> 291
<212> PRT
<213> Roseovarius nubinhibens

<400> 267

```
Met Thr Asp Thr Pro Pro Pro Ser Gln Val Ile Thr Ser Arg Leu Phe
1               5                   10                  15

Gly Gly Ala Gly Asn Gln Leu Phe Gln Tyr Ala Ala Gly Arg Ala Leu
            20                  25                  30

Ala Asp Arg Leu Gly Cys Asp Leu Met Ile Asp Ala Arg Tyr Val Ala
        35                  40                  45

Gly Ser Arg Asp Arg Gly Asp Cys Phe Thr His Phe Ala Lys Ala Arg
    50                  55                  60

Leu Arg Arg Asp Val Ala Leu Pro Pro Ala Lys Ser Asp Gly Pro Leu
65                  70                  75                  80

Arg Tyr Ala Leu Trp Arg Lys Phe Gly Arg Ser Pro Arg Phe His Arg
                85                  90                  95

Glu Arg Gly Leu Gly Val Asp Pro Glu Phe Phe Asn Leu Pro Arg Gly
            100                 105                 110

Thr Tyr Leu His Gly Tyr Trp Gln Ser Glu Gln Tyr Phe Gly Pro Asp
```

115 120 125

Thr Asp Ala Leu Arg Arg Asp Leu Thr Leu Thr Thr Ala Leu Asp Ala
130 135 140

Pro Asn Ala Ala Met Ala Ala Gln Ile Asp Ala Ala Pro Cys Pro Val
145 150 155 160

Ser Phe His Val Arg Arg Gly Asp Tyr Ile Ala Ala Gly Ala Tyr Ala
165 170 175

Ala Cys Thr Pro Asp Tyr Tyr Arg Ala Ala Ala Asp His Leu Ala Thr
180 185 190

Thr Leu Gly Lys Pro Leu Thr Cys Phe Ile Phe Ser Asn Asp Pro Ala
195 200 205

Trp Ala Arg Asp Asn Leu Asp Leu Gly Gln Asp Gln Val Ile Val Asp
210 215 220

Leu Asn Asp Glu Ala Thr Gly His Phe Asp Met Ala Leu Met Ala Arg
225 230 235 240

Cys Ala His His Val Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala
245 250 255

Trp Leu Asn Pro Asp Pro Asp Lys Leu Val Val Ala Pro Arg Asn Trp
260 265 270

Phe Ala Thr Gln Ala Leu His Asn Pro Asp Leu Ile Pro Glu Gln Trp
275 280 285

His Arg Leu
290

<210> 268
<211> 300
<212> PRT
<213> Eubacterium sp. CAG:581

<400> 268

Met Ile Glu Val Asn Ile Val Gly Gln Leu Gly Asn Gln Met Phe Glu
1 5 10 15

Tyr Ala Cys Ala Arg Gln Leu Gln Lys Lys Tyr Gly Gly Glu Ile Val
20 25 30

Leu Asn Thr Tyr Glu Met Arg Lys Glu Thr Pro Asn Phe Lys Leu Ser
35 40 45

Ile Leu Asp Tyr Lys Leu Ser Glu Asn Val Lys Ile Ile Ser Asp Lys
50 55 60

```
Pro Leu Ser Ser Ala Asn Ala Asn Asn Tyr Leu Val Lys Ile Met Arg
65                  70                  75                  80

Gln Tyr Phe Pro Asn Trp Tyr Phe Asn Phe Met Ala Lys Arg Gly Thr
                85                  90                  95

Phe Val Trp Lys Ser Ala Arg Lys Tyr Lys Glu Leu Pro Glu Leu Asn
            100                 105                 110

Glu Gln Leu Ser Lys His Ile Val Leu Asn Gly Tyr Trp Gln Cys Asp
        115                 120                 125

Lys Tyr Phe Asn Asp Val Val Asp Thr Ile Arg Glu Asp Phe Thr Pro
    130                 135                 140

Lys Tyr Pro Leu Lys Ala Glu Asn Glu Gln Leu Leu Glu Lys Ile Lys
145                 150                 155                 160

Ser Thr Glu Ser Val Cys Val Thr Ile Arg Arg Gly Asp Phe Met Asn
                165                 170                 175

Glu Lys Asn Lys Asp Thr Phe Tyr Ile Cys Asp Asp Asp Tyr Phe Asn
            180                 185                 190

Lys Ala Leu Ser Lys Ile Lys Glu Leu Cys Pro Asp Cys Thr Phe Phe
        195                 200                 205

Gly Phe Ser Asp Asp Val Glu Trp Ile Lys Lys Asn Val Asn Phe Pro
    210                 215                 220

Gly Glu Val Tyr Phe Glu Ser Gly Asn Asp Pro Val Trp Glu Lys Leu
225                 230                 235                 240

Arg Leu Met Ser Ala Cys Lys His Phe Val Leu Ser Asn Ser Ser Phe
                245                 250                 255

Ser Trp Trp Ala Gln Tyr Leu Ser Asp Asn Asn Asn Lys Ile Val Val
            260                 265                 270

Ala Pro Asp Ile Trp Tyr Lys Thr Gly Asp Pro Lys Lys Thr Ala Leu
        275                 280                 285

Tyr Gln Asp Gly Trp Asn Leu Ile His Ile Gly Asp
    290                 295                 300
```

<210> 269
<211> 303
<212> PRT
<213> Providencia alcalifaciens

<400> 269

```
Met Lys Ile Asn Gly Lys Glu Ser Ser Met Lys Ile Lys Gln Lys Lys
1               5                   10                  15

Ile Ile Ser His Leu Ile Gly Gly Leu Gly Asn Gln Leu Phe Gln Tyr
            20                  25                  30

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

Asp Asp Arg Leu Phe Lys Lys Tyr Lys Leu His Gly Gly Tyr Arg Leu
    50                  55                  60

Asp Lys Leu Asn Ile Ile Gly Glu Lys Ile Ser Ser Ile Asp Lys Leu
65                  70                  75                  80

Leu Phe Pro Leu Ile Leu Cys Lys Leu Ser Gln Lys Glu Asn Phe Ile
                85                  90                  95

Phe Lys Ser Thr Lys Lys Phe Ile Leu Glu Lys Lys Thr Ser Ser Phe
            100                 105                 110

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

Tyr Trp Gln Asn Ala Ile Tyr Phe Gln Lys Tyr Phe Ser Glu Leu Lys
    130                 135                 140

Glu Met Phe Val Pro Leu Asp Ile Ser Gln Glu Gln Leu Asp Leu Ser
145                 150                 155                 160

Ile Gln Ile His Ala Gln Gln Ser Val Ala Leu His Val Arg Arg Gly
                165                 170                 175

Asp Tyr Ile Ser Asn Lys Asn Ala Leu Ala Met His Gly Ile Cys Ser
            180                 185                 190

Ile Asp Tyr Tyr Lys Asn Ser Ile Gln His Ile Asn Ala Lys Leu Glu
        195                 200                 205

Lys Pro Phe Phe Tyr Ile Phe Ser Asn Asp Lys Leu Trp Cys Glu Glu
    210                 215                 220

Asn Leu Thr Pro Leu Phe Asp Gly Asn Phe His Ile Val Glu Asn Asn
225                 230                 235                 240

Ser Gln Glu Ile Asp Leu Trp Leu Ile Ser Gln Cys Gln His His Ile
                245                 250                 255

Ile Ala Asn Ser Thr Phe Ser Trp Trp Gly Ala Trp Leu Ala Asn Ser
            260                 265                 270
```

```
Asp Ser Gln Ile Val Ile Thr Pro Asp Pro Trp Phe Asn Lys Glu Ile
        275                 280                 285


Asp Ile Pro Ser Pro Val Leu Ser His Trp Leu Lys Leu Lys Lys
    290                 295                 300


<210>  270
<211>  301
<212>  PRT
<213>  Salmonella enterica

<400>  270

Met Phe Ser Cys Leu Ser Gly Gly Leu Gly Asn Gln Met Phe Gln Tyr
1               5                   10                  15


Ser Ala Ala Tyr Ile Leu Lys Lys Asn Ile Cys His Ala Gln Leu Ile
            20                  25                  30


Ile Asp Asp Ser Tyr Phe Tyr Cys Gln Pro Gln Lys Asp Thr Pro Arg
        35                  40                  45


Asn Phe Glu Ile Asn Gln Phe Asn Ile Val Phe Asp Arg Val Thr Thr
    50                  55                  60


Asp Glu Glu Lys Arg Ala Ile Ser Lys Leu Arg Lys Phe Lys Lys Ile
65                  70                  75                  80


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


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


Gln Phe Thr Val Lys Met Asn Ala Cys Leu Phe Ser Leu Tyr Gln Asp
        115                 120                 125


Ser Ser Leu Ile Asn Lys Tyr Arg Asp Leu Ile Leu Pro Leu Phe Thr
    130                 135                 140


Ile Asn Asp Glu Leu Leu Gln Val Cys Gln Gln Leu Asp Ser Tyr Gly
145                 150                 155                 160


Phe Ile Cys Glu His Thr Asn Thr Thr Ser Leu His Ile Arg Arg Gly
                165                 170                 175


Asp Tyr Val Thr Asn Pro His Ala Ala Lys Phe His Gly Thr Leu Ser
            180                 185                 190


Met Asn Tyr Tyr Ser Gln Ala Met Asn Tyr Val Asp His Lys Leu Gly
        195                 200                 205
```

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

Lys Phe Gly Gly Arg Ser Asp Cys Tyr Ile Val Asn Asn Val Asn Cys
225                 230                 235                 240

Gln Phe Ser Ala Ile Asp Met Tyr Leu Met Ser Leu Cys Asn Asn Asn
                245                 250                 255

Ile Ile Ala Asn Ser Thr Tyr Ser Trp Trp Gly Ala Trp Leu Asn Lys
            260                 265                 270

Ser Glu Glu Lys Leu Val Ile Ala Pro Arg Lys Trp Phe Ala Glu Asp
        275                 280                 285

Lys Glu Ser Leu Leu Ala Val Asn Asp Trp Ile Ser Ile
    290                 295                 300
```

<210> 271
<211> 289
<212> PRT
<213> Sulfurospirillum deleyianum

<400> 271

```
Met Ile Ile Ile Lys Ile Met Gly Gly Leu Ala Ser Gln Leu His Lys
1               5                   10                  15

Tyr Ser Val Gly Arg Ala Leu Ser Leu Lys Tyr Asn Thr Glu Leu Lys
            20                  25                  30

Leu Asp Ile Phe Trp Phe Asp Asn Ile Ser Gly Ser Asp Thr Ile Arg
        35                  40                  45

Glu Tyr His Leu Asp Lys Tyr Asn Val Val Ala Lys Ile Ala Thr Glu
    50                  55                  60

Gln Glu Ile Lys Gln Phe Lys Pro Asn Lys Tyr Leu Leu Lys Ile Asn
65                  70                  75                  80

Asn Leu Phe Gln Lys Phe Thr Asn Trp Lys Ile Asn Tyr Arg Asn Tyr
                85                  90                  95

Cys Asn Glu Ser Phe Ile Ser Leu Glu Asn Phe Asn Leu Leu Pro Asp
            100                 105                 110

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

Ile Lys Glu Ile Leu Gln Lys Glu Leu Thr Leu Lys Ser Glu Tyr Met
    130                 135                 140

Asp Ser Thr Asn His Phe Leu Ala Lys Gln Ser Ser Asp Phe Ala His
```

145 150 155 160

Asp Asp Asn Ala Ser Lys Leu His Cys Thr Cys Ser Leu Glu Tyr Tyr
165 170 175

Lys Lys Ala Leu Gln Tyr Ile Ser Lys Asn Leu Leu Lys Met Lys Leu
180 185 190

Leu Ile Phe Ser Asp Asp Leu Asp Trp Leu Lys Pro Asn Phe Asn Phe
195 200 205

Leu Asp Asn Val Glu Phe Glu Phe Val Glu Gly Phe Gln Asp Tyr Glu
210 215 220

Glu Phe His Leu Met Thr Leu Ser Lys His Asn Ile Ile Ala Asn Ser
225 230 235 240

Gly Phe Ser Leu Phe Phe Ala Trp Leu Asn Ile Asn His Asn Lys Ile
245 250 255

Ile Ile Ser Leu Ser Glu Trp Val Phe Glu Glu Lys Leu Asn Lys Tyr
260 265 270

Ile Ile Asp Asn Ile Lys Asp Lys Asn Ile Leu Phe Leu Glu Asn Leu
275 280 285

Glu

<210> 272
<211> 309
<212> PRT
<213> Pseudovibrio sp. FO-BEG1

<400> 272

Met Ser Val Ala Ser Gln Val Arg Ile Ser Gly Ala Ala Arg Arg Arg
1 5 10 15

Lys Leu Lys Pro Thr Leu Ile Val Arg Ile Arg Gly Gly Ile Gly Asn
20 25 30

Gln Leu Phe Gln Tyr Ala Leu Gly Arg Lys Ile Ala Leu Glu Thr Gly
35 40 45

Met Lys Leu Arg Phe Asp Arg Ser Glu Tyr Asp Gln Tyr Phe Asn Arg
50 55 60

Ser Tyr Cys Leu Asn Leu Phe Lys Thr Gln Gly Leu Ser Ala Thr Glu
65 70 75 80

Ser Glu Met Ser Ala Val Leu Trp Pro Ala Gln Ser Phe Gly Gln Thr
85 90 95

```
Val Lys Leu Cys Arg Lys Phe Tyr Pro Phe Tyr Gln Arg Arg Tyr Ile
            100                 105                 110

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

Ser Ala Tyr Leu Asp Gly Tyr Trp Gln Thr Trp Glu Ile Pro Phe Ser
    130                 135                 140

Ile Met Glu Gln Leu Arg Asp Glu Ile Thr Leu Lys Lys Pro Met Val
145                 150                 155                 160

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

Ala Leu His Val Arg Tyr Gly Asp Tyr Ser Gln Ala His Asn Leu Gln
            180                 185                 190

Asn Phe Gly Leu Cys Ser Ala Gly Tyr Tyr Lys Gly Ala Met Asp Phe
        195                 200                 205

Leu Thr Glu Arg Val Pro Gly Leu Thr Phe Tyr Val Phe Ser Asp Ser
    210                 215                 220

Pro Glu Arg Ala Arg Glu Val Val Pro Gln Gln Glu Asn Val Tyr Phe
225                 230                 235                 240

Ser Asp Pro Met Gln Asp Gly Lys Asp His Glu Asp Leu Met Val Met
                245                 250                 255

Ser Ser Cys Asp His Ile Val Thr Ala Asn Ser Thr Phe Ser Trp Trp
            260                 265                 270

Ala Ala Phe Leu Asn Gly Asn Glu Asp Lys His Val Ile Ala Pro Leu
        275                 280                 285

Lys Trp Phe Lys Asn Pro Asn Leu Asp Asp Ser Leu Ile Val Pro Pro
    290                 295                 300

His Trp Gln Arg Leu
305
```

<210> 273
<211> 264
<212> PRT
<213> Prevotella sp. oral taxon 472

<400> 273

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Met Lys Ile Val Cys Ile Lys Gly Gly Leu Gly Asn Gln Leu Phe Glu
1               5                   10                  15
```

```
Tyr Cys Arg Tyr His Gly Leu Leu Arg Gln His Asn Asn His Gly Val
            20                  25                  30

Tyr Leu His Tyr Asp Arg Arg Arg Thr Lys Gln His Gly Gly Val Trp
        35                  40                  45

Leu Asp Lys Ala Phe Leu Ile Thr Leu Pro Thr Glu Pro Trp Arg Val
    50                  55                  60

Lys Leu Met Val Met Ala Leu Lys Met Leu Arg Lys Leu His Leu Phe
65                  70                  75                  80

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

Tyr Ser Gln His Lys Gln Phe Ile Thr Asn Ala Ala Glu Ile Leu Asn
            100                 105                 110

Phe Arg Pro Phe Ala Gln Leu Asp Tyr Val Asp Glu Ile Thr Ser Glu
        115                 120                 125

Pro Phe Ala Val Ser Val His Val Arg Arg Gly Asp Tyr Leu Leu Pro
    130                 135                 140

Ala Asn Lys Ala Asn Phe Gly Val Cys Ser Val His Tyr Tyr Leu Ser
145                 150                 155                 160

Ala Ala Val Ala Val Arg Glu Arg His Pro Asp Ala Arg Phe Phe Val
                165                 170                 175

Phe Ser Asp Asp Ile Glu Trp Ala Lys Met Asn Leu Asn Leu Pro Asn
            180                 185                 190

Cys Val Phe Val Glu His Ala Gln Pro Gln Pro Asp His Ala Asp Leu
        195                 200                 205

Tyr Leu Met Ser Leu Cys Lys Gly His Ile Ile Ala Asn Ser Thr Phe
    210                 215                 220

Ser Phe Trp Gly Ala Tyr Leu Ser Met Gly Ser Ser Ala Ile Ala Ile
225                 230                 235                 240

Tyr Pro Lys Gln Trp Phe Ala Glu Pro Thr Trp Asn Ala Pro Asp Ile
                245                 250                 255

Phe Leu Gly His Trp Ile Ala Leu
            260

<210>  274
<211>  304
<212>  PRT
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<213> Butyrivibrio fibrisolvens

<400> 274

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Met Leu Ile Ile Arg Val Ala Gly Gly Leu Gly Asn Gln Met Gln Gln
1               5                  10                  15

Tyr Ala Met Tyr Arg Lys Leu Lys Ser Leu Gly Lys Glu Val Lys Leu
            20                  25                  30

Asp Leu Ser Trp Phe Asp Val Glu Asn Gln Glu Gly Gln Leu Ala Pro
        35                  40                  45

Arg Lys Cys Glu Leu Lys Tyr Phe Asp Gly Val Asp Phe Glu Glu Cys
    50                  55                  60

Thr Asp Ala Glu Arg Ala Tyr Phe Thr Lys Arg Ser Ile Leu Thr Lys
65                  70                  75                  80

Ala Leu Asn Lys Val Phe Pro Ala Thr Cys Lys Ile Phe Glu Glu Thr
                85                  90                  95

Glu Met Phe His Pro Glu Ile Tyr Ser Phe Lys Asp Lys Tyr Leu Glu
            100                 105                 110

Gly Tyr Phe Leu Cys Asn Lys Tyr Tyr Asp Asp Ile Leu Pro Phe Ile
        115                 120                 125

Gln Asn Glu Ile Val Phe Pro Lys His Ser Asp Pro Lys Met Gln Lys
    130                 135                 140

Arg Asn Glu Glu Leu Met Glu Arg Met Asp Gly Trp His Thr Ala Ser
145                 150                 155                 160

Ile His Leu Arg Arg Gly Asp Tyr Ile Thr Glu Pro Gln Asn Glu Ala
                165                 170                 175

Leu Phe Gly Asn Ile Ala Thr Asp Ala Tyr Tyr Asp Ala Ala Ile Arg
            180                 185                 190

Tyr Val Leu Asp Lys Asp Tyr Gln Thr His Phe Tyr Ile Phe Ser Asn
        195                 200                 205

Asp Pro Glu Tyr Ala Arg Glu His Tyr Ser Asp Glu Ser Arg Tyr Thr
    210                 215                 220

Ile Val Thr Gly Asn Asp Gly Asp Asn Ser Leu Leu Asp Met Glu Leu
225                 230                 235                 240

Met Ser His Cys Arg Tyr Asn Ile Cys Ala Asn Ser Thr Phe Ser Phe
                245                 250                 255
```

Trp Gly Ala Arg Leu Asn Lys Arg Ser Asp Lys Glu Met Ile Arg Thr
260 265 270

Phe Lys Met Arg Asn Asn Gln Glu Val Thr Ala Arg Glu Met Thr Asp
275 280 285

Tyr Trp Lys Asp Trp Ile Leu Ile Asp Glu Lys Gly Asn Arg Ile Phe
290 295 300

<210> 275
<211> 294
<212> PRT
<213> Lewinella persica

<400> 275

Met Val Ile Ser Arg Leu His Ser Gly Leu Gly Asn Gln Met Phe Gln
1 5 10 15

Tyr Ala Phe Ala Arg Arg Ile Gln Leu Gln Leu Asn Val Lys Leu Arg
20 25 30

Ile Asp Leu Ser Ile Leu Leu Asp Ser Arg Pro Pro Asp Gly Tyr Ile
35 40 45

Lys Arg Glu Tyr Asp Leu Asp Ile Phe Lys Leu Ser Pro Ala Tyr His
50 55 60

Cys Asn Pro Thr Ser Leu Arg Ile Leu Tyr Ala Pro Gly Lys Tyr Arg
65 70 75 80

Trp Ser Gln Val Val Arg Asp Leu Ala Arg Lys Gly Tyr Pro Val Tyr
85 90 95

Met Glu Lys Ser Phe Ser Val Asp Asn Thr Leu Leu Asp Ser Pro Pro
100 105 110

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

Glu Val Ala Asn Thr Ile Arg Lys Asp Phe Ala Phe Gln His Ser Ile
130 135 140

Gln Pro Gln Ser Glu Ser Leu Ala Arg Glu Ile Arg Lys Glu Asp Ser
145 150 155 160

Val Cys Leu Asn Ile Arg Arg Lys Asp Tyr Leu Ala Ser Pro Thr His
165 170 175

Asn Val Thr Asp Glu Thr Tyr Tyr Glu Asn Cys Ile Gln Gln Met Arg
180 185 190

Glu Arg Phe Ser Gly Ala Arg Phe Phe Leu Phe Ser Asp Asp Leu Val

195 200 205

Trp Cys Arg Glu Phe Phe Ala Asp Phe His Asp Val Val Ile Val Gly
210 215 220

His Asp His Ala Gly Pro Lys Phe Gly Asn Tyr Leu Gln Leu Met Ala
225 230 235 240

Gln Cys His His Tyr Ile Ile Pro Asn Ser Thr Phe Ala Trp Trp Ala
245 250 255

Ala Trp Leu Gly Glu Arg Thr Gly Ser Val Ile Met Ala Pro Glu Arg
260 265 270

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

Trp Leu Lys Val Pro Asn
290

<210> 276
<211> 916
<212> DNA
<213> Artificial Sequence

<220>
<223> artifical construct

<400> 276
cagtcagtca gaattcaaga aggagatata catatgaaaa tcgtcaaaat cctgggcggt 60

ctgggcaatc agatgttcca gtatgctctg tacctgagcc tgcaagaaag ttttccaaaa 120

gaacgtgtgg ccctggacct gtcctccttc cacggctatc acctgcataa tggctttgag 180

ctggagaaca ttttctccgt taccgctcag aaagcatccg ccgcagatat catgcgtatt 240

gcttattact acccgaacta tctgctgtgg cgcattggca aacgttttct gccgcgtcgt 300

aaaggtatgt gcctggaatc tagctccctg cgtttcgatg aaagcgttct gcgtcaggaa 360

ggtaaccgtt attttgacgg ttactggcaa gacgaacgct acttcgcagc ctatcgtgaa 420

aaagtgctga aggctttcac ctttcctgca ttcaaacgcg cagaaaacct gagcctgctg 480

gaaaaactgg acgaaaacag cattgctctg catgttcgtc gcggtgatta cgtaggtaat 540

aacctgtacc aaggcatctg tgacctggac tactaccgta ccgctatcga gaaaatgtgt 600

gcacacgtta ctccgtctct gttttgtatc ttttccaacg acatcacgtg gtgccagcag 660

cacctgcaac cgtacctgaa ggcccctgtg gtgtacgtta cttggaacac cggtgttgaa 720

tcctaccgcg atatgcagct gatgtcctgc tgcgcacata acatcatcgc gaatagctcc 780

ttctcttggt ggggtgcttg gctgaatcag aaccgtgaaa aagttgttat cgccccgaaa 840

aaatggctga acatggaaga atgtcacttc acgctgccgg caagctggat caaaatttag 900

ctcgagtgac tgactg 916

<210> 277
<211> 886
<212> DNA
<213> Artificial Sequence

<220>
<223> artifical construct

<400> 277
cagtcagtca gaattcaaga aggagatata catatggtga ttatcaaaat gatgggtggt 60

ctgggcaacc agatgttcca gtacgcactg tacaaagcat tcgagcagaa gcacatcgat 120

gtgtatgcag acctggcatg gtacaaaaac aaatccgtga aatttgaact gtacaacttc 180

ggcattaaaa tcaacgtagc atccgagaaa gacatcaacc gtctgagcga ttgccaggcg 240

gactttgttt cccgcatccg ccgtaaaatc tttggtaaaa aaaagagctt cgtatctgaa 300

aaaaatgact cctgctatga aaacgacatc ctgcgtatgg acaacgttta tctgagcggt 360

tattggcaga ccgaaaaata cttctctaac acgcgtgaga agctgctgga ggattattcc 420

ttcgctctgg taaactctca ggtgtccgaa tgggaagact ccattcgcaa caaaaacagc 480

gttagcatcc atatccgtcg tggtgattat ctacagggcg aactgtatgg tggtatttgc 540

acctctctgt actacgccga agcaatcgag tacattaaaa tgcgtgttcc gaacgcaaaa 600

ttcttcgttt tctctgatga cgttgaatgg gttaaacagc aagaagactt caaaggcttc 660

gtaatcgttg atcgcaacga gtattctagc gctctgtccg atatgtacct gatgtccctg 720

tgcaagcata acattattgc taactcctct ttcagctggt gggcagcttg gctgaaccgt 780

aacgaagaaa aaattgtaat cgcgccgcgc cgttggctga acggcaagtg caccccagat 840

atctggtgta aaaaatggat tcgtatctag ctcgagtgac tgactg 886

<210> 278
<211> 919
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 278

Cys Ala Gly Thr Cys Ala Gly Thr Cys Ala Gly Ala Ala Thr Thr Cys
1 5 10 15

Ala Ala Gly Ala Ala Gly Gly Ala Gly Ala Thr Ala Thr Ala Cys Ala
20 25 30

Thr Ala Thr Gly Gly Thr Gly Ala Thr Cys Gly Thr Ala Cys Ala Gly
35 40 45

Cys Thr Gly Ala Gly Cys Gly Gly Cys Gly Gly Thr Cys Thr Gly Gly
50 55 60

Gly Cys Ala Ala Cys Cys Ala Gly Ala Thr Gly Thr Thr Cys Gly Ala

65 70 75 80

Ala Thr Ala Cys Gly Cys Gly Cys Thr Gly Thr Ala Cys Cys Thr Gly
85 90 95

Ala Gly Cys Cys Thr Gly Ala Ala Ala Gly Cys Ala Ala Ala Ala Gly
100 105 110

Gly Cys Ala Ala Ala Gly Ala Ala Gly Thr Gly Ala Ala Ala Ala Thr
115 120 125

Thr Gly Ala Cys Gly Ala Thr Gly Thr Thr Ala Cys Gly Thr Gly Thr
130 135 140

Thr Ala Cys Gly Ala Gly Gly Gly Cys Cys Cys Thr Gly Gly Cys Ala
145 150 155 160

Cys Cys Cys Gly Thr Cys Cys Gly Cys Gly Thr Cys Ala Ala Cys Thr
165 170 175

Gly Gly Ala Thr Gly Thr Thr Thr Thr Thr Gly Gly Thr Ala Thr Cys
180 185 190

Ala Cys Gly Thr Ala Cys Gly Ala Thr Cys Gly Cys Gly Cys Gly Thr
195 200 205

Cys Thr Cys Gly Thr Gly Ala Gly Gly Ala Gly Cys Thr Gly Ala Cys
210 215 220

Thr Gly Ala Gly Ala Thr Gly Ala Cys Gly Gly Ala Cys Gly Cys Gly
225 230 235 240

Ala Gly Cys Ala Thr Gly Gly Ala Thr Gly Cys Gly Cys Thr Gly Thr
245 250 255

Cys Thr Cys Gly Thr Gly Thr Thr Cys Gly Thr Cys Gly Cys Ala Ala
260 265 270

Ala Cys Thr Gly Ala Cys Cys Gly Gly Thr Cys Gly Cys Cys Gly Cys
275 280 285

Ala Cys Thr Ala Ala Ala Gly Cys Gly Thr Ala Cys Cys Gly Cys Gly
290 295 300

Ala Ala Cys Gly Cys Gly Ala Cys Ala Thr Cys Ala Ala Cys Thr Thr
305 310 315 320

Cys Gly Ala Thr Cys Cys Ala Cys Thr Gly Gly Thr Thr Ala Thr Gly
325 330 335

Gly Ala Ala Ala Ala Ala Gly Ala Cys Cys Cys Gly Gly Cys Ala Cys

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            340                 345                 350

Thr Gly Cys Thr Gly Gly Ala Ala Gly Gly Cys Thr Gly Thr Thr Thr
        355                 360                 365

Cys Cys Ala Gly Thr Cys Thr Gly Ala Cys Ala Ala Ala Thr Ala Cys
    370                 375                 380

Thr Thr Thr Cys Gly Thr Gly Ala Thr Thr Gly Cys Gly Ala Ala Gly
385                 390                 395                 400

Gly Cys Cys Gly Cys Gly Thr Gly Cys Gly Cys Gly Ala Ala Gly Cys
                405                 410                 415

Gly Thr Ala Thr Cys Gly Thr Thr Thr Cys Cys Gly Cys Gly Gly Cys
            420                 425                 430

Ala Thr Thr Gly Ala Ala Thr Cys Cys Gly Gly Cys Gly Cys Gly Thr
        435                 440                 445

Thr Cys Cys Cys Gly Cys Thr Gly Cys Cys Gly Gly Ala Ala Gly Ala
    450                 455                 460

Cys Thr Ala Thr Cys Thr Gly Cys Gly Cys Cys Thr Gly Gly Ala Ala
465                 470                 475                 480

Ala Ala Gly Cys Ala Gly Ala Thr Cys Gly Ala Ala Gly Ala Thr Thr
                485                 490                 495

Gly Thr Cys Ala Gly Thr Cys Cys Gly Thr Ala Thr Cys Cys Gly Thr
            500                 505                 510

Ala Cys Ala Cys Ala Thr Cys Cys Gly Thr Cys Gly Thr Gly Gly Cys
        515                 520                 525

Gly Ala Cys Thr Ala Cys Cys Thr Gly Gly Ala Cys Gly Ala Ala Thr
    530                 535                 540

Cys Thr Cys Ala Thr Gly Gly Thr Gly Gly Thr Cys Thr Gly Thr Ala
545                 550                 555                 560

Cys Ala Cys Cys Gly Gly Cys Ala Thr Thr Thr Gly Thr Ala Cys Thr
                565                 570                 575

Gly Ala Gly Gly Cys Gly Thr Ala Cys Thr Ala Thr Ala Ala Ala Gly
            580                 585                 590

Ala Gly Gly Cys Thr Thr Thr Thr Gly Cys Thr Cys Gly Cys Ala Thr
        595                 600                 605

Gly Gly Ala Ala Cys Gly Thr Cys Thr Gly Gly Thr Thr Cys Cys Gly
```

610 615 620

Gly Gly Cys Gly Cys Ala Cys Gly Thr Thr Thr Cys Thr Thr Cys Cys
625 630 635 640

Thr Gly Thr Thr Cys Thr Cys Thr Ala Ala Cys Gly Ala Thr Cys Cys
645 650 655

Ala Gly Ala Ala Thr Gly Gly Ala Cys Thr Cys Gly Thr Gly Ala Gly
660 665 670

Cys Ala Cys Thr Thr Thr Gly Ala Gly Ala Gly Cys Ala Ala Gly Ala
675 680 685

Ala Cys Thr Gly Cys Gly Thr Thr Cys Thr Gly Gly Thr Thr Gly Ala
690 695 700

Ala Gly Gly Thr Ala Gly Cys Ala Cys Cys Gly Ala Ala Gly Ala Cys
705 710 715 720

Ala Cys Gly Gly Gly Thr Thr Ala Cys Ala Thr Gly Gly Ala Cys Cys
725 730 735

Thr Gly Thr Ala Cys Cys Thr Gly Ala Thr Gly Ala Gly Cys Cys Gly
740 745 750

Cys Thr Gly Cys Cys Gly Cys Cys Ala Cys Ala Ala Thr Ala Thr Thr
755 760 765

Ala Thr Thr Gly Cys Cys Ala Ala Cys Thr Cys Thr Thr Cys Thr Thr
770 775 780

Thr Cys Ala Gly Cys Thr Gly Gly Thr Gly Gly Gly Gly Cys Gly Cys
785 790 795 800

Thr Thr Gly Gly Cys Thr Gly Ala Ala Thr Gly Ala Gly Ala Ala Cys
805 810 815

Cys Cys Thr Gly Ala Gly Ala Ala Ala Ala Ala Ala Gly Thr Cys Ala
820 825 830

Thr Cys Gly Cys Ala Cys Cys Gly Gly Cys Thr Ala Ala Ala Thr Gly
835 840 845

Gly Cys Thr Gly Ala Ala Cys Gly Gly Thr Cys Gly Thr Gly Ala Gly
850 855 860

Thr Gly Cys Cys Gly Thr Gly Ala Thr Ala Thr Cys Thr Ala Thr Ala
865 870 875 880

Cys Cys Gly Ala Ala Cys Gly Cys Ala Thr Gly Ala Thr Thr Cys Gly

885 890 895

Thr Cys Thr Gly Thr Ala Gly Cys Thr Cys Gly Ala Gly Thr Gly Ala
900 905 910

Cys Thr Gly Ala Cys Thr Gly
915

<210> 279
<211> 937
<212> PRT
<213> Artificial Sequence

<220>
<223> artifical construct

<400> 279

Cys Ala Gly Thr Cys Ala Gly Thr Cys Ala Gly Ala Ala Thr Thr Cys
1 5 10 15

Ala Ala Gly Ala Ala Gly Gly Ala Gly Ala Thr Ala Thr Ala Cys Ala
20 25 30

Thr Ala Thr Gly Ala Thr Cys Ala Thr Thr Gly Thr Thr Cys Gly Thr
35 40 45

Cys Thr Gly Ala Ala Ala Gly Gly Cys Gly Gly Thr Cys Thr Gly Gly
50 55 60

Gly Cys Ala Ala Cys Cys Ala Ala Cys Thr Gly Thr Cys Thr Cys Ala
65 70 75 80

Gly Thr Ala Thr Gly Cys Ala Cys Thr Gly Gly Gly Cys Cys Gly Thr
85 90 95

Ala Ala Gly Ala Thr Cys Gly Cys Gly Cys Ala Thr Cys Thr Gly Cys
100 105 110

Ala Cys Ala Ala Thr Ala Cys Cys Gly Ala Ala Cys Thr Gly Ala Ala
115 120 125

Ala Cys Thr Gly Gly Ala Cys Ala Cys Cys Ala Cys Thr Thr Gly Gly
130 135 140

Thr Thr Cys Ala Cys Cys Ala Cys Thr Ala Thr Cys Thr Cys Cys Thr
145 150 155 160

Cys Cys Gly Ala Cys Ala Cys Thr Cys Cys Ala Cys Gly Thr Ala Cys
165 170 175

Cys Thr Ala Cys Cys Gly Thr Cys Thr Gly Ala Ala Cys Ala Ala Thr
180 185 190

```
Thr Ala Thr Ala Ala Cys Ala Thr Cys Ala Thr Cys Gly Gly Cys Ala
        195                 200                 205

Cys Thr Ala Thr Thr Gly Cys Ala Thr Cys Cys Gly Cys Ala Ala Ala
    210                 215                 220

Gly Gly Ala Ala Ala Thr Cys Cys Ala Gly Cys Thr Gly Ala Thr Cys
225                 230                 235                 240

Gly Ala Ala Cys Gly Thr Gly Gly Thr Cys Gly Cys Gly Cys Gly Cys
                245                 250                 255

Ala Ala Gly Gly Cys Cys Gly Thr Gly Gly Cys Thr Ala Cys Cys Thr
            260                 265                 270

Gly Cys Thr Gly Thr Cys Thr Ala Ala Ala Ala Thr Thr Thr Cys Thr
        275                 280                 285

Gly Ala Thr Cys Thr Gly Cys Thr Gly Ala Cys Thr Cys Cys Gly Ala
    290                 295                 300

Thr Gly Thr Ala Cys Cys Gly Thr Cys Gly Thr Ala Cys Cys Thr Ala
305                 310                 315                 320

Cys Gly Thr Cys Cys Gly Thr Gly Ala Ala Cys Gly Thr Ala Thr Gly
                325                 330                 335

Cys Ala Thr Ala Cys Cys Thr Thr Cys Gly Ala Thr Ala Ala Ala Gly
            340                 345                 350

Cys Thr Ala Thr Cys Cys Thr Gly Ala Cys Cys Gly Thr Thr Cys Cys
        355                 360                 365

Gly Gly Ala Cys Ala Ala Cys Gly Thr Gly Thr Ala Cys Cys Thr Gly
    370                 375                 380

Gly Ala Thr Gly Gly Thr Thr Ala Cys Thr Gly Gly Cys Ala Gly Ala
385                 390                 395                 400

Cys Cys Gly Ala Ala Ala Ala Gly Thr Ala Cys Thr Thr Cys Ala Ala
                405                 410                 415

Ala Gly Ala Cys Ala Thr Cys Gly Ala Ala Gly Ala Ala Ala Thr Cys
            420                 425                 430

Cys Thr Gly Cys Gly Cys Cys Gly Thr Gly Ala Gly Gly Thr Thr Ala
        435                 440                 445

Cys Gly Cys Thr Gly Ala Ala Ala Gly Ala Thr Gly Ala Ala Cys Cys
    450                 455                 460
```

```
Gly Gly Ala Thr Ala Gly Cys Ala Thr Cys Ala Ala Cys Cys Thr Gly
465                 470                 475                 480

Gly Ala Ala Ala Thr Gly Gly Cys Thr Gly Ala Ala Cys Gly Thr Ala
                485                 490                 495

Thr Thr Cys Ala Gly Gly Cys Thr Thr Gly Cys Cys Ala Cys Ala Gly
            500                 505                 510

Cys Gly Thr Thr Thr Cys Cys Cys Thr Gly Cys Ala Cys Gly Thr Gly
        515                 520                 525

Cys Gly Thr Cys Gly Thr Gly Gly Cys Gly Ala Cys Thr Ala Cys Gly
    530                 535                 540

Thr Thr Thr Cys Cys Ala Ala Cys Cys Cys Gly Ala Cys Cys Ala Cys
545                 550                 555                 560

Thr Cys Ala Ala Cys Ala Ala Thr Thr Cys Cys Ala Cys Gly Gly Cys
                565                 570                 575

Thr Gly Thr Thr Gly Cys Thr Cys Cys Ala Thr Thr Gly Ala Cys Thr
            580                 585                 590

Ala Cys Thr Ala Cys Ala Ala Cys Cys Gly Cys Gly Cys Thr Ala Thr
        595                 600                 605

Cys Thr Cys Thr Cys Thr Gly Ala Thr Thr Gly Ala Ala Gly Ala Ala
    610                 615                 620

Ala Ala Ala Gly Thr Gly Gly Ala Thr Gly Ala Cys Cys Cys Gly Thr
625                 630                 635                 640

Cys Thr Thr Thr Cys Thr Thr Thr Ala Thr Thr Thr Thr Thr Thr Cys
                645                 650                 655

Thr Gly Ala Cys Gly Ala Thr Cys Thr Gly Cys Cys Gly Thr Gly Gly
            660                 665                 670

Gly Cys Thr Ala Ala Ala Gly Ala Ala Ala Ala Cys Cys Thr Gly Gly
        675                 680                 685

Ala Cys Ala Thr Cys Cys Cys Thr Gly Gly Cys Gly Ala Ala Ala Ala
    690                 695                 700

Ala Ala Cys Cys Thr Thr Cys Gly Thr Thr Gly Cys Gly Cys Ala Thr
705                 710                 715                 720

Ala Ala Cys Gly Gly Cys Cys Cys Gly Gly Ala Ala Ala Ala Ala Gly
                725                 730                 735
```

```
Ala Gly Thr Ala Thr Thr Gly Cys Gly Ala Thr Cys Thr Gly Thr Gly
            740                 745                 750

Gly Cys Thr Gly Ala Thr Gly Thr Cys Thr Cys Thr Gly Thr Gly Cys
        755                 760                 765

Cys Ala Gly Cys Ala Cys Cys Ala Thr Ala Thr Cys Ala Thr Cys Gly
    770                 775                 780

Cys Ala Ala Ala Cys Thr Cys Thr Thr Cys Thr Thr Thr Cys Ala Gly
785                 790                 795                 800

Cys Thr Gly Gly Thr Gly Gly Gly Gly Thr Gly Cys Cys Thr Gly Gly
                805                 810                 815

Cys Thr Gly Gly Gly Thr Cys Ala Ala Gly Ala Cys Gly Cys Cys Gly
            820                 825                 830

Ala Ala Ala Ala Gly Ala Thr Gly Gly Thr Gly Ala Thr Cys Gly Cys
        835                 840                 845

Gly Cys Cys Gly Cys Gly Thr Cys Gly Cys Thr Gly Gly Gly Cys Cys
    850                 855                 860

Cys Thr Gly Thr Cys Cys Gly Ala Gly Ala Gly Cys Thr Thr Thr Gly
865                 870                 875                 880

Ala Cys Ala Cys Thr Thr Cys Thr Gly Ala Cys Ala Thr Cys Ala Thr
                885                 890                 895

Thr Cys Cys Gly Gly Ala Cys Thr Cys Thr Thr Gly Gly Ala Thr Thr
            900                 905                 910

Ala Cys Thr Ala Thr Cys Thr Ala Gly Cys Thr Cys Gly Ala Gly Thr
        915                 920                 925

Gly Ala Cys Thr Gly Ala Cys Thr Gly
    930                 935


<210>  280
<211>  913
<212>  DNA
<213>  Artificial Sequence

<220>
<223>  artifical construct

<400>  280
cagtcagtca gaattcaaga aggagatata catatggtac gcattgtgga aatcatcggc       60

ggtctgggta accagatgtt ccagtacgca ttctccctgt acctgaaaaa caaatctcac      120

atctgggacc gtctgtatgt ggacatcgag gcgatgaaaa cctacgatcg tcactatggt      180
```

ctggaactgg agaaagtttt caatctgagc ctgtgtccaa tctctaaccg tctgcaccgc 240

aacctgcaaa aacgctcctt cgcaaaacac tttgtaaaga gcctgtacga gcactctgaa 300

tgcgagttcg acgaaccggt gtaccgtggc ctgcgtcctt atcgctatta tcgcggctac 360

tggcaaaacg aaggttactt cgttgatatt gaaccgatga tccgtgaggc ttttcagttc 420

aacgttaaca tcctgagcaa aaagactaaa gcgatcgcat ccaaaatgcg ccgtgaactg 480

tccgtatcta tccatgttcg ccgtggtgat tacgaaaacc tgccggaagc gaaagcgatg 540

catggcggta tttgttctct ggactattac cacaaagcga tcgacttcat ccgccagcgt 600

ctggataata acatctgttt ctatctgttc tccgacgata tcaattgggt agaagaaaac 660

ctgcaactgg aaaaccgttg catcatcgac tggaaccagg gcgaagatag ctggcaggac 720

atgtacctga tgagctgctg ccgccaccac attatcgcaa acagctcttt ctcctggtgg 780

gcggcatggc tgaatccaaa caagaacaaa atcgtactga ccccgaacaa atggttcaac 840

catactgacg cagtgggtat cgtcccaaag tcctggatta aaattcctgt gttttagctc 900

gagtgactga ctg 913

<210> 281
<211> 919
<212> DNA
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 281
cagtcagtca gaattcaaga aggagatata catatgaaaa tcgttaaaat cctgggcggc 60

ctgggtaacc agatgtttca gtacgccctg ttcctgtctc tgaaagaacg cttcccgcat 120

gaacaggtga tgattgacac cagctgcttc cgcaattacc cactgcacaa cggtttcgaa 180

gtggatcgta tcttcgccca gaaagcaccg gttgcctctt ggcgtaacat cctgaaggtt 240

gcctacccgt acccgaacta ccgtttctgg aaaatcggta aatacatcct gcctaaacgt 300

aaaaccatgt gtgtagagcg taaaaacttc agctttgacg ccgcagtcct gacccgtaaa 360

ggcgattgct actatgatgg ctactggcag catgaggaat atttctgtga tatgaaagaa 420

acgatttggg aggctttctc cttccctgag ccggttgatg gtcgtaacaa ggagatcggt 480

gccctgctac aggcatctga tagcgcttcc ctgcacgttc gtcgcggtga ctacgtgaac 540

cacccactgt ttcgtggtat ttgtgacctg gactattata aacgtgccat ccactacatg 600

gaagaacgcg tcaacccaca gctgtactgc gttttcagca acgatatggc ctggtgcgag 660

tcccacctgc gtgcactgct gccaggcaaa gaagtagttt atgttgactg gaacaagggt 720

gcggaatctt acgttgatat gcgtctgatg agcctgtgcc gtcacaacat catcgctaac 780

tcttctttca gctggtgggg cgcatggctg aaccgtaacc cgcagaaagt ggtggtagcg 840

ccggaacgtt ggatgaacag cccgattgaa gacccagtga gcgacaaatg gattaaactg 900

tagctcgagt gactgactg 919

<210> 282
<211> 922
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 282

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Cys Ala Gly Thr Cys Ala Gly Thr Cys Ala Gly Ala Ala Thr Thr Cys
1               5                  10                  15

Ala Ala Gly Ala Ala Gly Gly Ala Gly Ala Thr Ala Thr Ala Cys Ala
            20                  25                  30

Thr Ala Thr Gly Ala Thr Cys Ala Thr Cys Ala Thr Cys Cys Ala Gly
        35                  40                  45

Cys Thr Gly Ala Ala Ala Gly Gly Thr Gly Gly Cys Cys Thr Gly Gly
    50                  55                  60

Gly Cys Ala Ala Cys Cys Ala Ala Ala Thr Gly Thr Thr Cys Cys Ala
65                  70                  75                  80

Gly Thr Ala Cys Gly Cys Gly Cys Thr Gly Thr Ala Cys Ala Ala Ala
                85                  90                  95

Thr Cys Cys Cys Thr Gly Ala Ala Ala Ala Ala Ala Cys Gly Thr Gly
            100                 105                 110

Gly Thr Ala Ala Ala Gly Ala Ala Gly Thr Thr Ala Ala Ala Ala Thr
        115                 120                 125

Thr Gly Ala Thr Gly Ala Cys Ala Ala Ala Ala Cys Thr Gly Gly Cys
    130                 135                 140

Thr Thr Cys Gly Thr Gly Ala Ala Cys Gly Ala Cys Ala Ala Ala Cys
145                 150                 155                 160

Thr Gly Cys Gly Thr Ala Thr Cys Cys Cys Gly Gly Thr Ala Cys Thr
                165                 170                 175

Gly Thr Cys Cys Cys Gly Thr Thr Gly Gly Gly Gly Thr Gly Thr Thr
            180                 185                 190

Gly Ala Gly Thr Ala Cys Gly Ala Thr Cys Gly Thr Gly Cys Ala Ala
        195                 200                 205

Cys Cys Gly Ala Cys Gly Ala Ala Gly Ala Gly Ala Thr Thr Ala Thr
    210                 215                 220

Thr Ala Ala Cys Cys Thr Gly Ala Cys Cys Gly Ala Cys Thr Cys Cys
```

225 230 235 240

Ala Ala Ala Ala Thr Gly Gly Ala Cys Cys Thr Gly Thr Thr Cys Thr
245 250 255

Cys Thr Cys Gly Cys Ala Thr Cys Cys Gly Cys Cys Gly Thr Ala Ala
260 265 270

Ala Cys Thr Gly Ala Cys Thr Gly Gly Cys Cys Gly Cys Ala Ala Ala
275 280 285

Ala Cys Gly Thr Thr Cys Cys Gly Thr Ala Thr Cys Gly Ala Cys Gly
290 295 300

Ala Ala Gly Ala Ala Thr Cys Cys Gly Gly Thr Ala Ala Ala Thr Thr
305 310 315 320

Cys Ala Ala Cys Cys Cys Gly Gly Ala Ala Ala Thr Cys Cys Thr Gly
325 330 335

Gly Ala Ala Ala Ala Ala Gly Ala Gly Ala Ala Cys Gly Cys Thr Thr
340 345 350

Ala Thr Cys Thr Gly Gly Thr Gly Gly Gly Thr Thr Ala Thr Thr Gly
355 360 365

Gly Cys Ala Gly Thr Gly Cys Gly Ala Cys Ala Ala Gly Thr Ala Cys
370 375 380

Thr Thr Cys Gly Ala Cys Gly Ala Cys Ala Ala Ala Gly Ala Thr Gly
385 390 395 400

Thr Gly Gly Thr Thr Cys Gly Cys Gly Ala Ala Ala Thr Thr Cys Gly
405 410 415

Thr Gly Ala Ala Gly Cys Gly Thr Thr Cys Gly Ala Gly Ala Ala Ala
420 425 430

Ala Ala Ala Cys Cys Gly Cys Ala Gly Gly Ala Gly Cys Thr Gly Ala
435 440 445

Thr Gly Ala Cys Cys Gly Ala Cys Gly Cys Cys Ala Gly Cys Thr Cys
450 455 460

Thr Thr Gly Gly Thr Cys Thr Ala Cys Thr Cys Thr Ala Cys Ala Gly
465 470 475 480

Cys Ala Gly Ala Thr Thr Gly Ala Ala Thr Gly Cys Thr Gly Cys Gly
485 490 495

Ala Gly Thr Cys Cys Gly Thr Ala Thr Cys Cys Cys Thr Gly Cys Ala

500 505 510

Cys Gly Thr Ala Cys Gly Thr Cys Gly Thr Ala Cys Thr Gly Ala Thr
515 520 525

Thr Ala Cys Gly Thr Gly Gly Ala Cys Gly Ala Gly Gly Ala Ala Cys
530 535 540

Ala Thr Ala Thr Thr Cys Ala Thr Ala Thr Cys Cys Ala Thr Ala Ala
545 550 555 560

Cys Ala Thr Cys Thr Gly Thr Ala Cys Gly Gly Ala Ala Ala Ala Ala
565 570 575

Thr Ala Cys Thr Ala Thr Ala Ala Ala Ala Ala Cys Gly Cys Cys Ala
580 585 590

Thr Thr Gly Ala Thr Cys Gly Thr Gly Thr Gly Cys Gly Thr Ala Ala
595 600 605

Ala Cys Ala Gly Thr Ala Cys Cys Cys Gly Ala Gly Cys Gly Cys Ala
610 615 620

Gly Thr Gly Thr Thr Cys Thr Thr Cys Ala Thr Cys Thr Thr Cys Ala
625 630 635 640

Cys Cys Gly Ala Thr Gly Ala Thr Ala Ala Ala Gly Ala Ala Thr Gly
645 650 655

Gly Thr Gly Cys Cys Gly Cys Gly Ala Cys Cys Ala Cys Thr Thr Thr
660 665 670

Ala Ala Ala Gly Gly Thr Cys Cys Gly Ala Ala Cys Thr Thr Cys Ala
675 680 685

Thr Cys Gly Thr Ala Gly Thr Cys Gly Ala Ala Cys Thr Gly Gly Ala
690 695 700

Ala Gly Ala Ala Gly Gly Cys Gly Ala Cys Gly Gly Thr Ala Cys Cys
705 710 715 720

Gly Ala Cys Ala Thr Cys Gly Cys Thr Gly Ala Ala Ala Thr Gly Ala
725 730 735

Cys Thr Cys Thr Gly Ala Thr Gly Thr Cys Cys Cys Gly Cys Thr Gly
740 745 750

Thr Ala Ala Ala Cys Ala Thr Cys Ala Cys Ala Thr Cys Ala Thr Cys
755 760 765

Gly Cys Thr Ala Ala Thr Thr Cys Thr Ala Gly Cys Thr Thr Thr Ala

770 775 780

Gly Cys Thr Gly Gly Thr Gly Gly Gly Cys Gly Gly Cys Gly Thr Gly
785 790 795 800

Gly Cys Thr Gly Ala Ala Cys Gly Ala Cys Thr Cys Cys Cys Cys Gly
805 810 815

Gly Ala Ala Ala Ala Ala Ala Thr Cys Gly Thr Gly Ala Thr Cys Gly
820 825 830

Cys Thr Cys Cys Thr Cys Ala Gly Ala Ala Ala Thr Gly Gly Ala Thr
835 840 845

Thr Ala Ala Cys Ala Ala Cys Cys Gly Cys Gly Ala Cys Ala Thr Gly
850 855 860

Gly Ala Cys Gly Ala Thr Ala Thr Thr Thr Ala Cys Ala Cys Cys Gly
865 870 875 880

Ala Gly Cys Gly Thr Ala Thr Gly Ala Cys Thr Ala Ala Ala Ala Thr
885 890 895

Cys Gly Cys Ala Cys Thr Gly Thr Ala Gly Cys Thr Cys Gly Ala Gly
900 905 910

Thr Gly Ala Cys Thr Gly Ala Cys Thr Gly
915 920

<210> 283
<211> 898
<212> DNA
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 283
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gttcgtatcg acctgaccga tatgatgcac tacaacgtac actatggcta cgaactgcac 180

aaagttttcg gtctgccgcg caccgagttc tgtatgaacc agcctctgaa aaaggttctg 240

gagttcctgt tcttccgtac cattgttgaa cgtaaacagc acggtcgtat ggagccgtat 300

acttgccagt atgtttggcc gctggtttac tttaagggct tctatcagtc cgaacgttac 360

ttctccgaag ttaaggacga agttcgtgag tgtttcacct tcaatccggc actggcgaat 420

cgttcttccc aacagatgat ggaacagatc cagaatgatc ctcaggctgt ctctatccac 480

atccgtcgtg gcgactatct gaatccgaag cactacgaca ctatcggttg tatctgtcag 540

ctgccgtatt acaagcacgc cgtttccgaa attaaaaagt acgtttctaa ccctcacttt 600

tacgttttct ccgaagacct ggattgggtc aaagcaaacc tgccgctgga aaacgcacag 660

tacatcgatt ggaacaaagg cgcagatagc tggcaggata tgatgctgat gagctgttgc 720

aaacaccaca ttatctgtaa ctccaccttt agctggtggg cggcgtggct gaacccatct 780

gtcgaaaaaa ccgtgatcat gccggaacag tggacgtctc gtcaagattc cgtggacttt 840

gtggctagct gtggccgttg ggtccgtgtt aaaacggagt agctcgagtg actgactg 898

<210> 284
<211> 895
<212> DNA
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 284
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ctgggtaacc agatgtttat ctacgcgttc tacctgaaaa tgaaacacca ttacccggat 120

acgaacatcg atctgtctga catggttcat tataaagttc acaacggtta tgagatgaac 180

cgtatctttg acctgagcca gactgaattt tgcatcaacc gtaccctgaa aaaaatcctg 240

gagttcctgt tcttcaaaaa aatctacgaa cgtcgccagg acccgtctac tctgtatcca 300

tacgaaaaac gttatttttg gccgctgctg tactttaaag gtttctacca gtctgaacgc 360

ttcttcttcg atatcaaaga cgacgttcgt aaagccttct cttttaacct gaacatcgct 420

aacccggaaa gcctggaact gctgaaacag atcgaagttg acgaccaagc tgtttctatc 480

cacatccgcc gtggtgacta cctgctgccg cgtcactggg caaacacggg ttccgtgtgc 540

cagctgccgt attacaagaa cgcgatcgcg gaaatggaga accgtattac tggcccgagc 600

tactacgtgt tctctgatga tatctcttgg gttaaagaaa acatcccgct gaagaaagcg 660

gtctacgtga cgtggaacaa gggcgaagac agctggcagg atatgatgct gatgagccac 720

tgtcgtcacc acattatctg taattctacg ttctcctggt ggggtgcttg gctgaaccca 780

cgtaaagaga aaatcgtcat cgcgccgtgt cgctggttcc agcataaaga aaccccggac 840

atgtacccga aagaatggat caaagtaccg attaactagc tcgagtgact gactg 895

<210> 285
<211> 946
<212> PRT
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 285

Cys Ala Gly Thr Cys Ala Gly Thr Cys Ala Gly Ala Ala Thr Thr Cys
1 5 10 15

Ala Ala Gly Ala Ala Gly Gly Ala Gly Ala Thr Ala Thr Ala Cys Ala
20 25 30

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Thr Ala Thr Gly Thr Ala Thr Thr Cys Thr Thr Gly Cys Cys Thr Gly
        35                  40                  45

Thr Cys Thr Gly Gly Thr Gly Gly Cys Cys Thr Gly Gly Gly Thr Ala
    50                  55                  60

Ala Cys Cys Ala Ala Ala Thr Gly Thr Thr Thr Cys Ala Ala Thr Ala
65                  70                  75                  80

Cys Gly Cys Ala Gly Cys Ala Gly Cys Gly Thr Ala Thr Ala Thr Cys
                85                  90                  95

Cys Thr Gly Ala Ala Gly Cys Ala Gly Thr Ala Thr Thr Thr Thr Cys
            100                 105                 110

Ala Gly Thr Cys Thr Ala Cys Cys Ala Cys Thr Cys Thr Gly Gly Thr
        115                 120                 125

Cys Cys Thr Gly Gly Ala Thr Gly Ala Thr Ala Gly Cys Thr Ala Thr
    130                 135                 140

Thr Ala Cys Thr Ala Thr Thr Cys Cys Cys Ala Gly Cys Cys Gly Ala
145                 150                 155                 160

Ala Ala Cys Gly Thr Gly Ala Thr Ala Cys Cys Gly Thr Thr Cys Gly
                165                 170                 175

Thr Ala Gly Cys Cys Thr Gly Gly Ala Ala Cys Thr Gly Ala Ala Thr
            180                 185                 190

Cys Ala Gly Thr Thr Cys Ala Ala Cys Ala Thr Cys Thr Cys Thr Thr
        195                 200                 205

Ala Thr Gly Ala Thr Cys Gly Thr Thr Thr Thr Ala Gly Cys Thr Thr
    210                 215                 220

Cys Gly Cys Gly Gly Ala Thr Gly Ala Ala Ala Ala Ala Gly Ala Gly
225                 230                 235                 240

Ala Ala Gly Ala Thr Cys Ala Ala Ala Cys Thr Gly Cys Thr Gly Cys
                245                 250                 255

Gly Cys Ala Ala Ala Thr Thr Cys Ala Ala Ala Cys Gly Thr Ala Ala
            260                 265                 270

Cys Cys Cys Gly Thr Thr Cys Cys Cys Thr Ala Ala Ala Cys Ala Gly
        275                 280                 285

Ala Thr Thr Thr Cys Cys Gly Ala Gly Ala Thr Cys Cys Thr Gly Thr
    290                 295                 300
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Cys Thr Ala Thr Thr Gly Cys Gly Cys Thr Gly Thr Thr Cys Gly Gly
305                 310                 315                 320

Cys Ala Ala Ala Thr Ala Cys Gly Cys Gly Cys Thr Gly Thr Cys Cys
                325                 330                 335

Gly Ala Cys Cys Gly Thr Gly Cys Ala Thr Thr Thr Thr Ala Cys Ala
            340                 345                 350

Cys Cys Thr Thr Cys Gly Ala Ala Ala Cys Thr Ala Thr Cys Ala Ala
        355                 360                 365

Ala Ala Ala Cys Ala Thr Cys Gly Ala Cys Ala Ala Ala Gly Cys Gly
    370                 375                 380

Thr Gly Cys Cys Thr Gly Thr Thr Cys Thr Cys Cys Thr Thr Thr Thr
385                 390                 395                 400

Ala Cys Cys Ala Gly Gly Ala Cys Gly Cys Cys Gly Ala Thr Cys Thr
                405                 410                 415

Gly Cys Thr Gly Ala Ala Thr Ala Ala Ala Thr Ala Thr Ala Ala Gly
            420                 425                 430

Cys Ala Gly Cys Thr Gly Ala Thr Cys Cys Thr Gly Cys Cys Gly Cys
        435                 440                 445

Thr Gly Thr Thr Cys Gly Ala Ala Cys Thr Gly Cys Gly Cys Gly Ala
    450                 455                 460

Thr Gly Ala Cys Cys Thr Gly Cys Thr Gly Gly Ala Thr Ala Thr Cys
465                 470                 475                 480

Thr Gly Cys Ala Ala Gly Ala Ala Cys Cys Thr Gly Gly Ala Ala Cys
                485                 490                 495

Thr Gly Thr Ala Thr Thr Cys Cys Cys Thr Gly Ala Thr Cys Cys Ala
            500                 505                 510

Ala Cys Gly Cys Ala Gly Cys Ala Ala Cys Ala Ala Thr Ala Cys Cys
        515                 520                 525

Ala Cys Thr Gly Cys Ala Cys Thr Gly Cys Ala Thr Ala Thr Cys Cys
    530                 535                 540

Gly Cys Cys Gly Thr Gly Gly Cys Gly Ala Cys Thr Ala Cys Gly Thr
545                 550                 555                 560

Gly Ala Cys Cys Ala Ala Cys Cys Ala Gly Cys Ala Cys Gly Cys Cys
                565                 570                 575
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Gly Cys Gly Ala Ala Ala Thr Ala Cys Cys Ala Cys Gly Gly Cys Gly
            580                 585                 590

Thr Gly Cys Thr Gly Gly Ala Cys Ala Thr Cys Ala Gly Cys Thr Ala
        595                 600                 605

Cys Thr Ala Thr Ala Ala Cys Cys Ala Cys Gly Cys Ala Ala Thr Gly
    610                 615                 620

Gly Ala Ala Thr Ala Cys Gly Thr Gly Gly Ala Ala Cys Gly Thr Gly
625                 630                 635                 640

Ala Ala Cys Gly Cys Gly Gly Cys Ala Ala Ala Cys Ala Gly Ala Ala
                645                 650                 655

Cys Thr Thr Cys Ala Thr Thr Ala Thr Cys Thr Thr Cys Ala Gly Cys
            660                 665                 670

Gly Ala Thr Gly Ala Thr Gly Thr Ala Cys Gly Thr Thr Gly Gly Gly
        675                 680                 685

Cys Ala Cys Ala Gly Ala Ala Ala Gly Cys Gly Thr Thr Thr Cys Thr
    690                 695                 700

Gly Gly Ala Gly Ala Ala Cys Gly Ala Thr Ala Ala Thr Thr Gly Cys
705                 710                 715                 720

Thr Ala Cys Gly Thr Gly Ala Thr Thr Ala Ala Cys Ala Ala Cys Thr
                725                 730                 735

Cys Cys Gly Ala Cys Thr Ala Cys Gly Ala Thr Thr Thr Cys Thr Cys
            740                 745                 750

Thr Gly Cys Gly Ala Thr Cys Gly Ala Thr Ala Thr Gly Thr Ala Thr
        755                 760                 765

Cys Thr Gly Ala Thr Gly Thr Cys Thr Cys Thr Gly Thr Gly Cys Ala
    770                 775                 780

Ala Ala Ala Ala Cys Ala Ala Cys Ala Thr Cys Ala Thr Cys Gly Cys
785                 790                 795                 800

Ala Ala Ala Thr Thr Cys Cys Ala Cys Cys Thr Ala Cys Thr Cys Cys
                805                 810                 815

Thr Gly Gly Thr Gly Gly Gly Gly Thr Gly Cys Gly Thr Gly Gly Cys
            820                 825                 830

Thr Gly Ala Ala Cys Ala Ala Ala Thr Ala Cys Gly Ala Gly Gly Ala
        835                 840                 845
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Cys Ala Ala Ala Cys Thr Gly Gly Thr Thr Ala Thr Cys Thr Cys Thr
850 855 860

Cys Cys Gly Ala Ala Ala Cys Ala Ala Thr Gly Gly Thr Thr Thr Cys
865 870 875 880

Thr Gly Gly Gly Thr Ala Ala Cys Ala Ala Cys Gly Ala Ala Ala Cys
885 890 895

Cys Thr Cys Thr Cys Thr Gly Cys Gly Thr Ala Ala Cys Gly Cys Gly
900 905 910

Thr Cys Thr Thr Gly Gly Ala Thr Cys Ala Cys Cys Cys Thr Gly Thr
915 920 925

Ala Gly Cys Thr Cys Gly Ala Gly Thr Gly Ala Cys Thr Gly Ala Cys
930 935 940

Thr Gly
945

<210> 286
<211> 895
<212> DNA
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 286
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gttcgtattg atctgtctga tatggttcat tatcacgttc accacggcta tgaaatgcac 180

cgtgttttca atctgccgca caccgaattt tgcatcaacc agccgctgaa aaaagtgatc 240

gagttcctgt ttttcaaaaa gatttacgaa cgtaaacagg accctaattc tctgcgtgca 300

ttcgagaaga agtatctgtg gccgctgctg tacttcaaag gtttctatca atctgagcgc 360

ttctttgctg acatcaaaga cgaggttcgt aaagcattca cctttgactc ttctaaagtg 420

aacgctcgct ctgccgaact gctgcgtcgc ctggatgccg atgctaacgc ggttagcctg 480

cacattcgtc gcggtgacta tctacagccg cagcattggg ctaccactgg ttctgtctgc 540

cagctgccgt actaccagaa cgcgatcgct gaaatgaacc gtcgcgttgc tgccccgagc 600

tactacgttt tcagcgatga catcgcgtgg gtgaaggaaa acatccctct acagaacgca 660

gtgtacatcg actggaataa aggcgaagaa agctggcagg atatgatgct gatgagccac 720

tgccgccacc acattatctg taacagcacc ttctcttggt ggggcgcgtg gctggacccg 780

cacgaggaca aaattgtaat cgttccgaat cgttggttcc agcattgcga aactcctaac 840

atctatccgg caggctgggt gaaagttgcg attaattagc tcgagtgact gactg 895

<210> 287
<211> 6153
<212> DNA
<213> Artificial Sequence

<220>
<223> artificial construct

<400> 287
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ttggcgggtg tcggggctgg cttaactatg cggcatcaga gcagattgta ctgagagtgc 180

accatatatg cggtgtgaaa taccgcacag atgcgtaagg agaaaatacc gcatcaggcg 240

cctcctcaac ctgtatattc gtaaaccacg cccaatggga gctgtctcag gtttgttcct 300

gattggttac ggcgcgtttc gcatcattgt tgagtttttc cgccagcccg acgcgcagtt 360

taccggtgcc tgggtgcagt acatcagcat ggggcaaatt ctttccatcc cgatgattgt 420

cgcgggtgtg atcatgatgg tctgggcata tcgtcgcagc ccacagcaac acgtttcctg 480

aggaaccatg aaacagtatt tagaactgat gcaaaaagtg ctcgacgaag gcacacagaa 540

aaacgaccgt accggaaccg gaacgctttc catttttggt catcagatgc gttttaacct 600

gcaagatgga ttcccgctgg tgacaactaa acgttgccac ctgcgttcca tcatccatga 660

actgctgtgg tttctgcagg gcgacactaa cattgcttat ctacacgaaa acaatgtcac 720

catctgggac gaatgggccg atgaaaacgg cgacctcggg ccagtgtatg gtaaacagtg 780

gcgcgcctgg ccaacgccag atggtcgtca tattgaccag atcactacgg tactgaacca 840

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tgccagctac gcgttattgg tgcatatgat ggcgcagcag tgcgatctgg aagtgggtga 1080

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gcaattaagc cgcgaaccgc gtccgctgcc gaagttgatt atcaaacgta aacccgaatc 1200

catcttcgac taccgtttcg aagactttga gattgaaggc tacgatccgc atccgggcat 1260

taaagcgccg gtggctatct aattacgaaa catcctgcca gagccgacgc cagtgtgcgt 1320

cggttttttt accctccgtt aaattcttcg agacgccttc ccgaaggcgc cattcgccat 1380

tcaggctgcg caactgttgg gaagggcgat cggtgcgggc ctcttcgcta ttacgccagc 1440

tggcgaaagg gggatgtgct gcaaggcgat taagttgggt aacgccaggg ttttcccagt 1500

cacgacgttg taaaacgacg gccagtgcca agctttcttt aatgaagcag ggcatcagga 1560

cggtatcttt gtggagaaag cagagtaatc ttattcagcc tgactggtgg gaaaccacca 1620

gtcagaatgt gttagcgcat gttgacaaaa ataccattag tcacattatc cgtcagtcgg 1680

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gattccggtt taatcgattt agaactgatc aataaatttt ttctgaccaa tagatattca 1980

tcaaaatgaa cattggcaat tgccataaaa acgataaata acgtattggg atgttgatta 2040

atgatgagct tgatacgctg actgttagaa gcatcgtgga tgaaacagtc ctcattaata 2100

aacaccactg aagggcgctg tgaatcacaa gctatggcaa ggtcatcaac ggtttcaatg 2160

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gtgtaactac ataaatccat aataatcgtt gacatggcat accctcactc aatgcgtaac 2280

gataattccc cttacctgaa tatttcatca tgactaaacg gaacaacatg ggtcacctaa 2340

tgcgccactc tcgcgatttt tcaggcggac ttactatccc gtaaagtgtt gtataatttg 2400

cctggaattg tcttaaagta aagtaaatgt tgcgatatgt gagtgagctt aaaacaaata 2460

tttcgctgca ggagtatcct ggaagatgtt cgtagaagct tactgctcac aagaaaaaag 2520

gcacgtcatc tgacgtgcct tttttatttg tactaccctg tacgattact gcagctcgag 2580

ctagttaatc ggtactttga tccattcttt cgggtacatg tccggggttt ctttatgctg 2640

gaaccagcga cacggcgcga tgacgatttt ctctttacgt gggttcagcc aagcacccca 2700

ccaggagaac gtagaattac agataatgtg gtgacgacag tggctcatca gcatcatatc 2760

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gaaggcttta cgaacgtcgt ctttgatatc gaagaagaag cgttcagact ggtagaaacc 3120

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ctggcgacgt tcgtagattt ttttgaagaa caggaactcc aggatttttt tcagggtacg 3240

gttgatgcaa aattcagtct ggctcaggtc aaagatacgg ttcatctcat aaccgttgtg 3300

aactttataa tgaaccatgt cagacagatc gatgttcgta tccgggtaat ggtgtttcat 3360

tttcaggtag aacgcgtaga taaacatctg gttacccagg ccgccgatca tcttgatcag 3420

acgcatatgt atatctcctt cttgaattct aaaaattgat tgaatgtatg caaataaatg 3480

catacaccat aggtgtggtt taatttgatg ccctttttca gggctggaat gtgtaagagc 3540

ggggttattt atgctgttgt ttttttgtta ctcgggaagg gctttacctc ttccgcataa 3600

acgcttccat cagcgtttat agttaaaaaa atctttcgga actggttttg cgcttacccc 3660

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acgcaggaaa gaacatgtga gcaaaaggcc agcaaaaggc caggaaccgt aaaaaggccg 4320

cgttgctggc gtttttccat aggctccgcc cccctgacga gcatcacaaa aatcgacgct 4380

caagtcagag gtggcgaaac ccgacaggac tataaagata ccaggcgttt ccccctggaa 4440

gctccctcgt gcgctctcct gttccgaccc tgccgcttac cggatacctg tccgcctttc 4500

tcccttcggg aagcgtggcg ctttctcata gctcacgctg taggtatctc agttcggtgt 4560

aggtcgttcg ctccaagctg ggctgtgtgc acgaaccccc cgttcagccc gaccgctgcg 4620

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tgaagtggtg gcctaactac ggctacacta gaagaacagt atttggtatc tgcgctctgc 4800

tgaagccagt taccttcgga aaaagagttg gtagctcttg atccggcaaa caaaccaccg 4860

ctggtagcgg tggttttttt gtttgcaagc agcagattac gcgcagaaaa aaaggatctc 4920

aagaagatcc tttgatcttt tctacggggt ctgacgctca gtggaacgaa aactcacgtt 4980

aagggatttt ggtcatgaga ttatcaaaaa ggatcttcac ctagatcctt ttaaattaaa 5040

aatgaagttt taaatcaatc taaagtatat atgagtaaac ttggtctgac agttaccaat 5100

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<210> 292
<211> 278
<212> PRT
<213> Artificial Sequence

<220>
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<220>
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<400> 292

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20 25 30

Asp Leu Ala Trp Tyr Lys Asn Lys Ser Val Lys Phe Glu Leu Tyr Asn
35 40 45

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

Ser Asp Cys Gln Ala Asp Phe Val Ser Arg Ile Arg Arg Lys Ile Phe
65 70 75 80

Gly Lys Lys Lys Ser Phe Val Ser Glu Lys Asn Asp Ser Cys Tyr Glu
85 90 95

Asn Asp Ile Leu Arg Met Asp Asn Val Tyr Leu Ser Gly Tyr Trp Gln
100 105 110

Thr Glu Lys Tyr Phe Ser Asn Thr Arg Glu Lys Leu Leu Glu Asp Tyr
115 120 125

Ser Phe Ala Leu Val Asn Ser Gln Val Ser Glu Trp Glu Asp Ser Ile
130 135 140

Arg Asn Lys Asn Ser Val Ser Ile His Ile Arg Arg Gly Asp Tyr Leu
145 150 155 160

Gln Gly Glu Leu Tyr Gly Gly Ile Cys Thr Ser Leu Tyr Tyr Ala Glu
165 170 175

```
Ala Ile Glu Tyr Ile Lys Met Arg Val Pro Asn Ala Lys Phe Phe Val
            180                 185                 190

Phe Ser Asp Asp Val Glu Trp Val Lys Gln Gln Glu Asp Phe Lys Gly
        195                 200                 205

Phe Val Ile Val Asp Arg Asn Glu Tyr Ser Ser Ala Leu Ser Asp Met
    210                 215                 220

Tyr Leu Met Ser Leu Cys Lys His Asn Ile Ile Ala Asn Ser Ser Phe
225                 230                 235                 240

Ser Trp Trp Ala Ala Trp Leu Asn Arg Asn Glu Glu Lys Ile Val Ile
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Ala Pro Arg Arg Trp Leu Asn Gly Lys Cys Thr Pro Asp Ile Trp Cys
            260                 265                 270

Lys Lys Trp Ile Arg Ile
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<210> 293
<211> 300
<212> PRT
<213> Helicobacter pylori

<400> 293

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

Val Leu Leu Asp Ile Thr Ser Phe Asp Trp Ser Asp Arg Lys Met Gln
        35                  40                  45

Leu Glu Leu Phe Pro Ile Asp Leu Pro Tyr Ala Ser Ala Lys Glu Ile
    50                  55                  60

Ala Ile Ala Lys Met Gln His Leu Pro Lys Leu Val Arg Asp Ala Leu
65                  70                  75                  80

Lys Cys Met Gly Phe Asp Arg Val Ser Gln Glu Ile Val Phe Glu Tyr
                85                  90                  95

Glu Pro Lys Leu Leu Lys Pro Ser Arg Leu Thr Tyr Phe Phe Gly Tyr
            100                 105                 110

Phe Gln Asp Pro Arg Tyr Phe Asp Ala Ile Ser Pro Leu Ile Lys Gln
        115                 120                 125
```

```
Thr Phe Thr Leu Pro Pro Pro Pro Glu Asn Asn Lys Asn Asn Asn Lys
    130                 135                 140

Lys Glu Glu Glu Tyr Gln Cys Lys Leu Ser Leu Ile Leu Ala Ala Lys
145                 150                 155                 160

Asn Ser Val Phe Val His Ile Arg Arg Gly Asp Tyr Val Gly Ile Gly
                165                 170                 175

Cys Gln Leu Gly Ile Asp Tyr Gln Lys Lys Ala Leu Glu Tyr Met Ala
            180                 185                 190

Lys Arg Val Pro Asn Met Glu Leu Phe Val Phe Cys Glu Asp Leu Glu
        195                 200                 205

Phe Thr Gln Asn Leu Asp Leu Gly Tyr Pro Phe Met Asp Met Thr Thr
    210                 215                 220

Arg Asp Lys Glu Glu Glu Ala Tyr Trp Asp Met Leu Leu Met Gln Ser
225                 230                 235                 240

Cys Gln His Gly Ile Ile Ala Asn Ser Thr Tyr Ser Trp Trp Ala Ala
                245                 250                 255

Tyr Leu Ile Glu Asn Pro Glu Lys Ile Ile Ile Gly Pro Lys His Trp
            260                 265                 270

Leu Phe Gly His Glu Asn Ile Leu Cys Lys Glu Trp Val Lys Ile Glu
        275                 280                 285

Ser His Phe Glu Val Lys Ser Gln Lys Tyr Asn Ala
    290                 295                 300
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<210> 294
<211> 297
<212> PRT
<213> Escherichia coli

<400> 294

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Met Ser Ile Ile Arg Leu Gln Gly Gly Leu Gly Asn Gln Leu Phe Gln
1               5                   10                  15

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

Phe Asp Ile Ser His Tyr Ala Glu Asn Asp Asp His Gly Gly Tyr Arg
        35                  40                  45

Leu Asn Asn Leu Gln Ile Pro Glu Glu Tyr Leu Gln Tyr Tyr Thr Pro
    50                  55                  60

Lys Ile Asn Asn Ile Tyr Lys Phe Leu Val Arg Gly Ser Arg Leu Tyr
```

65 70 75 80

Pro Glu Ile Phe Leu Phe Leu Gly Phe Cys Asn Glu Phe His Ala Tyr
85 90 95

Gly Tyr Asp Phe Glu Tyr Ile Ala Gln Lys Trp Lys Ser Lys Lys Tyr
100 105 110

Ile Gly Tyr Trp Gln Ser Glu His Phe Phe His Lys His Ile Leu Asp
115 120 125

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

Leu Ala Ala Lys Ile Leu Glu Ser Gln Ser Ser Leu Ser Ile His Ile
145 150 155 160

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

Val Cys Ser Leu Glu Tyr Tyr Lys Lys Ala Leu Asn Lys Ile Arg Asp
180 185 190

Leu Ala Met Ile Arg Asp Val Phe Ile Phe Ser Asp Asp Ile Phe Trp
195 200 205

Cys Lys Glu Asn Ile Glu Thr Leu Leu Ser Lys Lys Tyr Asn Ile Tyr
210 215 220

Tyr Ser Glu Asp Leu Ser Gln Glu Glu Asp Leu Trp Leu Met Ser Leu
225 230 235 240

Ala Asn His His Ile Ile Ala Asn Ser Ser Phe Ser Trp Trp Gly Ala
245 250 255

Tyr Leu Gly Thr Ser Ala Ser Gln Ile Val Ile Tyr Pro Thr Pro Trp
260 265 270

Tyr Asp Ile Thr Pro Lys Asn Thr Tyr Ile Pro Ile Val Asn His Trp
275 280 285

Ile Asn Val Asp Lys His Ser Ser Cys
290 295