

SEQUENCE LISTING

<110> GENOMATICA, INC.

<120> MICROORGANISMS FOR THE PRODUCTION OF 1,4-BUTANEDIOL AND RELATED METHODS

<130> 066662-0311

<140> PCT/US2010/037544

<141> 2010-06-04

<150> 61/184,311

<151> 2009-06-04

<160> 88

<170> PatentIn version 3.5

<210> 1

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<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

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<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic primer

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<210> 3

<211> 18

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic primer

<400> 3

atgtaccgca agttccgc 18

<210> 4
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<223> Description of Artificial Sequence: Synthetic
primer

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primer

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<210> 7
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27

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<211> 30
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<223> Description of Artificial Sequence: Synthetic primer

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<210> 9

<211> 32

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic primer

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tggccaacat aagttcacca ttcgggcaaa ac

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<210> 10

<211> 29

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic primer

<400> 10

tctcttcaac cagccattcg ttttgcccg

29

<210> 11

<211> 27

<212> DNA

<213> Clostridium acetobutylicum

<400> 11

attaaagtta agtggaggaa tgtaac

27

<210> 12

<211> 22

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic primer

<400> 12

acacgcggat ccaacgtccc gg

22

<210> 13
 <211> 23
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<400> 13
 agcggctccg ctagccgctt atg 23

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<400> 14
 aagccgttgc tgcagctctt gagg 24

<210> 15
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<210> 17
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<210> 18
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<400> 18
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<210> 19
<211> 22
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<210> 20
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<210> 21
<211> 25
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 <223> Description of Artificial Sequence: Synthetic
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<210> 24
 <211> 48
 <212> DNA
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 <223> Description of Artificial Sequence: Synthetic
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 <211> 42
 <212> DNA
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 <223> Description of Artificial Sequence: Synthetic
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<400> 25
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<223> Description of Artificial Sequence: Synthetic
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<210> 27

<211> 49

<212> DNA

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<223> Description of Artificial Sequence: Synthetic
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<212> DNA

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<223> Description of Artificial Sequence: Synthetic
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<210> 29

<211> 54

<212> DNA

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<223> Description of Artificial Sequence: Synthetic
primer

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<211> 49

<212> DNA

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<223> Description of Artificial Sequence: Synthetic
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<210> 31
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<212> DNA
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<223> Description of Artificial Sequence: Synthetic
oligonucleotide

<400> 31
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gagctgcttc 70

<210> 32
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<223> Description of Artificial Sequence: Synthetic
oligonucleotide

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tctctcttag 70

<210> 33
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<212> DNA
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<223> Description of Artificial Sequence: Synthetic
primer

<400> 33
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<210> 36
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<210> 37
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 <212> DNA
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<400> 37
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35

<210> 38
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 primer

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38

<210> 39
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 <212> DNA
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<220>

<223> Description of Artificial Sequence: Synthetic primer

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25

<210> 40

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

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24

<210> 41

<211> 75

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic primer

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tcacgaggcc ctttc

75

<210> 42

<211> 70

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

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gccatggtcc

70

<210> 43

<211> 73

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence: Synthetic
oligonucleotide

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cgtgactcga tac 73

<210> 44

<211> 70

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
oligonucleotide

<400> 44

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gctcaaggac 70

<210> 45

<211> 2036

<212> DNA

<213> Escherichia coli

<400> 45

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gtgggttatg cctgtactac tccgcgcgaa gcagaagaag ccgcttcaaa aatcggtgcc 120

ggtcggtggg tagtgaaatg tcagggttcac gctgggtggcc gcggtaaaagc gggcggtgtg 180

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gcgaccgata tcgctaaaga gctgtatctc ggtgccgttg ttgaccgtag ttcccgctgt 360

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aacgcactgt tccgcacgcc tgatctgcgc gaaatgcgtg accagtcgca ggaagatccg 720

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<210> 46

<211> 388

<212> PRT

<213> Escherichia coli

<400> 46

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

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```

Glu Ala Ala Ser Lys Ile Gly Ala Gly Pro Trp Val Val Lys Cys Gln
35          40          45

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Val His Ala Gly Gly Arg Gly Lys Ala Gly Gly Val Lys Val Val Asn
50 55 60

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

Leu Val Thr Tyr Gln Thr Asp Ala Asn Gly Gln Pro Val Asn Gln Ile
85 90 95

Leu Val Glu Ala Ala Thr Asp Ile Ala Lys Glu Leu Tyr Leu Gly Ala
100 105 110

Val Val Asp Arg Ser Ser Arg Arg Val Val Phe Met Ala Ser Thr Glu
115 120 125

Gly Gly Val Glu Ile Glu Lys Val Ala Glu Glu Thr Pro His Leu Ile
130 135 140

His Lys Val Ala Leu Asp Pro Leu Thr Gly Pro Met Pro Tyr Gln Gly
145 150 155 160

Arg Glu Leu Ala Phe Lys Leu Gly Leu Glu Gly Lys Leu Val Gln Gln
165 170 175

Phe Thr Lys Ile Phe Met Gly Leu Ala Thr Ile Phe Leu Glu Arg Asp
180 185 190

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

Leu Ile Cys Leu Asp Gly Lys Leu Gly Ala Asp Gly Asn Ala Leu Phe
210 215 220

Arg Gln Pro Asp Leu Arg Glu Met Arg Asp Gln Ser Gln Glu Asp Pro
225 230 235 240

Arg Glu Ala Gln Ala Ala Gln Trp Glu Leu Asn Tyr Val Ala Leu Asp
245 250 255

Gly Asn Ile Gly Cys Met Val Asn Gly Ala Gly Leu Ala Met Gly Thr
260 265 270

14/80

Met Asp Ile Val Lys Leu His Gly Gly Glu Pro Ala Asn Phe Leu Asp
275 280 285

Val Gly Gly Gly Ala Thr Lys Glu Arg Val Thr Glu Ala Phe Lys Ile
290 295 300

Ile Leu Ser Asp Asp Lys Val Lys Ala Val Leu Val Asn Ile Phe Gly
305 310 315 320

Gly Ile Val Arg Cys Asp Leu Ile Ala Asp Gly Ile Ile Gly Ala Val
325 330 335

Ala Glu Val Gly Val Asn Val Pro Val Val Val Arg Leu Glu Gly Asn
340 345 350

Asn Ala Glu Leu Gly Ala Lys Lys Leu Ala Asp Ser Gly Leu Asn Ile
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Ile Ala Ala Lys Gly Leu Thr Asp Ala Ala Gln Gln Val Val Ala Ala
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Val Glu Gly Lys
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<210> 47

<211> 289

<212> PRT

<213> Escherichia coli

<400> 47

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Thr Lys Met Val Gly Gly Val Thr Pro Gly Lys Gly Gly Thr Thr His
35 40 45

Leu Gly Leu Pro Val Phe Asn Thr Val Arg Glu Ala Val Ala Ala Thr
50 55 60

Gly Ala Thr Ala Ser Val Ile Tyr Val Pro Ala Pro Phe Cys Lys Asp
65 70 75 80

15/80

Ser Ile Leu Glu Ala Ile Asp Ala Gly Ile Lys Leu Ile Ile Thr Ile
85 90 95

Thr Glu Gly Ile Pro Thr Leu Asp Met Leu Thr Val Lys Val Lys Leu
100 105 110

Asp Glu Ala Gly Val Arg Met Ile Gly Pro Asn Cys Pro Gly Val Ile
115 120 125

Thr Pro Gly Glu Cys Lys Ile Gly Ile Gln Pro Gly His Ile His Lys
130 135 140

Pro Gly Lys Val Gly Ile Val Ser Arg Ser Gly Thr Leu Thr Tyr Glu
145 150 155 160

Ala Val Lys Gln Thr Thr Asp Tyr Gly Phe Gly Gln Ser Thr Cys Val
165 170 175

Gly Ile Gly Gly Asp Pro Ile Pro Gly Ser Asn Phe Ile Asp Ile Leu
180 185 190

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

Glu Ile Gly Gly Ser Ala Glu Glu Glu Ala Ala Tyr Ile Lys Glu
210 215 220

His Val Thr Lys Pro Val Val Gly Tyr Ile Ala Gly Val Thr Ala Pro
225 230 235 240

Lys Gly Lys Arg Met Gly His Ala Gly Ala Ile Ile Ala Gly Gly Lys
245 250 255

Gly Thr Ala Asp Glu Lys Phe Ala Ala Leu Glu Ala Ala Gly Val Lys
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Lys

<210> 48
 <211> 3696
 <212> DNA
 <213> *Mycobacterium bovis*

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atgaaccatcg	cgatgccgtc	gactccgtcg	aactacttcc	acctgctacg	cggcatgcc	3180
ctggacggca	tccaacgccc	gctgatcgtg	ttcacgccc	agtcgatgtt	gcgtcacaag	3240
gccgcgctca	gcgaaatcaa	ggacttcacc	gagatcaagt	tccgctcagt	gctggaggaa	3300

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cccacctatg aggacggcat cggagaccgc aacaagggtca gccggatcct gctgaccagt 3360
ggcaagctgt attacgagct ggccgcccgc aaggccaagg acaaccgcaa tgacctcgcg 3420
atcgtgcggc ttgaacagct cgccccgctg cccaggcgtc gactgctga aacgctggac 3480
cgctacgaga acgtcaagga gttcttctgg gtccaagagg aaccggccaa ccagggtgcg 3540
tggccgcgat tcgggctcga actaccgag ctgctgcctg acaagttggc cgggatcaag 3600
cgaatctcgc gccgggcgat gtcagccccg tcgtcaggct cgtcgaaggt gcacgccgtc 3660
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<210> 49

<211> 1231

<212> PRT

<213> Mycobacterium bovis

<400> 49

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

```

```

Glu Met Tyr Arg Lys Phe Arg Asp Asp Pro Ser Ser Val Asp Pro Ser
                20             25             30

```

```

Trp His Glu Phe Leu Val Asp Tyr Ser Pro Glu Pro Thr Ser Gln Pro
        35             40             45

```

```

Ala Ala Glu Pro Thr Arg Val Thr Ser Pro Leu Val Ala Glu Arg Ala
        50             55             60

```

```

Ala Ala Ala Ala Pro Gln Ala Pro Pro Lys Pro Ala Asp Thr Ala Ala
65             70             75             80

```

```

Ala Gly Asn Gly Val Val Ala Ala Leu Ala Ala Lys Thr Ala Val Pro
        85             90             95

```

```

Pro Pro Ala Glu Gly Asp Glu Val Ala Val Leu Arg Gly Ala Ala Ala
        100            105            110

```

```

Ala Val Val Lys Asn Met Ser Ala Ser Leu Glu Val Pro Thr Ala Thr
        115            120            125

```

```

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

```

19/80

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

His Leu Leu Gly Tyr Ala Leu Val Gln Ala Val Lys Lys Phe Pro Asn
165 170 175

Met Asn Arg His Tyr Thr Glu Val Asp Gly Lys Pro Thr Ala Val Thr
180 185 190

Pro Ala His Thr Asn Leu Gly Leu Ala Ile Asp Leu Gln Gly Lys Asp
195 200 205

Gly Lys Arg Ser Leu Val Val Ala Gly Ile Lys Arg Cys Glu Thr Met
210 215 220

Arg Phe Ala Gln Phe Val Thr Ala Tyr Glu Asp Ile Val Arg Arg Ala
225 230 235 240

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

Leu Thr Asn Pro Gly Thr Ile Gly Thr Val His Ser Val Pro Arg Leu
260 265 270

Met Pro Gly Gln Gly Ala Ile Ile Gly Val Gly Ala Met Glu Tyr Pro
275 280 285

Ala Glu Phe Gln Gly Ala Ser Glu Glu Arg Ile Ala Glu Leu Gly Ile
290 295 300

Gly Lys Leu Ile Thr Leu Thr Ser Thr Tyr Asp His Arg Ile Ile Gln
305 310 315 320

Gly Ala Glu Ser Gly Asp Phe Leu Arg Thr Ile His Glu Leu Leu Leu
325 330 335

Ser Asp Gly Phe Trp Asp Glu Val Phe Arg Glu Leu Ser Ile Pro Tyr
340 345 350

Leu Pro Val Arg Trp Ser Thr Asp Asn Pro Asp Ser Ile Val Asp Lys
355 360 365

Asn Ala Arg Val Met Asn Leu Ile Ala Ala Tyr Arg Asn Arg Gly His
370 375 380

Leu Met Ala Asp Thr Asp Pro Leu Arg Leu Asp Lys Ala Arg Phe Arg
385 390 395 400

Ser His Pro Asp Leu Glu Val Leu Thr His Gly Leu Thr Leu Trp Asp
405 410 415

Leu Asp Arg Val Phe Lys Val Asp Gly Phe Ala Gly Ala Gln Tyr Lys
420 425 430

Lys Leu Arg Asp Val Leu Gly Leu Leu Arg Asp Ala Tyr Cys Arg His
435 440 445

Ile Gly Val Glu Tyr Ala His Ile Leu Asp Pro Glu Gln Lys Glu Trp
450 455 460

Leu Glu Gln Arg Val Glu Thr Lys His Val Lys Pro Thr Val Ala Gln
465 470 475 480

Gln Lys Tyr Ile Leu Ser Lys Leu Asn Ala Ala Glu Ala Phe Glu Thr
485 490 495

Phe Leu Gln Thr Lys Tyr Val Gly Gln Lys Arg Phe Ser Leu Glu Gly
500 505 510

Ala Glu Ser Val Ile Pro Met Met Asp Ala Ala Ile Asp Gln Cys Ala
515 520 525

Glu His Gly Leu Asp Glu Val Val Ile Gly Met Pro His Arg Gly Arg
530 535 540

Leu Asn Val Leu Ala Asn Ile Val Gly Lys Pro Tyr Ser Gln Ile Phe
545 550 555 560

Thr Glu Phe Glu Gly Asn Leu Asn Pro Ser Gln Ala His Gly Ser Gly
565 570 575

Asp Val Lys Tyr His Leu Gly Ala Thr Gly Leu Tyr Leu Gln Met Phe
580 585 590

Gly Asp Asn Asp Ile Gln Val Ser Leu Thr Ala Asn Pro Ser His Leu
595 600 605

21/80

Glu Ala Val Asp Pro Val Leu Glu Gly Leu Val Arg Ala Lys Gln Asp
610 615 620

Leu Leu Asp His Gly Ser Ile Asp Ser Asp Gly Gln Arg Ala Phe Ser
625 630 635 640

Val Val Pro Leu Met Leu His Gly Asp Ala Ala Phe Ala Gly Gln Gly
645 650 655

Val Val Ala Glu Thr Leu Asn Leu Ala Asn Leu Pro Gly Tyr Arg Val
660 665 670

Gly Gly Thr Ile His Ile Ile Val Asn Asn Gln Ile Gly Phe Thr Thr
675 680 685

Ala Pro Glu Tyr Ser Arg Ser Ser Glu Tyr Cys Thr Asp Val Ala Lys
690 695 700

Met Ile Gly Ala Pro Ile Phe His Val Asn Gly Asp Asp Pro Glu Ala
705 710 715 720

Cys Val Trp Val Ala Arg Leu Ala Val Asp Phe Arg Gln Arg Phe Lys
725 730 735

Lys Asp Val Val Ile Asp Met Leu Cys Tyr Arg Arg Arg Gly His Asn
740 745 750

Glu Gly Asp Asp Pro Ser Met Thr Asn Pro Tyr Met Tyr Asp Val Val
755 760 765

Asp Thr Lys Arg Gly Ala Arg Lys Ser Tyr Thr Glu Ala Leu Ile Gly
770 775 780

Arg Gly Asp Ile Ser Met Lys Glu Ala Glu Asp Ala Leu Arg Asp Tyr
785 790 795 800

Gln Gly Gln Leu Glu Arg Val Phe Asn Glu Val Arg Glu Leu Glu Lys
805 810 815

His Gly Val Gln Pro Ser Glu Ser Val Glu Ser Asp Gln Met Ile Pro
820 825 830

Ala Gly Leu Ala Thr Ala Val Asp Lys Ser Leu Leu Ala Arg Ile Gly
835 840 845

Asp Ala Phe Leu Ala Leu Pro Asn Gly Phe Thr Ala His Pro Arg Val
 850 855 860

Gln Pro Val Leu Glu Lys Arg Arg Glu Met Ala Tyr Glu Gly Lys Ile
 865 870 875 880

Asp Trp Ala Phe Gly Glu Leu Leu Ala Leu Gly Ser Leu Val Ala Glu
 885 890 895

Gly Lys Leu Val Arg Leu Ser Gly Gln Asp Ser Arg Arg Gly Thr Phe
 900 905 910

Ser Gln Arg His Ser Val Leu Ile Asp Arg His Thr Gly Glu Glu Phe
 915 920 925

Thr Pro Leu Gln Leu Leu Ala Thr Asn Ser Asp Gly Ser Pro Thr Gly
 930 935 940

Gly Lys Phe Leu Val Tyr Asp Ser Pro Leu Ser Glu Tyr Ala Ala Val
 945 950 955 960

Gly Phe Glu Tyr Gly Tyr Thr Val Gly Asn Pro Asp Ala Val Val Leu
 965 970 975

Trp Glu Ala Gln Phe Gly Asp Phe Val Asn Gly Ala Gln Ser Ile Ile
 980 985 990

Asp Glu Phe Ile Ser Ser Gly Glu Ala Lys Trp Gly Gln Leu Ser Asn
 995 1000 1005

Val Val Leu Leu Leu Pro His Gly His Glu Gly Gln Gly Pro Asp
 1010 1015 1020

His Thr Ser Ala Arg Ile Glu Arg Phe Leu Gln Leu Trp Ala Glu
 1025 1030 1035

Gly Ser Met Thr Ile Ala Met Pro Ser Thr Pro Ser Asn Tyr Phe
 1040 1045 1050

His Leu Leu Arg Arg His Ala Leu Asp Gly Ile Gln Arg Pro Leu
 1055 1060 1065

Ile Val Phe Thr Pro Lys Ser Met Leu Arg His Lys Ala Ala Val
1070 1075 1080

Ser Glu Ile Lys Asp Phe Thr Glu Ile Lys Phe Arg Ser Val Leu
1085 1090 1095

Glu Glu Pro Thr Tyr Glu Asp Gly Ile Gly Asp Arg Asn Lys Val
1100 1105 1110

Ser Arg Ile Leu Leu Thr Ser Gly Lys Leu Tyr Tyr Glu Leu Ala
1115 1120 1125

Ala Arg Lys Ala Lys Asp Asn Arg Asn Asp Leu Ala Ile Val Arg
1130 1135 1140

Leu Glu Gln Leu Ala Pro Leu Pro Arg Arg Arg Leu Arg Glu Thr
1145 1150 1155

Leu Asp Arg Tyr Glu Asn Val Lys Glu Phe Phe Trp Val Gln Glu
1160 1165 1170

Glu Pro Ala Asn Gln Gly Ala Trp Pro Arg Phe Gly Leu Glu Leu
1175 1180 1185

Pro Glu Leu Leu Pro Asp Lys Leu Ala Gly Ile Lys Arg Ile Ser
1190 1195 1200

Arg Arg Ala Met Ser Ala Pro Ser Ser Gly Ser Ser Lys Val His
1205 1210 1215

Ala Val Glu Gln Gln Glu Ile Leu Asp Glu Ala Phe Gly
1220 1225 1230

<210> 50

<211> 1356

<212> DNA

<213> Porphyromonas gingivalis

<400> 50

atggaaatca aagaaatggt gaggccttgca cgcaaggctc agaaggagta tcaagctacc 60

cataaccaag aagcagttga caacatttgc cgagctgcag caaaagttat ttatgaaaat 120

gcagctattc tggctcgga agcagtagac gaaaccggca tgggcgttta cgaacacaaa 180

gtggccaaga atcaaggcaa atccaaaggt gtttggtaca acctccacaa taaaaaatcg 240

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attggtatcc tcaatataga cgagcgtaac ggtatgatcg agattgcaaa gcctatcgga      300
gttgtaggag ccgtaacgcc gacgaccaac ccgatogtta ctccgatgag caatatcacc      360
tttgccttta agacctgcaa tgccatcatt attgcccccc accccagatc caaaaaatgc      420
tctgcacacg cagttcgtct gatcaaagaa gctatcgctc cgttcaacgt accggaaggt      480
atggttcaga tcctcgaaga acccagcacc gagaagacgc aggaactcat gggcgccgta      540
gacgtagtag ttgctacggg tggatatggc atggtgaagt ctgcatattc ttcaggaaag      600
ccttctttcg gtgttgagc cggtaacgtt caggatgatc tggatagcaa catcgatttc      660
gaagctgctg cagaaaaaat catcacgggt cgtgctttcg acaacgggtat catctgctca      720
ggcgaacaga gcctcatcta caacgaggct gacaaggaag cagttttcac agcattccgc      780
aaccacggtg catattttctg tgacgaagcc gaaggagatc gggctcgtgc agctatcttc      840
gaaaatggag ccctcgcgaa agatgtagta ggtcagagcg ttgccttcat tgccaagaaa      900
gcaaacatca atatccccga gggtaaccgt attctcgttg ttgaagctcg cggcgtagga      960
gcagaagacg ttatctgtaa ggaaaagatg tgtcccgtaa tgtgcgccct cagctacaag     1020
cacttcgaag aagggtgtaga aatgcacgt acgaacctcg ccaacgaagg taacggccac     1080
acctgtgcta tccactccaa caatcaggca cacatcatcc tcgcaggatc agagctgacg     1140
gtatctcgta tcgtagtga tgcctcgagt gccactacag caggcggtca catccaaaac     1200
ggctttgccg taaccaatac gctcggatgc ggatcatggg gtaataactc tatctccgag     1260
aacttcactt acaagcacct cctcaacatt tcacgcacgc caccgttgaa ttcaagcatt     1320
cacatccccg atgacaaaga aatctgggaa ctctaa                                1356

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<210> 51

<211> 451

<212> PRT

<213> Porphyromonas gingivalis

<400> 51

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

```

```

Tyr Gln Ala Thr His Asn Gln Glu Ala Val Asp Asn Ile Cys Arg Ala
          20          25          30

```

```

Ala Ala Lys Val Ile Tyr Glu Asn Ala Ala Ile Leu Ala Arg Glu Ala
          35          40          45

```

```

Val Asp Glu Thr Gly Met Gly Val Tyr Glu His Lys Val Ala Lys Asn

```

50		55		60
Gln Gly Lys Ser Lys Gly Val Trp Tyr Asn Leu His Asn Lys Lys Ser				
65		70		75
				80
Ile Gly Ile Leu Asn Ile Asp Glu Arg Thr Gly Met Ile Glu Ile Ala				
		85		90
				95
Lys Pro Ile Gly Val Val Gly Ala Val Thr Pro Thr Thr Asn Pro Ile				
		100		105
				110
Val Thr Pro Met Ser Asn Ile Ile Phe Ala Leu Lys Thr Cys Asn Ala				
		115		120
				125
Ile Ile Ile Ala Pro His Pro Arg Ser Lys Lys Cys Ser Ala His Ala				
		130		135
				140
Val Arg Leu Ile Lys Glu Ala Ile Ala Pro Phe Asn Val Pro Glu Gly				
		145		150
				155
				160
Met Val Gln Ile Ile Glu Glu Pro Ser Ile Glu Lys Thr Gln Glu Leu				
		165		170
				175
Met Gly Ala Val Asp Val Val Val Ala Thr Gly Gly Met Gly Met Val				
		180		185
				190
Lys Ser Ala Tyr Ser Ser Gly Lys Pro Ser Phe Gly Val Gly Ala Gly				
		195		200
				205
Asn Val Gln Val Ile Val Asp Ser Asn Ile Asp Phe Glu Ala Ala Ala				
		210		215
				220
Glu Lys Ile Ile Thr Gly Arg Ala Phe Asp Asn Gly Ile Ile Cys Ser				
		225		230
				235
				240
Gly Glu Gln Ser Ile Ile Tyr Asn Glu Ala Asp Lys Glu Ala Val Phe				
		245		250
				255
Thr Ala Phe Arg Asn His Gly Ala Tyr Phe Cys Asp Glu Ala Glu Gly				
		260		265
				270
Asp Arg Ala Arg Ala Ala Ile Phe Glu Asn Gly Ala Ile Ala Lys Asp				
		275		280
				285

Val Val Gly Gln Ser Val Ala Phe Ile Ala Lys Lys Ala Asn Ile Asn
290 295 300

Ile Pro Glu Gly Thr Arg Ile Leu Val Val Glu Ala Arg Gly Val Gly
305 310 315 320

Ala Glu Asp Val Ile Cys Lys Glu Lys Met Cys Pro Val Met Cys Ala
325 330 335

Leu Ser Tyr Lys His Phe Glu Glu Gly Val Glu Ile Ala Arg Thr Asn
340 345 350

Leu Ala Asn Glu Gly Asn Gly His Thr Cys Ala Ile His Ser Asn Asn
355 360 365

Gln Ala His Ile Ile Leu Ala Gly Ser Glu Leu Thr Val Ser Arg Ile
370 375 380

Val Val Asn Ala Pro Ser Ala Thr Thr Ala Gly Gly His Ile Gln Asn
385 390 395 400

Gly Leu Ala Val Thr Asn Thr Leu Gly Cys Gly Ser Trp Gly Asn Asn
405 410 415

Ser Ile Ser Glu Asn Phe Thr Tyr Lys His Leu Leu Asn Ile Ser Arg
420 425 430

Ile Ala Pro Leu Asn Ser Ser Ile His Ile Pro Asp Asp Lys Glu Ile
435 440 445

Trp Glu Leu
450

<210> 52

<211> 1116

<212> DNA

<213> Porphyromonas gingivalis

<400> 52

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aaggaattct gtcttggaga acgcgacttg gtaattacca acgagttcat ctatgaaccg 120

tatatgaagg catgccagct cccctgccat tttgttatgc aggagaaata tgggcaaggc 180

gagcctttctg acgaaatgat gaataacatc ttggcagaca tccgtaatat ccagttcgac 240

```

cgcgtaatcg gtatcggagg aggtacgggtt attgacatct cttaaactttt cgttctgaaa      300
ggattaaatg atgtactcga tgcattcgac cgcaaaatac ctottatcaa agagaaagaa      360
ctgatcattg tgcccacaac atgcggaacg ggtagcggagg tgacgaacat ttctatcgca      420
gaaatcaaaa gccgtcacac caaaatggga ttggctgacg atgccattgt tgcagaccat      480
gccatcatca tacctgaact tctgaagagc ttgcctttcc acttctacgc atgcagtgca      540
atcgatgctc ttatccatgc catcgagtca tacgtatctc cttaaagccag tccatattct      600
cgtctgttca gtgaggcggc ttgggacatt atcctggaag tattcaagaa aatcgccgaa      660
caaggccctg aataccgctt cgaaaagctg ggagaaatga tcatggccag caactatgcc      720
ggtatagcct tcggaaatgc aggagtagga gccgtccacg cactatccta cccgttggga      780
ggcaactatc acgtgccgca tggagaagca aactatcagt tcttcacaga ggtattcaaa      840
gtataccaaa agaagaatcc tttcggctat atagtcgaac tcaactggaa gctctccaag      900
atactgaact gccagcccgga atacgtatat ccgaagctgg atgaacttct cggatgcctt      960
cttaccaaga aaccttttgc cgaatacggc atgaaggacg aagaggtaag aggcctttgcg     1020
gaatcagtgc ttaagacaca gcaaagattg ctgcceaaca actacgtaga gcttactgta     1080
gatgagatcg aaggtatcta cagaagactc tactaa                                  1116

```

<210> 53

<211> 371

<212> PRT

<213> Porphyromonas gingivalis

<400> 53

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Met Gln Leu Phe Lys Leu Lys Ser Val Thr His His Phe Asp Thr Phe
1           5           10           15

```

```

Ala Glu Phe Ala Lys Glu Phe Cys Leu Gly Glu Arg Asp Leu Val Ile
          20           25           30

```

```

Thr Asn Glu Phe Ile Tyr Glu Pro Tyr Met Lys Ala Cys Gln Leu Pro
          35           40           45

```

```

Cys His Phe Val Met Gln Glu Lys Tyr Gly Gln Gly Glu Pro Ser Asp
          50           55           60

```

```

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

```

Arg Val Ile Gly Ile Gly Gly Gly Thr Val Ile Asp Ile Ser Lys Leu
85 90 95

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

Ile Pro Leu Ile Lys Glu Lys Glu Leu Ile Ile Val Pro Thr Thr Cys
115 120 125

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

Arg His Thr Lys Met Gly Leu Ala Asp Asp Ala Ile Val Ala Asp His
145 150 155 160

Ala Ile Ile Ile Pro Glu Leu Leu Lys Ser Leu Pro Phe His Phe Tyr
165 170 175

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

Ser Pro Lys Ala Ser Pro Tyr Ser Arg Leu Phe Ser Glu Ala Ala Trp
195 200 205

Asp Ile Ile Leu Glu Val Phe Lys Lys Ile Ala Glu His Gly Pro Glu
210 215 220

Tyr Arg Phe Glu Lys Leu Gly Glu Met Ile Met Ala Ser Asn Tyr Ala
225 230 235 240

Gly Ile Ala Phe Gly Asn Ala Gly Val Gly Ala Val His Ala Leu Ser
245 250 255

Tyr Pro Leu Gly Gly Asn Tyr His Val Pro His Gly Glu Ala Asn Tyr
260 265 270

Gln Phe Phe Thr Glu Val Phe Lys Val Tyr Gln Lys Lys Asn Pro Phe
275 280 285

Gly Tyr Ile Val Glu Leu Asn Trp Lys Leu Ser Lys Ile Leu Asn Cys
290 295 300

Gln Pro Glu Tyr Val Tyr Pro Lys Leu Asp Glu Leu Leu Gly Cys Leu
305 310 315 320

Leu Thr Lys Lys Pro Leu His Glu Tyr Gly Met Lys Asp Glu Glu Val
325 330 335

Arg Gly Phe Ala Glu Ser Val Leu Lys Thr Gln Gln Arg Leu Leu Ala
340 345 350

Asn Asn Tyr Val Glu Leu Thr Val Asp Glu Ile Glu Gly Ile Tyr Arg
355 360 365

Arg Leu Tyr
370

```
<210> 54
<211> 1296
<212> DNA
<213> Porphyromonas gingivalis
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<400> 54	
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catatcaaaa atggagaacg ggtagctttg tcacatgctg ccggaggtcc tcagagttgt	120
gttgatgcac tggtaaca ggcgcacctt ttccagaatg tcgaaattta tcacatgctt	180
tgtctcggcg aaggaaaata tatggcacct gaaatggccc ctcaactccg acacataacc	240
aattttgtag gtggtaatc tcgtaaagca gttgaggaaa atagagccga cttcattccg	300
gtattctttt atgaagtgcc atcaatgatt cgcaaagaca tccttcacat agatgtcgcc	360
atcggtcagc tttcaatgcc tgatgagaat gggtactgta gttttggagt atcttgcgat	420
tatagcaaac cggcagcaga aagcgcctcat ttagttatag gggaaatcaa ccgtcaaattg	480
ccatatgtac atggcgacaa cttgattcac atatcgaagt tggattacat cgtgatggca	540
gactacccta tctattctct tgcaaagccc aaaatcggag aagtagaaga agctatcggg	600
cgtaattgtg ccgagcttat tgaagatggt gccacactcc aactcgggat cggcgcgatt	660
cctgatgcag ccctgttatt cctcaaggac aaaaaagatc tggggatcca taccgagatg	720
ttctccgatg gtgttgctga attagttcgc agtggagtaa ttacaggaaa gaaaaagaca	780
cttcaccccg gaaagatggt cgcaaccttc ttaatgggaa gcgaagacgt atatcatttc	840
atcgacaaaa atcccgatgt agaactttat ccggtagatt acgtcaatga tccgcgagta	900
atcgctcaaa atgataatat ggtcagcacc aatagctgta tcgaaatcga tcttatggga	960
caagtcgtgt ccgaatgtat aggaagcaag caattcagcg gaaccggcgg tcaagtagat	1020

tatgttcgtg gagcagcatg gtctaaaaac ggcaaaagca tcatggcaat tccctcaaca 1080
gccaaaaaacg gtactgcatac tgaattgta cctataattg cagagggagc tgctgtaaca 1140
acctccgca acgaagtcga ttacgttgta accgaatacg gtatagcaca actcaaagga 1200
aagagtttgc gccagcgagc agaagctctt attgccatag cccacccgga tttcagagag 1260
gaactaacga aacatctccg caaacgtttc ggataa 1296

<210> 55

<211> 431

<212> PRT

<213> Porphyromonas gingivalis

<400> 55

Met Lys Asp Val Leu Ala Glu Tyr Ala Ser Arg Ile Val Ser Ala Glu
1 5 10 15

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

Ala Ala Gly Val Pro Gln Ser Cys Val Asp Ala Leu Val Gln Gln Ala
35 40 45

Asp Leu Phe Gln Asn Val Glu Ile Tyr His Met Leu Cys Leu Gly Glu
50 55 60

Gly Lys Tyr Met Ala Pro Glu Met Ala Pro His Phe Arg His Ile Thr
65 70 75 80

Asn Phe Val Gly Gly Asn Ser Arg Lys Ala Val Glu Glu Asn Arg Ala
85 90 95

Asp Phe Ile Pro Val Phe Phe Tyr Glu Val Pro Ser Met Ile Arg Lys
100 105 110

Asp Ile Leu His Ile Asp Val Ala Ile Val Gln Leu Ser Met Pro Asp
115 120 125

Glu Asn Gly Tyr Cys Ser Phe Gly Val Ser Cys Asp Tyr Ser Lys Pro
130 135 140

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

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

Ile Val Met Ala Asp Tyr Pro Ile Tyr Ser Leu Ala Lys Pro Lys Ile
 180 185 190

Gly Glu Val Glu Glu Ala Ile Gly Arg Asn Cys Ala Glu Leu Ile Glu
 195 200 205

Asp Gly Ala Thr Leu Gln Leu Gly Ile Gly Ala Ile Pro Asp Ala Ala
 210 215 220

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

Phe Ser Asp Gly Val Val Glu Leu Val Arg Ser Gly Val Ile Thr Gly
 245 250 255

Lys Lys Lys Thr Leu His Pro Gly Lys Met Val Ala Thr Phe Leu Met
 260 265 270

Gly Ser Glu Asp Val Tyr His Phe Ile Asp Lys Asn Pro Asp Val Glu
 275 280 285

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

Asp Asn Met Val Ser Ile Asn Ser Cys Ile Glu Ile Asp Leu Met Gly
 305 310 315 320

Gln Val Val Ser Glu Cys Ile Gly Ser Lys Gln Phe Ser Gly Thr Gly
 325 330 335

Gly Gln Val Asp Tyr Val Arg Gly Ala Ala Trp Ser Lys Asn Gly Lys
 340 345 350

Ser Ile Met Ala Ile Pro Ser Thr Ala Lys Asn Gly Thr Ala Ser Arg
 355 360 365

Ile Val Pro Ile Ile Ala Glu Gly Ala Ala Val Thr Thr Leu Arg Asn
 370 375 380

Glu Val Asp Tyr Val Val Thr Glu Tyr Gly Ile Ala Gln Leu Lys Gly
 385 390 395 400

Lys Ser Leu Arg Gln Arg Ala Glu Ala Leu Ile Ala Ile Ala His Pro
 405 410 415

Asp Phe Arg Glu Glu Leu Thr Lys His Leu Arg Lys Arg Phe Gly
 420 425 430

<210> 56
 <211> 906
 <212> DNA
 <213> Clostridium acetobutylicum

<400> 56
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 gctgttgctg tagcacaaga cgagccagta cttgaagcag taagagatgc taagaaaaat 120
 ggtattgcag atgctattct tgttgagac catgacgaaa tcgtgtcaat cgcgcttaaa 180
 ataggaatgg atgtaaatga ttttgaaata gtaaacgagc ctaacgttaa gaaagctgct 240
 ttaaaggcag tagagcttgt atcaactgga aaagctgata tggtaatgaa gggacttgta 300
 aatacagcaa ctttcttaag atctgtatta aacaaagaag ttggacttag aacaggaaaa 360
 actatgtctc acgttgcagt atttgaaaact gagaaatttg atagactatt atttttaaca 420
 gatgttgctt tcaatactta tcttgaatta aaggaaaaaa ttgatatagt aaacaattca 480
 gttaagggtg cacatgcaat aggaattgaa aatccaaagg ttgctccaat ttgtgcagtt 540
 gaggttataa accctaaaat gccatcaaca cttgatgcag caatgctttc aaaaatgagt 600
 gacagaggac aaattaaagg ttgtgtagtt gacggacctt tagcacttga tatagcttta 660
 tcagaagaag cagcacatca taaggagta acaggagaag ttgctggaaa agctgatatc 720
 ttcttaatgc caaacataga aacaggaaat gtaatgtata agactttaac atatacaact 780
 gattcaaaaa atggaggaat cttagttgga acttctgcac cagttgtttt aacttcaaga 840
 gctgacagcc atgaaacaaa aatgaactct atagcacttg cagctttagt tgcaggcaat 900
 aaataa 906

<210> 57
 <211> 301
 <212> PRT
 <213> Clostridium acetobutylicum

<400> 57
 Met Ile Lys Ser Phe Asn Glu Ile Ile Met Lys Val Lys Ser Lys Glu
 1 5 10 15

Met Lys Lys Val Ala Val Ala Val Ala Gln Asp Glu Pro Val Leu Glu
20 25 30

Ala Val Arg Asp Ala Lys Lys Asn Gly Ile Ala Asp Ala Ile Leu Val
35 40 45

Gly Asp His Asp Glu Ile Val Ser Ile Ala Leu Lys Ile Gly Met Asp
50 55 60

Val Asn Asp Phe Glu Ile Val Asn Glu Pro Asn Val Lys Lys Ala Ala
65 70 75 80

Leu Lys Ala Val Glu Leu Val Ser Thr Gly Lys Ala Asp Met Val Met
85 90 95

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

Glu Val Gly Leu Arg Thr Gly Lys Thr Met Ser His Val Ala Val Phe
115 120 125

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

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

Val Lys Val Ala His Ala Ile Gly Ile Glu Asn Pro Lys Val Ala Pro
165 170 175

Ile Cys Ala Val Glu Val Ile Asn Pro Lys Met Pro Ser Thr Leu Asp
180 185 190

Ala Ala Met Leu Ser Lys Met Ser Asp Arg Gly Gln Ile Lys Gly Cys
195 200 205

Val Val Asp Gly Pro Leu Ala Leu Asp Ile Ala Leu Ser Glu Glu Ala
210 215 220

Ala His His Lys Gly Val Thr Gly Glu Val Ala Gly Lys Ala Asp Ile
225 230 235 240

2

2

100

ga
ca
ga
cc
gt
at
ag
gc
gt
gt
at
aa
gt
ca
at
aa
gg

<210> 59
 <211> 355
 <212> PRT
 <213> Clostridium acetobutylicum

<400> 59

Met Tyr Arg Leu Leu Ile Ile Asn Pro Gly Ser Thr Ser Thr Lys Ile
 1 5 10 15

Gly Ile Tyr Asp Asp Glu Lys Glu Ile Phe Glu Lys Thr Leu Arg His
 20 25 30

Ser Ala Glu Glu Ile Glu Lys Tyr Asn Thr Ile Phe Asp Gln Phe Gln
 35 40 45

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

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

Ile Val Ser Gly Thr Tyr Ala Val Asn Gln Lys Met Leu Glu Asp Leu
 85 90 95

Lys Val Gly Val Gln Gly Gln His Ala Ser Asn Leu Gly Gly Ile Ile
 100 105 110

Ala Asn Glu Ile Ala Lys Glu Ile Asn Val Pro Ala Tyr Ile Val Asp
 115 120 125

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

Ala Asp Ile Pro Arg Lys Ser Ile Phe His Ala Leu Asn Gln Lys Ala
 145 150 155 160

Val Ala Arg Arg Tyr Ala Lys Glu Val Gly Lys Lys Tyr Glu Asp Leu
 165 170 175

Asn Leu Ile Val Val His Met Gly Gly Gly Thr Ser Val Gly Thr His
 180 185 190

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

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

Arg Leu Cys Phe Ser Asn Lys Tyr Thr Tyr Glu Glu Val Met Lys Lys
225 230 235 240

Ile Asn Gly Lys Gly Gly Val Val Ser Tyr Leu Asn Thr Ile Asp Phe
245 250 255

Lys Ala Val Val Asp Lys Ala Leu Glu Gly Asp Lys Lys Cys Ala Leu
260 265 270

Ile Tyr Glu Ala Phe Thr Phe Gln Val Ala Lys Glu Ile Gly Lys Cys
275 280 285

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

Ile Ala Tyr Asn Glu His Val Cys Asn Ala Ile Glu Asp Arg Val Lys
305 310 315 320

Phe Ile Ala Pro Val Val Arg Tyr Gly Gly Glu Asp Glu Leu Leu Ala
325 330 335

Leu Ala Glu Gly Gly Leu Arg Val Leu Arg Gly Glu Glu Lys Ala Lys
340 345 350

Glu Tyr Lys
355

<210> 60

<211> 906

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 60

atgattaaga gttttaatga aattatcatg aaggtaaaga gcaaagaaat gaaaaaagtt 60

gctgttgctg tagcacaaga cgaqccagta cttgaagcag tacgcgatgc taagaaaaat 120

ggatttgcag atgctattct tgttggcgac catgacgaaa tcgtgtcaat cgcgottaaa 180

ataggcatgg atgtaaatga ttttgaaaata gtaaacgagc ctaacgttaa gaaagctgct 240

```

ttaaaggcag tagagctggg atcaactgga aaagctgata tggtaatgaa gggacttgta 300
aatacagcaa ctttcttacg ctctgtatta aacaaagaag ttggactgag aacaggaaaa 360
actatgtctc acgttgcaat atttgaaact gagaaatttg atcgtctgtt atttttaaca 420
gatgttgctt tcaataactta tcctgaatta aaggaaaaaa ttgatatcgt aaacaattca 480
gttaagggtg cacatgcaat aggtattgaa aatccaaagg ttgctccaat ttgtgcagtt 540
gagggtataa accctaaaat gccatcaaca cttgatgcag caatgctttc aaaaatgagt 600
gacagaggac aaattaaagg ttgtgtagtt gacggaccgt tagcacttga tatcgcttta 660
tcagaagaag cagcacatca taagggcgta acaggagaag ttgctggaaa agctgatatc 720
ttcttaatgc caaacattga aacaggaaat gtaatgtata agactttaac atatacaact 780
gatagcaaaa atggcggaat cttagttgga acttctgcac cagttgtttt aacttcacgc 840
gctgacagcc atgaaacaaa aatgaactct attgcacttg cagctttagt tgcaggcaat 900
aaataa 906

```

<210> 61

<211> 906

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 61

```

atgattaaga gttttaatga aattatcatg aaggtaaaga gcaaagaaat gaaaaaagtt 60
gctgttgctg tagcacaaga cgagccagta cttgaagcag tacgcgatgc taagaaaaat 120
ggatattgccg atgctattct gggtggcgac catgacgaaa tcgtgtctat cgcgctgaaa 180
atagggcatgg atgtaaatga ttttgaaatt gttaacgagc ctaacgttaa gaaagctgcg 240
ttaaaggcag tagagctggg atcaactgga aaagctgata tggtaatgaa gggactggta 300
aataccgcaa ctttcttacg ctctgtatta aacaaagaag ttggtctgcg tacaggaaaa 360
accatgtctc acgttgcaat atttgaaact gagaaatttg atcgtctgtt atttttaaca 420
gatgttgctt tcaataactta tcctgaatta aaggaaaaaa ttgatatcgt taacaatagc 480
gttaagggtg cacatgccat tggattgaa aatccaaagg ttgctccaat ttgtgcagtt 540
gagggtatta acccgaaaaat gccatcaaca cttgatgcag caatgctttc aaaaatgagt 600
gaccgcggac aaattaaagg ttgtgtagtt gacggaccgc tggcacttga tatcgcttta 660

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tcagaagaag cagcacatca taaaggcgta acaggagaag ttgctggaaa agctgatata	720
ttcttaatgc caaacattga aacaggaaat gtaatgtata agacgttaac ctataccact	780
gatagcaaaa atggcgggcat cctgggttga acttctgcac cagttgtttt aacttcacgc	840
gctgacagcc atgaaacaaa aatgaactct attgcaactgg cagcgctggg tgcaggcaat	900
aaataa	906

<210> 62

<211> 906

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 62

atgattaaga gttttaatga aattatcatg aaggtaaaga gcaaagaaat gaaaaaagtt	60
gctgttgctg ttgcacaaga cgagcgggta ctggaagcgg tacgcgatgc taagaaaaat	120
ggtattgcgc atgctattct ggttggcgac catgacgaaa tcgtctctat cgcgctgaaa	180
attggcatgg atgttaatga ttttgaaatt gttaacgagc ctaacgttaa gaaagctgcg	240
ctgaaggcgg tagagctggg ttccaccgga aaagctgata tggtaatgaa agggctgggtg	300
aataccgcaa ctttcttacg cagcgtaactg aacaaagaag ttggtctgcg taccggaaaa	360
accatgagtc acgttgccgt atttgaaact gagaaatttg atcgtctgct gtttctgacc	420
gatgttgctt tcaataacta tcttgaatta aaagaaaaaa ttgatatcgt taacaatagc	480
gttaagggtg cgcattgccat tggatttgaa aatocaaagg ttgctccaat ttgtgcagtt	540
gagggttatta acccgaaaat gccatcaaca cttgatgcgc caatgcttag caaaatgagt	600
gaccgcggaac aaattaaagg ttgtgtgggt gacggccgcg tggcaactgga tatcggtta	660
agcgaagaag cggcacatca taaaggcgta accggcgaag ttgctggaaa agctgatata	720
ttctgatgc caaacattga aacaggcaat gtaatgtata aaacgttaac ctataccact	780
gatagcaaaa atggcgggcat cctgggttga acttctgcac cagttgtttt aacctcacgc	840
gctgacagcc atgaaaccaa aatgaacagc attgcaactgg cagcgctggg tgcaggcaat	900
aaataa	906

<210> 63

<211> 906

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 63

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atgattaaaa gttttaacga aattatcatg aaagtgaaaa gcaaagagat gaaaaaagtg      60
gcggttgccg ttgcgcagga tgaaccggtg ctggaagcgg tgccgcgatgc caaaaaaac      120
ggtattgccg atgccattct ggtgggcgat cagcatgaaa ttgtctctat tgcgctgaaa      180
attggcatgg atgttaacga ttttgaaatt gttaatgaac cgaacgtgaa aaaagcggcg      240
ctgaaagcgg ttgaaactgg ttccacoggt aaagccgata tggatgatgaa agggctggtg      300
aataccgcaa ccttcctgcg cagcgtgctg aataaagaag tgggtctgcg taccggtaaa      360
accatgagtc atgttgccgt gtttgaaacc gaaaaatttg accgtctgct gtttctgacc      420
gatgttgcg ttaataccta tccggaactg aaagagaaaa ttgatatcgt taataacagc      480
gtgaaagtgg cgcattgccat tggatttgaa aaccgcgaaag tggcgccgat ttgcgcggtt      540
gaagtgatta acccgaaaaat gccgtcaacg ctggatgccg cgatgctcag caaaatgagc      600
gatcgcggtc aaatcaaagg ctgtgtggtt gatggccgcg tggcgctgga tatcgcgctt      660
agcgaagaag cggcgcatca taaaggcgtg accggcgaag tggccggtaa agccgatatt      720
ttcctgatgc cgaatattga aaccggcaac gtgatgtata aaacgctgac ctataccacc      780
gacagcaaaa acggcgccat tctggtgggt accagcgcgc cgggtggtgct gacctcgcgc      840
gccgacagcc atgaaaccaa aatgaacagc attgcgctgg cggcgctggt ggccggtaat      900
aaataa                                           906

```

<210> 64

<211> 1068

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 64

```

atgtatcggt tactgattat caatcctggc tcgacctcaa ctaaaattgg tatttatgac      60
gatgaaaaag agatatttga gaagaattta cgtcattcag ctgaagagat agaaaaatat      120
aacactatat ttgatcaatt tcagttcaga aagaatgtaa ttctcgatgc gttaaaagaa      180
gcaaacattg aagtaagttc tttaaatgct gtagttggac gcggcggaact gttaaagcca      240
atagtaagtg gaacttatgc agtaaatcaa aaaatgcttg aagaccttaa agtaggcgtt      300

```

```

caaggtcagc atgCGTcaaa tcttGGtgga attattgcaa atgaaatagc aaaagaaata      360
aatgttccag catacatcgt tgatccagtt gttgtggatg agcttgatga agtttcacgt      420
atatcaggaa tggctgacat tccacgtaaa agtatattcc atgcattaaa tcaaaaagca      480
gttgctagac gctatgcaaa agaagttgga aaaaaatacg aagatcttaa tttaatcgtg      540
gtccacatgg gtggcggtac ttcagtaggt actcataaag atggtagagt aattgaagtt      600
aataatacac ttgatggaga aggtccattc tcaccagaaa gaagtggtagg cgttccaata      660
ggcgatcttg tacgtttgtg cttcagcaac aaatatactt atgaagaagt aatgaaaaag      720
ataaacggca aaggcgcgct tgttagttag ttaaatacta tcgattttaa ggctgtagtt      780
gataaagctc ttgaaggcga taagaaatgt gcacttatat atgaagcttt cacattccag      840
gtagcaaaaag agataggaaa atgttcaacc gttttaaaag gaaatgtaga tgcaataatc      900
ttaacaggcg gaattgcgta caacgagcat gtatgtaatg ccatagagga tagagtaaaa      960
ttcattgcac ctgtagttcg ttatgggtgga gaagatgaac ttcttgcaact tgcagaaggt    1020
ggactgCGcg ttttacgCGg agaagaaaaa gctaaggaat acaaataa                    1068

```

<210> 65

<211> 1068

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 65

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atgtatcgtt tactgattat caatcctggc tcgacctcaa ctaaaattgg tatttatgac      60
gatgaaaaag agatatttga gaagacgtta cgtcattcag ctgaagagat tgaaaaatat    120
aacactatat ttgatcaatt tcagttccgc aagaatgtga ttctcgatgc gttaaaagaa    180
gcaaacattg aagtcagttc tttaaatgct gtagttggac gcggcggact gttaaagcca    240
attgtcagtg gaacttatgc agtaaatcaa aaaatgcttg aagaccttaa agtgggcggt    300
caaggtcagc atgccagcaa tcttGGtgGC attattGCCa atgaaatCGc aaaagaaatC    360
aatgttccag catacatcgt tgatccggtt gttgtggatg agcttgatga agttagccgt    420
ataagcggaa tggctgacat tccacgtaaa agtatattcc atgcattaaa tcaaaaagca    480
gttgctcgtc gctatgcaaa agaagttggt aaaaaatacg aagatcttaa tttaatcgtg    540
gtccacatgg gtggcggtac ttcagtaggt actcataaag atggtcgCGt gattgaagtt    600

```

```

aataatacac ttgatggcga aggtccattc tcaccagaac gtagtgggtg cgttccaatt      660
ggcgatctgg tacgtttgtg cttcagcaac aaatatactt atgaagaagt gatgaaaaag      720
ataaacggca aaggcggcgt tgtagttac ctgaatacta tcgattttaa ggctgtagtt      780
gataaagcgc ttgaaggcga taagaaatgt gcactgattt atgaagcttt caccttccag      840
gtagcaaaag agattggtaa atgttcaacc gttttaaaag gaaatgttga tgccattatc      900
ttaacaggcg gcattgctta caacgagcat gtatgtaatg ccattgagga tcgcgtaaaa      960
ttcattgcac ctgtagttcg ttatgggtggc gaagatgaac tgctggcact ggcagaaggt    1020
ggactgcgcg ttttacgcgg cgaagaaaaa gcgaaggaat acaaataa      1068

```

<210> 66

<211> 1068

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 66

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atgtatcgtc tgctgattat caatcctggc tcgacctcaa ctaaaattgg tatttatgac      60
gatgaaaaag agatatttga gaaaacgtta cgtcatagcg ctgaagagat tgaaaaatat    120
aacactathtt ttgatcaatt tcagttccgc aagaatgtga ttctcgatgc gctgaaagaa    180
gcaaacattg aagtcagttc gctgaatgcg gtagttggtc gcggcggctc gctgaagcca    240
attgtcagcg gcaattatgc ggtaaatcaa aaaatgctgg aagacctgaa agtgggcgtt    300
caggggcagc atgccagcaa tcttgggtggc attattgcca atgaaatcgc caaagaaatc    360
aatgttccgg catacatcgt tgatccgggt gttgtggatg agctggatga agttagccgt    420
atcagcggaa tggctgacat tccacgtaaa agtattttcc atgcactgaa tcaaaaagcg    480
gttgccgcgt cctatgcaaa agaagttggt aaaaaatacg aagatcttaa tctgatcgtg    540
gtgcatatgg gtggcggtag tagcgctcgt actcataaag atggtcgcgt gattgaagtt    600
aataatacac ttgatggcga aggtccattc tcaccagaac gtagcgggtg cgttccaatt      660
ggcgatctgg tacgtttgtg cttcagcaac aaatatacct atgaagaagt gatgaaaaag      720
ataaacggca aaggcggcgt tgtagttac ctgaatacta tcgattttaa ggcggttagtt      780
gataaagcgc tggaaggcga taagaaatgt gcactgattt atgaagcgtt caccttccag      840
gtggcaaaaag agattggtaa atgttcaacc gttctgaaag gcaatgttga tgccattatc      900
ctgaccggcg gcattgctta caacgagcat gtttgaatg ccattgagga tcgcgtaaaa      960

```

ttcattgcac ctgtggttcg ttatggtggc gaagatgaac tgctggcact ggcagaaggt 1020
 ggtctgcgcg ttttacgcgg cgaagaaaaa gcgaaagaat acaaataa 1068

<210> 67
 <211> 1068
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 polynucleotide

<400> 67
 atgtatcgtc tgctgattat caaccgggc agcacctcaa ccaaattgg tatttacgac 60
 gatgaaaaag agatttttga aaaaacgctg cgtcacagcg cagaagagat tgaaaaatac 120
 aacaccattt tcgatcagtt ccagttccgc aaaaacgtga ttctcgatgc gctgaaagaa 180
 gccaatattg aagtctcttc gctgaatgcg gtggtcggtc gcggcggtct gctgaaaccg 240
 attgtcagcg gcacttatgc ggttaatcag aaaatgctgg aagatctgaa agtgggcgtg 300
 caggggcagc atgccagcaa tctcggcggc attatcgcca atgaaatcgc caaagagatc 360
 aacgtgccgg cttatatcgt cgatccggtg gtggttgatg aactggatga agtcagccgt 420
 atcagcggca tggcggatat tccgcgtaaa agcattttcc atgcgctgaa tcagaaagcg 480
 gttgcgcgtc gctatgccaa agaagtgggt aaaaaatatg aagatctcaa tctgattgtg 540
 gtgcatatgg gcggcggcac cagcgtcggc acgcataaag atggtcgcgt gattgaagtg 600
 aataacacgc tggatggcga agggccgttc tcgccggaac gtagcggcgg cgtgccgatt 660
 ggcgatctgg tgcgtctgtg ttccagcaat aaatacacct acgaagaagt gatgaaaaaa 720
 atcaacggca aaggcggcgt ggttagctat ctgaatacca tcgattttta agcgggtggtt 780
 gataaagcgc tggaaggcga taaaaaatgc gcgctgattt atgaagcgtt taccttccag 840
 gtggcgaaag agattggtaa atgttcaacc gtgctgaaag gcaacgttga tgccattatt 900
 ctgaccggcg gcattgctta taacgaacat gtttgtaatg ccattgaaga tcgctgaaa 960
 tttattgcgc cgggtgtgcg ttacggcggc gaagatgaac tgctggcgct gcgggaaggc 1020
 ggtctgcgcg tgctgcgcgg cgaagaaaaa gcgaaagagt acaaataa 1068

<210> 68
 <211> 1407
 <212> DNA
 <213> Clostridium biejerinckii

<400> 68

```

atgaataaaag acacactaat acctacaact aaagatttaa aagtaaaaac aaatggtgaa      60
aacattaatt taaagaacta caaggataat tcttcatggt tcggagtatt cgaaaatggt      120
gaaaatgcta taagcagcgc tgtacacgca caaaagatat tatcccttca ttatacaaaa      180
gagcaaagag aaaaaatcat aactgagata agaaaggccg cattacaaaa taaagaggtc      240
ttggctacaa tgattctaga agaaacacat atgggaagat atgaggataa aatattaaaa      300
catgaattgg tagctaaata tactcctggt acagaagatt taactactac tgcttggtca      360
ggtgataatg gtcttacagt tgtagaaatg tctccatatg gtgttatagg tgcaataact      420
ccttctacga atccaactga aactgtaata tgtaatagca taggcatgat agctgctgga      480
aatgctgtag tatttaacgg acacccatgc gctaaaaaat gtgttgccct tgctgttgaa      540
atgataaata aggcaattat ttcatgtggc ggtcctgaaa atctagtaac aactataaaa      600
aatccaacta tggagtctct agatgcaatt attaagcatc cttcaataaa acttctttgc      660
ggaactgggg gtccaggaat ggtaaaaacc ctcttaaatt ctggtagaa agctataggt      720
gctggtgctg gaaatccacc agttattgta gatgatactg ctgatataga aaaggctggt      780
aggagcatca ttgaaggctg ttcttttgat aataatttac cttgtattgc agaaaaagaa      840
gtatttgitt ttgagaatgt tgcagatgat ttaatatcta acatgctaaa aaataatgct      900
gtaattataa atgaagatca agtatcaaaa ttaatagatt tagtattaca aaaaaataat      960
gaaactcaag aatactttat aaacaaaaaa tgggtaggaa aagatgcaaa attattctta     1020
gatgaaatag atgttgagtc tccttcaaat gttaaagca taatctgcga agtaaagca     1080
aatcatccat ttgttatgac agaactcatg atgccaatat tgccaattgt aagagttaaa     1140
gatatagatg aagctattaa atatgcaaag atagcagaac aaaatagaaa acatagtgcc     1200
tatatttatt ctaaaaaatat agacaaccta aatagatttg aaagagaaat agatactact     1260
atttttgtaa agaatgctaa atcttttgct ggtgttggtt atgaagcaga aggatttaca     1320
actttcacta ttgctggatc tactggtgag ggaataacct ctgcaaggaa ttttacaaga     1380
caaagaagat gtgtacttgc cggctaa                                           1407

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<210> 69

<211> 468

<212> PRT

<213> *Clostridium biejerinckii*

<400> 69

```

Met Asn Lys Asp Thr Leu Ile Pro Thr Thr Lys Asp Leu Lys Val Lys
1              5              10              15

```

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

Cys Phe Gly Val Phe Glu Asn Val Glu Asn Ala Ile Ser Ser Ala Val
35 40 45

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

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

Leu Ala Thr Met Ile Leu Glu Glu Thr His Met Gly Arg Tyr Glu Asp
85 90 95

Lys Ile Leu Lys His Glu Leu Val Ala Lys Tyr Thr Pro Gly Thr Glu
100 105 110

Asp Leu Thr Thr Thr Ala Trp Ser Gly Asp Asn Gly Leu Thr Val Val
115 120 125

Glu Met Ser Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Ser Thr Asn
130 135 140

Pro Thr Glu Thr Val Ile Cys Asn Ser Ile Gly Met Ile Ala Ala Gly
145 150 155 160

Asn Ala Val Val Phe Asn Gly His Pro Cys Ala Lys Lys Cys Val Ala
165 170 175

Phe Ala Val Glu Met Ile Asn Lys Ala Ile Ile Ser Cys Gly Gly Pro
180 185 190

Glu Asn Leu Val Thr Thr Ile Lys Asn Pro Thr Met Glu Ser Leu Asp
195 200 205

Ala Ile Ile Lys His Pro Ser Ile Lys Leu Leu Cys Gly Thr Gly Gly
210 215 220

Pro Gly Met Val Lys Thr Leu Leu Asn Ser Gly Lys Lys Ala Ile Gly
225 230 235 240

45/80

Ala Gly Ala Gly Asn Pro Pro Val Ile Val Asp Asp Thr Ala Asp Ile
245 250 255

Glu Lys Ala Gly Arg Ser Ile Ile Glu Gly Cys Ser Phe Asp Asn Asn
260 265 270

Leu Pro Cys Ile Ala Glu Lys Glu Val Phe Val Phe Glu Asn Val Ala
275 280 285

Asp Asp Leu Ile Ser Asn Met Leu Lys Asn Asn Ala Val Ile Ile Asn
290 295 300

Glu Asp Gln Val Ser Lys Leu Ile Asp Leu Val Leu Gln Lys Asn Asn
305 310 315 320

Glu Thr Gln Glu Tyr Phe Ile Asn Lys Lys Trp Val Gly Lys Asp Ala
325 330 335

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

Cys Ile Ile Cys Glu Val Asn Ala Asn His Pro Phe Val Met Thr Glu
355 360 365

Leu Met Met Pro Ile Leu Pro Ile Val Arg Val Lys Asp Ile Asp Glu
370 375 380

Ala Ile Lys Tyr Ala Lys Ile Ala Glu Gln Asn Arg Lys His Ser Ala
385 390 395 400

Tyr Ile Tyr Ser Lys Asn Ile Asp Asn Leu Asn Arg Phe Glu Arg Glu
405 410 415

Ile Asp Thr Thr Ile Phe Val Lys Asn Ala Lys Ser Phe Ala Gly Val
420 425 430

Gly Tyr Glu Ala Glu Gly Phe Thr Thr Phe Thr Ile Ala Gly Ser Thr
435 440 445

Gly Glu Gly Ile Thr Ser Ala Arg Asn Phe Thr Arg Gln Arg Arg Cys
450 455 460

Val Leu Ala Gly
465

<210> 70
 <211> 1407
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 70
 atgaataaaag acacactaat acctacaact aaagatttaa aagtaaaaaac aaatggtgaa 60
 aacattaatt taaagaacta caaggataat tcttcatggt tcggcgtatt cgaataatggt 120
 gaaaatgcta taagcagcgc tgtacacgca caaaagatat tatcccttca ttatacaaaa 180
 gagcaacgtg aaaaaatcat aactgagata agaaaggccg cattacaaaa taaagaggtc 240
 ttggctacaa tgattctgga agaaacacat atgggacggt atgaggataa aatattaaaa 300
 catgaattgg tagctaaata tactcctggt acagaagatt taactactac tgcctggtca 360
 ggtgataatg gtctgacagt tgtagaaatg tctccatag gtgttattgg tgcaataact 420
 ccttctacga atccaactga aactgtaata tgtaaatagca taggcatgat tgctgctgga 480
 aatgctgtag tatttaacgg acacccatgc gctaaaaaat gtgttgccct tgctgttgaa 540
 atgataaata aggcaattat ttcattgtggc ggtcctgaaa atctggtaac aactataaaa 600
 aatccaacca tggagtcctt ggatgcaatt attaagcatc cttcaataaa acttctttgc 660
 ggaactgggg gtccaggaat ggtaaaaacc ctgttaaatt ctggtaagaa agctataggt 720
 gctggtgctg gaaatccacc agttattgtc gatgatactg ctgatataga aaaggctggt 780
 cgtagcatca ttgaaggctg ttcttttgat aataatttac cttgtattgc agaaaaagaa 840
 gtatttgttt ttgagaatgt tgcagatgat ttaatatcta acatgctaaa aaataatgct 900
 gtaattataa atgaagatca agtatcaaaa ttaatcgatt tagtattaca aaaaaataat 960
 gaaactcaag aatactttat aaacaaaaaa tgggtaggaa aagatgcaaa attattcctc 1020
 gatgaaatag atgttgagtc tccttcaaat gttaaatgca taatctgcga agtaaatgca 1080
 aatcatccat ttgttatgac agaactgatg atgccaatat tgccaattgt acgcgttaaa 1140
 gatatcgatg aagctattaa atatgcaaag atagcagaac aaaatagaaa acatagtgcc 1200
 tataatttatt ctaaaaaatat cgacaacctg aatcgctttg aacgtgaaat agatactact 1260
 atttttgtaa agaatgctaa atcttttgct ggtgttggtt atgaagcaga aggatttaca 1320
 actttcacta ttgctggatc tactggtgag ggaataacct ctgcacgtaa ttttacacgc 1380

caacgtcgct gtgtacttgc cggctaa

1407

<210> 71

<211> 1407

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 71

atgaataaag acacactgat ccctacaact aaagatttaa aagtaaaaac aaatggtgaa	60
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gaaaatgcta tcagcagcgc tgtacacgca caaaagatat tatcgctgca ttatacaaaa	180
gagcaacgtg aaaaaatcat cactgagata cgtaaggccg cattacaaaa taaagaggtg	240
ctggctacaa tgattctgga agaaacacat atgggacgtt atgaggataa aatattaaaa	300
catgaactgg tagctaaata tactctgtgt acagaagatt taactactac tgcttgagc	360
ggtgataatg gtcctgacagt ttagagaaatgt tctccatatt gtgttattgg tgcaataact	420
ccttctacca atccaactga aactgtaatt tgtaaatagca ttggcatgat tgctgctgga	480
aatgctgtag tatttaacgg acacccatgc gctaaaaaat gtgttgccct tgctgttgaa	540
atgatcaata aggcaattat tagctgtggc ggtccggaaa atctggtaac aactataaaa	600
aatccaacca tggagtctct ggatgccatt attaagcatc cttcaataaa actgctttgc	660
ggaactggcg gtccaggaat ggtaaaaacc ctgttaaat ctggtaagaa agctattggt	720
gctggtgctg gaaatccacc agttattgtc gatgatactg ctgatattga aaaggctggt	780
cgtagcatca ttgaaggctg ttcttttgat aataatttac cttgtattgc agaaaaagaa	840
gtattttgtt ttgagaatgt tgcagatgat ttaatatcta acatgctgaa aaataatgct	900
gtaattatca atgaagatca ggtatcaaaa ttaatcgatt tagtattaca aaaaaataat	960
gaaactcaag aatactttat caacaaaaaa tgggtaggta aagatgcaaa attattctct	1020
gatgaaatcg atgttgagtc tccttcaaat gttaaatgca ttatctgcga agtgaatgcc	1080
aatcatccat ttgttatgac agaactgatg atgccaatat tgccaattgt gcgcgttaaa	1140
gatatcgatg aagctattaa atatgcaaag attgcagaac aaaatagaaa acatagtgcc	1200
tatatttata gcaaaaaatat cgacaacctg aatcgctttg aacgtgaaat cgatactact	1260
atttttgtaa agaatgctaa atcttttgct ggtgttggtt atgaagcaga aggatttacc	1320
actttcacta ttgctggatc tactgggtgag ggcataacct ctgcacgtaa ttttaccgcg	1380

caacgtcgct gtgtactggc cggctaa

1407

<210> 72

<211> 1407

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 72

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gaaaatgcta tcagcagcgc ggtacacgca caaaagatac tctcgctgca ttataccaaa	180
gagcaacgtg aaaaaatcat cactgagatc cgtaaggcgc cattacaaaa taaagagggtg	240
ctggcaacaa tgattctgga agaaacacat atgggacggt atgaggataa aatactgaaa	300
catgaactgg tggcgaaata tacgcctggt actgaagatt taaccaccac tgccctggagc	360
ggtgataatg gtctgaccgt tgtggaaatg tcgccttatg gtgttattgg tgcaattacg	420
ccttcaacca atccaactga aacggtaatt tgtaatagca ttggcatgat tgctgctgga	480
aatgcggtag tatttaacgg tcacccctgc gctaaaaaat gtgttgccct tgctgttgaa	540
atgatcaata aagcgattat tagctgtggc ggtccggaaa atctggtaac cactataaaa	600
aatccaacca tggagtcgct ggatgccatt attaagcatt cttcaatcaa actgctgtgc	660
ggcactggcg gtccaggaat ggtgaaaacc ctgctgaata gcggtaagaa agcgattggt	720
gctggtgctg gaaatccacc agttattgtc gatgatactg ctgatattga aaaagcgggt	780
cgtagcatca ttgaaggctg ttcttttgat aataatttac cttgtattgc agaaaaagaa	840
gtatttgttt ttgagaatgt tgccgatgat ctgatctcta acatgctgaa aaataatgcg	900
gtgattatca atgaagatca ggtagcaaaa ctgatcgatc tggattaca aaaaaataat	960
gaaactcaag aatactttat caacaaaaaa tgggtaggta aagatgcaaa actgttccctc	1020
gatgaaatcg atgttgagtc gccttcaaat gttaaattgca ttatctgoga agtgaatgcc	1080
aatcatccat ttgtgatgac cgaaotgatg atgocaaatt tgccgattgt ggcggttaaa	1140
gatatcgatg aagcgattaa atatgcaaag attgcagaac aaaatcgtaa acatagtgcc	1200
tatatttata gcaaaaatat cgacaacctg aatcgctttg aacgtgaaat cgataccact	1260
atttttgtga agaatgctaa atcttttgcg ggtgttggtt atgaagcaga aggttttacc	1320

actttcacta ttgctggaag caccggtgaa ggcattacct ctgcacgtaa ttttaccgcg 1380
 caacgtcgct gtgtactggc cggctaa 1407

<210> 73

<211> 1407

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
 polynucleotide

<400> 73

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 aatatcaacc tgaaaaacta taaagataac agcagttgct ttggcgtggt tgaaaacgtt 120
 gaaaacgcca tctccagcgc ggtgcatgcg caaaaaattc tctcgctgca ttacaccaa 180
 gagcagcgtg aaaaaattat caccgaaatc cgtaaagcgg cgctgcaaaa caaagaagtg 240
 ctggcaacca tgatcctgga agaaacgcgt atggggcggt atgaagataa aattctgaaa 300
 catgaactgg tggcgaaata cagccggggc actgaagatc tgaccaccac cgcttgagc 360
 ggcgataacg gcctgaccgt ggtggagatg tcgccttatg gcgtgattgg cgcgattacg 420
 ccgtcaacca acccgaccga aacggtgatt tgtaacagca ttggcatgat tgccgcggtt 480
 aatgcggtgg tgtttaacgg tcatccctgc gcgaaaaaat gtgtggcggt tgccgttgag 540
 atgatcaaca aagcgattat cagctgcggc ggcccggaaa atctggtgac caccatcaaa 600
 aatccgacca tggaatcgct ggatgccatt atcaaacatc cttccatcaa actgctgtgc 660
 ggcaccggcg gcccgggcat ggtgaaaacg ctgctgaaca gcggtaaaaa agcgattggc 720
 gcgggcgcgg gtaaccggcc ggtgattgtc gatgacaccg ccgatattga aaaagcgggg 780
 cgtagcatta ttgaaggctg ttcttttgat aacaacctgc cctgcattgc cgaaaaagaa 840
 gtgtttgtct ttgaaaacgt cgcgatgat ctgatcagca atatgctgaa aaacaacgcg 900
 gtgattatca atgaagatca ggtagcaaa ctgatcgatc tggtgctgca aaaaaacaac 960
 gaaacgcagg aatatattat caacaaaaaa tgggttggtg aagatgccaa actgtttctc 1020
 gatgaaatcg atgttgaatc gccgtctaac gtgaaatgta ttatctgcga agtgaacgcc 1080
 aaccatccgt ttgtgatgac cgaactgatg atgccgattc tgccgattgt gcgctgaaa 1140
 gatatcgatg aagcgattaa atatgccaaa attgccgaac aaaaccgtaa acacagcgcc 1200
 tatatttaca gcaaaaatat cgataacctg aaccgctttg aacgtgaaat cgataccacc 1260
 atttttgtga aaaatgccaa aagttttgcc ggcgttggtt atgaagcgga aggttttacc 1320

acctttacca ttgccggtag caccggcgaa ggcattacca gggcccgtaa ttttaccgcg 1380
 cagcgtcgct gcgtgctggc gggctaa 1407

<210> 74
 <211> 1023
 <212> DNA
 <213> *Geobacillus thermoglucosidasius*

<400> 74
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 ccatctatit catatggcga agtattagtc cgcattaaag catgcggtgt atgccatacg 120
 gacttgcaag ccgctcatgg cgattggcca gtaaaaccaa aacttccttt aatccctggc 180
 catgaaggag tcggaattgt tgaagaagtc ggtccggggg taaccatttt aaaagtggga 240
 gaccgcgttg gaattccttg gttatattct gcgtgcggcc attgcgaata ttgtttaagc 300
 ggacaagaag cattatgtga acatcaacaa aacgccggtt actcagtcga cgggggttat 360
 gcagaatatt gcagagctgc gccagattat gtggtgaaaa ttcctgacaa cttatcgttt 420
 gaagaagctg ctctatitit ctgcgcgga gttactactt ataaagcgtt aaaagtcaca 480
 ggtacaaaac cgggagaatg ggtagcgatc tatggcatcg gcggccttgg acatgttgcc 540
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 gcccaattta tgaaagagaa agtcggcgga gtacacgcgg ctgttgtgac agctgtatct 720
 aaacctgctt ttcaatctgc gtacaattct atccgcagag gcggcacgtg cgtgcttgtc 780
 ggattaccgc cggaagaaat gcctattcca atctttgata cggattataa cggaattaaa 840
 attatcggtt ccattgtcgg caccgggaaa gacttgcaag aagcgcttca gttcgctgca 900
 gaaggtaaag taaaaaccat tattgaagtg caacctcttg aaaaaattaa cgaagtatit 960
 gacagaatgc taaaaggaga aattaacgga cgggttgitt taacgttaga aaataataat 1020
 taa 1023

<210> 75
 <211> 340
 <212> PRT
 <213> *Geobacillus thermoglucosidasius*

<400> 75
 Met Lys Ala Ala Val Val Glu Gln Phe Lys Glu Pro Leu Lys Ile Lys
 1 5 10 15

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

Lys Ala Cys Gly Val Cys His Thr Asp Leu His Ala Ala His Gly Asp
 35 40 45

Trp Pro Val Lys Pro Lys Leu Pro Leu Ile Pro Gly His Glu Gly Val
 50 55 60

Gly Ile Val Glu Glu Val Gly Pro Gly Val Thr His Leu Lys Val Gly
 65 70 75 80

Asp Arg Val Gly Ile Pro Trp Leu Tyr Ser Ala Cys Gly His Cys Glu
 85 90 95

Tyr Cys Leu Ser Gly Gln Glu Ala Leu Cys Glu His Gln Gln Asn Ala
 100 105 110

Gly Tyr Ser Val Asp Gly Gly Tyr Ala Glu Tyr Cys Arg Ala Ala Pro
 115 120 125

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

Pro Ile Phe Cys Ala Gly Val Thr Thr Tyr Lys Ala Leu Lys Val Thr
 145 150 155 160

Gly Thr Lys Pro Gly Glu Trp Val Ala Ile Tyr Gly Ile Gly Gly Leu
 165 170 175

Gly His Val Ala Val Gln Tyr Ala Lys Ala Met Gly Leu His Val Val
 180 185 190

Ala Val Asp Ile Gly Asp Glu Lys Leu Glu Leu Ala Lys Glu Leu Gly
 195 200 205

Ala Asp Leu Val Val Asn Pro Ala Lys Glu Asn Ala Ala Gln Phe Met
 210 215 220

Lys Glu Lys Val Gly Gly Val His Ala Ala Val Val Thr Ala Val Ser
 225 230 235 240

52/80

Lys Pro Ala Phe Gln Ser Ala Tyr Asn Ser Ile Arg Arg Gly Gly Thr
245 250 255

Cys Val Leu Val Gly Leu Pro Pro Glu Glu Met Pro Ile Pro Ile Phe
260 265 270

Asp Thr Val Leu Asn Gly Ile Lys Ile Ile Gly Ser Ile Val Gly Thr
275 280 285

Arg Lys Asp Leu Gln Glu Ala Leu Gln Phe Ala Ala Glu Gly Lys Val
290 295 300

Lys Thr Ile Ile Glu Val Gln Pro Leu Glu Lys Ile Asn Glu Val Phe
305 310 315 320

Asp Arg Met Leu Lys Gly Glu Ile Asn Gly Arg Val Val Leu Thr Leu
325 330 335

Glu Asn Asn Asn
340

<210> 76

<211> 4090

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 76

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aaagcctcta tggaagttec gtctccgcag gcgggtatcg ttaaagagat caaagtctct	180
gttggcgata aaaccagac cggcgactg attatgattt tcgattccgc cgacggtgca	240
gcagacgctg cacctgctca ggcagaagag aagaaagaag cagctccggc agcagcacca	300
gcggctgcgg cggcaaaaga cgtaaacgtt ccggatatcg gcagcgacga agttgaagtg	360
accgaaatcc tgggtgaaagt tggcgataaa gttgaagctg aacagtcgct gatcaccgta	420
gaaggcgaca aggcttctat ggaagttccg gctccgtttg ctggcaccgt gaaagagatc	480
aaagtgaacg tgggtgacaa agtgtctacc ggctcgctga ttatggtctt cgaagtcgcg	540
ggtgaagcag gcgcggcagc tccggccgct aaacaggaag cagctccggc agcggccctt	600

gcaaccagcgg ctggcgtgaa agaagttaac gttccggata tccggcgggtga cgaagttgaa	660
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ctgaccgaga aagaagcgaa agagaaaggc atcagctacg aaaccgccac cttcccggtg	3360
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gttcgcatac tgctgaccgt tgctcgttat tcagcctgac agtatggta ctgtcgttta	3960
gaogttgtgg gcggctctcc tgaactttct cccgaaaaac ctgacgttgt tcaggtgatg	4020
ccgattgaac acgctggcgg gcgttatcac gttgctgttg attcagtggt cgctgctgta	4080

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4090

<210> 77

<211> 475

<212> PRT

<213> Escherichia coli

<400> 77

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Thr	Val	Ile	Val	Glu	Arg	Tyr	Asn	Thr	Leu	Gly	Gly	Val	Cys	Leu	Asn
		35					40					45			

Val	Gly	Cys	Ile	Pro	Ser	Lys	Ala	Leu	Leu	His	Val	Ala	Lys	Val	Ile
	50					55					60				

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

Lys	Thr	Asp	Ile	Asp	Lys	Ile	Arg	Thr	Trp	Lys	Glu	Lys	Val	Ile	Asn
			85						90					95	

Gln	Leu	Thr	Gly	Gly	Leu	Ala	Gly	Met	Ala	Lys	Gly	Arg	Lys	Val	Lys
			100					105					110		

Val	Val	Asn	Gly	Leu	Gly	Lys	Phe	Thr	Gly	Ala	Asn	Thr	Leu	Glu	Val
		115					120					125			

Glu	Gly	Glu	Asn	Gly	Lys	Thr	Val	Ile	Asn	Phe	Asp	Asn	Ala	Ile	Ile
	130					135					140				

Ala	Ala	Gly	Ser	Arg	Pro	Ile	Gln	Leu	Pro	Phe	Ile	Pro	His	Glu	Asp
145					150					155					160

Pro	Arg	Ile	Trp	Asp	Ser	Thr	Asp	Ala	Leu	Glu	Leu	Lys	Glu	Val	Pro
				165					170					175	

Glu	Arg	Leu	Leu	Val	Met	Gly	Gly	Gly	Ile	Ile	Gly	Leu	Glu	Met	Gly
			180					185					190		

Thr Val Tyr His Ala Leu Gly Ser Gln Ile Asp Val Val Glu Met Phe
 195 200 205

Asp Gln Val Ile Pro Ala Ala Asp Lys Asp Ile Val Lys Val Phe Thr
 210 215 220

Lys Arg Ile Ser Lys Lys Phe Asn Leu Met Leu Glu Thr Lys Val Thr
 225 230 235 240

Ala Val Glu Ala Lys Glu Asp Gly Ile Tyr Val Thr Met Glu Gly Lys
 245 250 255

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

Gly Arg Val Pro Asn Gly Lys Asn Leu Asp Ala Gly Lys Ala Gly Val
 275 280 285

Glu Val Asp Asp Arg Gly Phe Ile Arg Val Asp Lys Gln Leu Arg Thr
 290 295 300

Asn Val Pro His Ile Phe Ala Ile Gly Asp Ile Val Gly Gln Pro Met
 305 310 315 320

Leu Ala His Lys Gly Val His Glu Gly His Val Ala Ala Glu Val Ile
 325 330 335

Ala Gly Lys Lys His Tyr Phe Asp Pro Lys Val Ile Pro Ser Ile Ala
 340 345 350

Tyr Thr Glu Pro Glu Val Ala Trp Val Gly Leu Thr Glu Lys Glu Ala
 355 360 365

Lys Glu Lys Gly Ile Ser Tyr Glu Thr Ala Thr Phe Pro Trp Ala Ala
 370 375 380

Ser Gly Arg Ala Ile Ala Ser Asp Cys Ala Asp Gly Met Thr Lys Leu
 385 390 395 400

Ile Phe Asp Lys Glu Ser His Arg Val Ile Gly Gly Ala Ile Val Gly
 405 410 415

Thr Asn Gly Gly Glu Leu Leu Gly Glu Ile Gly Leu Ala Ile Glu Met
 420 425 430

Gly Cys Asp Ala Glu Asp Ile Ala Leu Thr Ile His Ala His Pro Thr
 435 440 445

Leu His Glu Ser Val Gly Leu Ala Ala Glu Val Phe Glu Gly Ser Ile
 450 455 460

Thr Asp Leu Pro Asn Pro Lys Ala Lys Lys Lys
 465 470 475

<210> 78

<211> 475

<212> PRT

<213> *Klebsiella pneumoniae*

<400> 78

Met Met Ser Thr Glu Ile Lys Thr Gln Val Val Val Leu Gly Ala Gly
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Pro Ala Gly Tyr Ser Ala Ala Phe Arg Cys Ala Asp Leu Gly Leu Glu
 20 25 30

Thr Val Ile Val Glu Arg Tyr Ser Thr Leu Gly Gly Val Cys Leu Asn
 35 40 45

Val Gly Cys Ile Pro Ser Lys Ala Leu Leu His Val Ala Lys Val Ile
 50 55 60

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

Lys Thr Asp Ile Asp Lys Ile Arg Thr Trp Lys Glu Lys Val Ile Thr
 85 90 95

Gln Leu Thr Gly Gly Leu Ala Gly Met Ala Lys Gly Arg Lys Val Lys
 100 105 110

Val Val Asn Gly Leu Gly Lys Phe Thr Gly Ala Asn Thr Leu Glu Val
 115 120 125

Glu Gly Glu Asn Gly Lys Thr Val Ile Asn Phe Asp Asn Ala Ile Ile
 130 135 140

Ala Ala Gly Ser Arg Pro Ile Gln Leu Pro Phe Ile Pro His Glu Asp
 145 150 155 160

Pro Arg Val Trp Asp Ser Thr Asp Ala Leu Glu Leu Lys Ser Val Pro
 165 170 175

Lys Arg Met Leu Val Met Gly Gly Gly Ile Ile Gly Leu Glu Met Gly
 180 185 190

Thr Val Tyr His Ala Leu Gly Ser Glu Ile Asp Val Val Glu Met Phe
 195 200 205

Asp Gln Val Ile Pro Ala Ala Asp Lys Asp Val Val Lys Val Phe Thr
 210 215 220

Lys Arg Ile Ser Lys Lys Phe Asn Leu Met Leu Glu Ala Lys Val Thr
 225 230 235 240

Ala Val Glu Ala Lys Glu Asp Gly Ile Tyr Val Ser Met Glu Gly Lys
 245 250 255

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

Gly Arg Val Pro Asn Gly Lys Asn Leu Asp Ala Gly Lys Ala Gly Val
 275 280 285

Glu Val Asp Asp Arg Gly Phe Ile Arg Val Asp Lys Gln Met Arg Thr
 290 295 300

Asn Val Pro His Ile Phe Ala Ile Gly Asp Ile Val Gly Gln Pro Met
 305 310 315 320

Leu Ala His Lys Gly Val His Glu Gly His Val Ala Ala Glu Val Ile
 325 330 335

Ser Gly Leu Lys His Tyr Phe Asp Pro Lys Val Ile Pro Ser Ile Ala
 340 345 350

Tyr Thr Lys Pro Glu Val Ala Trp Val Gly Leu Thr Glu Lys Glu Ala
 355 360 365

Lys Glu Lys Gly Ile Ser Tyr Glu Thr Ala Thr Phe Pro Trp Ala Ala
 370 375 380

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Ser Gly Arg Ala Ile Ala Ser Asp Cys Ala Asp Gly Met Thr Lys Leu
385 390 395 400

Ile Phe Asp Lys Glu Thr His Arg Val Ile Gly Gly Ala Ile Val Gly
405 410 415

Thr Asn Gly Gly Glu Leu Leu Gly Glu Ile Gly Leu Ala Ile Glu Met
420 425 430

Gly Cys Asp Ala Glu Asp Ile Ala Leu Thr Ile His Ala His Pro Thr
435 440 445

Leu His Glu Ser Val Gly Leu Ala Ala Glu Val Phe Glu Gly Ser Ile
450 455 460

Thr Asp Leu Pro Asn Ala Lys Ala Lys Lys Lys
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<210> 79

<211> 347

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 79

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gttagtgtga aagctgacaa cccttttgat cttttacttc ctgctgcaat ggccaaagtg	180
gccgaagagg cgggtgtcta taaagcaacg aaacatccgc ttaagacttt ctatctggcg	240
attaccgccg gtgttttcat ctcaatcgca ttcaccactg gcacaggcac agaaggtagg	300
tgttacatgt cagaacgttt acacaatgac gtggatccta ttattat	347

<210> 80

<211> 4678

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 80

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tgaatcacc gagatcctgg tcaaagtggg cgacaaagtt gaagccgaac agtcgctgat	120
caccgtagaa ggcgacaaaag cctctatgga agttccgtct ccgcaggcgg gtatcgtaa	180
agagatcaaa gtctctgttg gcgataaaac ccagaccggc gcaactgatta tgattttcga	240
ttccgccgac ggtgcagcag acgctgcacc tgctcaggca gaagagaaga aagaagcagc	300
tccggcagca gcaccagcgg ctgcggcggc aaaagacgtt aacgttccgg atatcggcag	360
cgacgaagtt gaagtgaccg aaatcctggt gaaagttggc gataaagttg aagctgaaca	420
gtcgtgatc accgtagaag gcgacaaggc ttctatggaa gtccggctc cgtttgctgg	480
caccgtgaaa gagatcaaaag tgaacgtggg tgacaaagtg tctaccggct cgctgattat	540
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cggtgacgaa gttgaagtga ctgaagtgat ggtgaaagtg ggcgacaaag ttgccgtga	720
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<210> 81

<211> 1114

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<220>

<221> CDS

<222> (323)..(958)

<400> 81

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tctctcttag ttctatttc gaagttccta ttctctagaa agtataggaa ctccggcgcg 120

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cctacctgtg acggaagatc acttcgcaga ataaataaat cctggtgtcc ctgttgatac	180
cggaagccc tgggccaaact tttggcgaaa atgagacgtt gatcggcacg taagaggttc	240
caactttcac cataatgaaa taagatcact accgggcgta ttttttgagt tgctgagatt	300
ttcaggagct aaggaagcta aa atg gag aaa aaa atc act gga tat acc acc	352
Met Glu Lys Lys Ile Thr Gly Tyr Thr Thr	
1 5 10	
gtt gat ata tcc caa tgg cat cgt aaa gaa cat ttt gag gca ttt cag	400
Val Asp Ile Ser Gln Trp His Arg Lys Glu His Phe Glu Ala Phe Gln	
15 20 25	
tca gtt gct caa tgt acc tat aac cag acc gtt cag ctg gat att acg	448
Ser Val Ala Gln Cys Thr Tyr Asn Gln Thr Val Gln Leu Asp Ile Thr	
30 35 40	
gcc ttt tta aag acc gta aag aaa aat aag cac aag ttt tat ccg gcc	496
Ala Phe Leu Lys Thr Val Lys Lys Asn Lys His Lys Phe Tyr Pro Ala	
45 50 55	
ttt att cac att ctt gcc cgc ctg atg aat gct cat ccg gaa tta cgt	544
Phe Ile His Ile Leu Ala Arg Leu Met Asn Ala His Pro Glu Leu Arg	
60 65 70	
atg gca atg aaa gac ggt gag ctg gtg ata tgg gat agt gtt cac cct	592
Met Ala Met Lys Asp Gly Glu Leu Val Ile Trp Asp Ser Val His Pro	
75 80 85 90	
tgt tac acc gtt ttc cat gag caa act gaa acg ttt tca tcg ctc tgg	640
Cys Tyr Thr Val Phe His Glu Gln Thr Glu Thr Phe Ser Ser Leu Trp	
95 100 105	
agt gaa tac cac gac gat ttc cgg cag ttt cta cac ata tat tcg caa	688
Ser Glu Tyr His Asp Asp Phe Arg Gln Phe Leu His Ile Tyr Ser Gln	
110 115 120	
gat gtg gcg tgt tac ggt gaa aac ctg gcc tat ttc cct aaa ggg ttt	736
Asp Val Ala Cys Tyr Gly Glu Asn Leu Ala Tyr Phe Pro Lys Gly Phe	
125 130 135	
att gag aat atg ttt ttc gtc tca gcc aat ccc tgg gtg agt ttc acc	784
Ile Glu Asn Met Phe Phe Val Ser Ala Asn Pro Trp Val Ser Phe Thr	
140 145 150	
agt ttt gat tta aac gtg gcc aat atg gac aac ttc ttc gcc ccc gtt	832
Ser Phe Asp Leu Asn Val Ala Asn Met Asp Asn Phe Phe Ala Pro Val	
155 160 165 170	
ttc acc atg ggc aaa tat tat acg caa ggc gac aag gtg ctg atg ccg	880
Phe Thr Met Gly Lys Tyr Tyr Thr Gln Gly Asp Lys Val Leu Met Pro	
175 180 185	
ctg gcg att cag gtt cat cat gcc gtt tgt gat ggc ttc cat gtc ggc	928
Leu Ala Ile Gln Val His His Ala Val Cys Asp Gly Phe His Val Gly	
190 195 200	

aga tgc tta atg aat aca aca gta ctg cga tgagtggcag ggcggggcgt 978
 Arg Cys Leu Met Asn Thr Thr Val Leu Arg
 205 210

aaggcgcgcc atttaaataga agttcctatt ccgaagttcc tattctctag aaagtatagg 1038

aacttcgaag cagctccagc ctacaccctt cttcagggct gactgtttgc ataaaaattc 1098

atctgtatgc acaata 1114

<210> 82

<211> 212

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
 polypeptide

<400> 82

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 20 25 30

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

Lys Lys Asn Lys His Lys Phe Tyr Pro Ala Phe Ile His Ile Leu Ala
 50 55 60

Arg Leu Met Asn Ala His Pro Glu Leu Arg Met Ala Met Lys Asp Gly
 65 70 75 80

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

Glu Gln Thr Glu Thr Phe Ser Ser Leu Trp Ser Glu Tyr His Asp Asp
 100 105 110

Phe Arg Gln Phe Leu His Ile Tyr Ser Gln Asp Val Ala Cys Tyr Gly
 115 120 125

Glu Asn Leu Ala Tyr Phe Pro Lys Gly Phe Ile Glu Asn Met Phe Phe
 130 135 140

65/80

Val Ser Ala Asn Pro Trp Val Ser Phe Thr Ser Phe Asp Leu Asn Val
145 150 155 160

Ala Asn Met Asp Asn Phe Phe Ala Pro Val Phe Thr Met Gly Lys Tyr
165 170 175

Tyr Thr Gln Gly Asp Lys Val Leu Met Pro Leu Ala Ile Gln Val His
180 185 190

His Ala Val Cys Asp Gly Phe His Val Gly Arg Cys Leu Met Asn Thr
195 200 205

Thr Val Leu Arg
210

<210> 83

<211> 2521

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
polynucleotide

<400> 83

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<210> 84
 <211> 3010
 <212> DNA
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 84

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 <213> Artificial Sequence

<220>
 <223> Description of Artificial Sequence: Synthetic
 polynucleotide

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 aacgccatcc gtattcaggg ccagtcgggg cactccagcg atccagcacg cggagttaac 240
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<210> 86

<211> 4960

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 86

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<210> 87

<211> 5083

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic polynucleotide

<400> 87

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