

~4559687.txt  
SEQUENCE LISTING

<110> Lek Pharmaceuticals  
Mrak, Peter

<120> SYNTHESIS OF STATINS

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<160> 49

<170> PatentIn version 3.4

<210> 1

<211> 780

<212> DNA

<213> Escherichia coli

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<212> PRT

<213> Escherichia coli

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20           25           30

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Cys His Gln Ala Lys Thr Pro Val Gly Asn Thr Ala Ala Ile Cys Ile
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Tyr Pro Arg Phe Ile Pro Ile Ala Arg Lys Thr Leu Lys Glu Gln Gly
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85 90 95

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

Gly Asn Glu Gln Val Gly Phe Asp Leu Val Lys Ala Cys Lys Glu Ala  
115 120 125

Cys Ala Ala Ala Asn Val Leu Leu Lys Val Ile Ile Glu Thr Gly Glu  
130 135 140

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

Ala Gly Ala Asp Phe Ile Lys Thr Ser Thr Gly Lys Val Ala Val Asn  
165 170 175

Ala Thr Pro Glu Ser Ala Arg Ile Met Met Glu Val Ile Arg Asp Met  
180 185 190

Gly Val Glu Lys Thr Val Gly Phe Lys Pro Ala Gly Gly Val Arg Thr  
195 200 205

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

Ala Asp Trp Ala Asp Ala Arg His Tyr Arg Phe Gly Ala Ser Ser Leu  
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Ser Ser Tyr

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<211> 663
<212> DNA
<213> Unknown

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<220>
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<213> Unknown

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<220>
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<400> 5

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```

20

25

30

Phe Ala Ala Val Cys Val Asn Pro Thr Trp Val Lys Thr Ala Ala Arg  
35 40 45

Glu Leu Ser Gly Thr Asp Val Arg Val Cys Thr Val Ile Gly Phe Pro  
50 55 60

Leu Gly Ala Thr Thr Pro Glu Thr Lys Ala Phe Glu Thr Thr Asn Ala  
65 70 75 80

Ile Glu Asn Gly Ala Arg Glu Val Asp Met Val Ile Asn Ile Gly Ala  
85 90 95

Leu Lys Ser Gly Gln Asp Glu Leu Val Glu Arg Asp Ile Arg Ala Val  
100 105 110

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

Ala Leu Leu Thr Asp Glu Glu Lys Val Arg Ala Cys Gln Leu Ala Val  
130 135 140

Lys Ala Gly Ala Asp Tyr Val Lys Thr Ser Thr Gly Phe Ser Gly Gly  
145 150 155 160

Gly Ala Thr Val Glu Asp Val Ala Leu Met Arg Lys Thr Val Gly Asp  
165 170 175

Arg Ala Gly Val Lys Ala Ser Gly Gly Val Arg Asp Trp Lys Thr Ala  
180 185 190

Glu Ala Met Ile Asn Ala Gly Ala Thr Arg Ile Gly Thr Ser Ser Gly  
195 200 205

Val Ala Ile Val Thr Gly Gly Thr Gly Arg Ala Asp Tyr  
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<210> 6  
<211> 666  
<212> DNA  
<213> Oceanobacillus iheyensis

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cactggggttt cttactgtta таатгаатта аагаатасас сagtтааagt ttgtacagta 180  
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<210> 7  
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Phe Ala Ser Val Cys Val Asn Pro His Trp Val Ser Tyr Cys Tyr Asn  
35 40 45  
Glu Leu Lys Asp Thr Pro Val Lys Val Cys Thr Val Ile Gly Phe Pro  
50 55 60  
Leu Gly Ala Thr Ser Thr Glu Thr Lys Ile Phe Glu Thr Asn Gln Ala  
65 70 75 80  
Ile Ala Asp Gly Ala Thr Glu Val Asp Met Val Ile Asn Val Gly Glu  
85 90 95  
Leu Lys Ser Asn Asn Asp Ala Phe Val Glu Lys Asp Ile Arg Ala Val  
100 105 110  
Val Glu Ala Ala Lys Gly Lys Ala Leu Thr Lys Val Ile Ile Glu Thr  
115 120 125  
Ser Leu Leu Thr Glu Asp Glu Lys Val Arg Ala Cys Lys Leu Ala Lys  
130 135 140  
Asn Ala Glu Ala Asp Tyr Val Lys Thr Ser Thr Gly Phe Ser Gly Gly  
145 150 155 160  
Gly Ala Thr Val Glu Asp Ile Arg Leu Met Arg Glu Thr Val Gly Pro  
165 170 175  
Glu Met Gly Val Lys Ala Ser Gly Gly Val Arg Asp Leu Glu Gln Thr  
180 185 190

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Glu Ala Met Ile Glu Ala Gly Ala Thr Arg Ile Gly Ala Ser Ser Gly  
195 200 205

Val Ala Ile Val Ser Gly Glu Gln Gly Thr Ser Asp Tyr  
210 215 220

<210> 8  
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<213> Deinococcus radiodurans

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<210> 9  
<211> 220  
<212> PRT  
<213> Deinococcus radiodurans

<400> 9

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Thr Leu Ala Asp Ile Arg Thr Leu Cys Glu Glu Ala Arg Glu His Ser  
20 25 30

Phe Tyr Ala Val Cys Ile Asn Pro Val Phe Ile Pro His Ala Arg Ala  
35 40 45

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

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

Ala Glu Thr Gly Ala Asp Glu Ile Asp Met Val Ile His Ile Gly Ser  
Page 6

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

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

Tyr Leu Thr Asp Glu Gln Lys Arg Leu Ala Thr Glu Val Ala Val Gln  
130 135 140

Gly Gly Ala Asp Phe Val Lys Thr Ser Thr Gly Phe Gly Thr Gly Gly  
145 150 155 160

Ala Thr Val Asp Asp Val Arg Leu Met Ala Glu Val Ile Gly Gly Arg  
165 170 175

Ala Gly Leu Lys Ala Ala Gly Gly Val Arg Thr Pro Ala Asp Ala Gln  
180 185 190

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

Gly Leu Val Ser Gly Gly Glu Asn Gly Ala Gly Tyr  
210 215 220

<210> 10  
<211> 675  
<212> DNA  
<213> Propionibacterium acnes

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<210> 11  
<211> 224

<212> PRT

<213> Propionibacterium acnes

<400> 11

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20 25 30

Val Ala Asp Ala Lys Lys Tyr Gly Thr Trp Ser Val Cys Val Ser Pro  
35 40 45

Ser Met Leu Pro Leu Asn Leu Asp Met Gly Asp Val His Leu Ala Val  
50 55 60

Val Cys Gly Phe Pro Ser Gly Lys His Thr Ser Ala Val Lys Ala Ala  
65 70 75 80

Glu Ala Arg Glu Ala Ile Ala Ala Gly Ala Glu Glu Val Asp Met Val  
85 90 95

Ile Asn Leu Gly Leu Val Lys Glu Gly Arg Trp Glu Asp Val Thr Ala  
100 105 110

Asp Ile Ala Ala Val Lys Gln Ala Val Pro Asp Pro Lys Ile Leu Lys  
115 120 125

Val Ile Ile Glu Ser Ala Val Leu Thr Asp Asp Glu Ile Val Arg Ala  
130 135 140

Cys Gln Ala Ala Glu Lys Ala Gly Ala Asp Phe Val Lys Thr Ser Thr  
145 150 155 160

Gly Phe His Pro Arg Gly Gly Ala Ser Val Glu Ala Val Lys Val Met  
165 170 175

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

Arg Asp Tyr Gln Thr Ala Cys Ala Met Val Glu Ala Gly Ala Thr Arg  
195 200 205

Leu Gly Val Ser Ser Thr Ala Lys Ile Leu Ala Gly Ala Pro Thr Glu  
210 215 220

<210> 12

<211> 768

<212> DNA

<213> Chromobacterium violaceum

<400> 12

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60



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cagatcgaga tcgccggcgg cgtcgccaag ccgagcagcg gctactga 768

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 <212> PRT  
 <213> Chromobacterium violaceum

<400> 13

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 35 40 45

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

Cys Pro Glu Val Gln Val Ala Thr Val Thr Asn Phe Pro His Gly Asn  
 65 70 75 80

Asp Asp Val Ser Ile Ala Val Ala Glu Thr Arg Ala Ala Ile Ala Tyr  
 85 90 95

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

Gly Asn Arg Asp Ile Gly Phe Glu Leu Val Lys Ala Cys Lys Glu Ala  
 115 120 125

Cys Gly Gly Lys Leu Leu Lys Val Ile Ile Glu Ser Gly Glu Leu Lys  
 130 135 140

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Asp Ala Ala Leu Ile Arg Glu Ala Ser Glu Ile Ser Ile Arg Ala Gly  
145 150 155 160

Ala Asp Phe Ile Lys Thr Ser Thr Gly Lys Val Pro Val Asn Ala Thr  
165 170 175

Leu Pro Ala Ala Glu Thr Met Leu Ala Val Ile Lys Glu Gln Gly Gly  
180 185 190

Gln Cys Gly Phe Lys Ala Ala Gly Gly Val Lys Ser Ala Thr Glu Ala  
195 200 205

Ala Glu Tyr Leu Ala Leu Ala Ala Arg Leu Leu Gly Glu Asp Trp Val  
210 215 220

Ser Ala Arg His Phe Arg Phe Gly Ala Ser Ser Leu Leu Ala Asn Leu  
225 230 235 240

Gln Ile Glu Ile Ala Gly Gly Val Ala Lys Pro Ser Ser Gly Tyr  
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<210> 14  
<211> 780  
<212> DNA  
<213> Agrobacterium tumefaciens

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<400> 15

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Met Thr Met Glu Leu Gln Arg Pro Arg Glu Ala Ala Ala Leu Thr Leu  
1 5 10 15

Ser Leu Leu Asp Leu Thr Asn Leu Arg Glu Asp Cys Thr Pro Gln Gln  
20 25 30

Ile Ala Thr Leu Cys Gln Arg Ala His Thr Glu Phe Gly Asn Thr Ala  
35 40 45

Ala Ile Cys Ile Trp Pro Arg Phe Val Ala Gln Ala Arg Ala Ala Phe  
50 55 60

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

Gly Asp Leu Asp Val Ala Thr Val Val Ala Glu Thr Glu Ala Ala Ile  
85 90 95

Gly Asp Gly Ala Asp Glu Ile Asp Leu Val Ile Pro Tyr Arg Lys Phe  
100 105 110

Met Ala Gly Asp Glu Ser Ala Val Ala Glu Met Ile Ala Ala Val Arg  
115 120 125

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

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

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

Asn Ala Thr Leu Glu Ala Ala Asp Ile Met Leu Gln Ala Ile Arg Asp  
180 185 190

Ser Lys Lys Lys Val Gly Phe Lys Pro Ala Gly Gly Ile Gly Thr Val  
195 200 205

Glu Asp Ala Thr Leu Tyr Leu Arg Leu Ala Glu Thr Ile Met Ala Pro  
210 215 220

Asn Trp Ala Met Pro Ser Thr Phe Arg Phe Gly Ala Ser Gly Val Leu  
225 230 235 240

Asp Asp Val Leu Asn Val Leu Ala Gly Gly Glu Pro Ala Lys Ala Ala  
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Ser Gly Tyr

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 <212> DNA  
 <213> *Anabaena variabilis*

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<210> 17  
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 <213> *Anabaena variabilis*

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 Glu Gln Ala Asp Arg Tyr Asn Phe Ala Ser Val Cys Leu Tyr Pro Thr  
 35 40 45  
 Tyr Val Lys Gln Ala Ala Glu Phe Leu His Gly Lys Lys Pro Lys Val  
 50 55 60  
 Cys Thr Val Ile Gly Phe Pro Thr Gly Ala Thr Thr Arg Ser Val Lys  
 65 70 75 80  
 Leu Tyr Glu Ala Leu Glu Ala Val Glu Asn Gly Ala Thr Glu Leu Asp  
 85 90 95  
 Val Val Ile Asn Leu Gly Cys Leu Lys Ser Gly Asn Thr Glu Ala Val  
 100 105 110  
 His Arg Glu Ile Ala Glu Ile Cys Glu Glu Thr Gly Gln Val Val Lys

115

120

125

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

Ala Asp Ile Ala Met Asp Ala Gly Ala Thr Phe Leu Lys Thr Asn Thr  
 145 150 155 160

Gly Trp Asn Gly Gly Ala Thr Val Ala Asp Val Arg Leu Leu Lys Glu  
 165 170 175

Ile Thr Arg Glu Arg Val Gly Ile Lys Ala Ser Gly Gly Ile Arg Thr  
 180 185 190

Leu Asn Gln Ala Leu Asp Leu Ile Leu Ala Gly Ala Thr Arg Leu Gly  
 195 200 205

Thr Ser Arg Gly Ile Asp Leu Ile His Gln Arg Asp Asn Pro Glu Lys  
 210 215 220

Val Glu  
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 <212> DNA  
 <213> Pseudomonas syringae

<400> 18  
 atgaattcgc tcgaaccgcg tgcactggcc caggccatcg atcacacctt gttggcggcg 60  
 gatgccagcc gagagcagat tgccacgctt tgcgcagaag cccgggaaca cggcttctac 120  
 tcggtgtgcg tgaactccag ccaggtgcct tttgccgccc gacaactggc cgggtctgcc 180  
 gtgaaggtct gtgcggtggt gggctttccg ctgggcgccc ggctgagtgc cagcaaggcg 240  
 tcggaagcag ccctgacgat cgccgcccgg gctcaggaaa tcgacatggt gctgaacatc 300  
 ggctggctca aggacggtct gttcgatgag gtccgcgacg atatcgccgc ggtgctgcaa 360  
 gcctgtggca aggtgccgct caaggtgatc ctggaaacct gcctgctcga tgaggcgacg 420  
 aaggtgacgc cctgcgagat ctgccgagag ctgggcgtgg cattcgtaaa gacctccact 480  
 ggcttcagcc gcagcggcgc gacgctcag gatgtggcgc tgatgcgccg tgtggtaggc 540  
 cctgacatcg gcgtcaaggc gtctggcggg gtgcgtgacg tggccacggc cagagcgatg 600  
 atcgaagctg gcgcaacgcg cctgggcacc agttccggga ttgcgatcgt gaccggcgca 660  
 ggtacggggg cgggttattg a 681

<210> 19  
 <211> 226  
 <212> PRT  
 <213> Pseudomonas syringae

<400> 19

~4559687.txt

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

Leu Leu Ala Ala Asp Ala Ser Arg Glu Gln Ile Ala Thr Leu Cys Ala  
20 25 30

Glu Ala Arg Glu His Gly Phe Tyr Ser Val Cys Val Asn Ser Ser Gln  
35 40 45

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

Ala Val Val Gly Phe Pro Leu Gly Ala Gly Leu Ser Ala Ser Lys Ala  
65 70 75 80

Ser Glu Ala Ala Leu Thr Ile Ala Ala Gly Ala Gln Glu Ile Asp Met  
85 90 95

Val Leu Asn Ile Gly Trp Leu Lys Asp Gly Leu Phe Asp Glu Val Arg  
100 105 110

Asp Asp Ile Ala Ala Val Leu Gln Ala Cys Gly Lys Val Pro Leu Lys  
115 120 125

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

Cys Glu Ile Cys Arg Glu Leu Gly Val Ala Phe Val Lys Thr Ser Thr  
145 150 155 160

Gly Phe Ser Arg Ser Gly Ala Thr Leu Glu Asp Val Ala Leu Met Arg  
165 170 175

Arg Val Val Gly Pro Asp Ile Gly Val Lys Ala Ser Gly Gly Val Arg  
180 185 190

Asp Val Ala Thr Ala Arg Ala Met Ile Glu Ala Gly Ala Thr Arg Leu  
195 200 205

Gly Thr Ser Ser Gly Ile Ala Ile Val Thr Gly Ala Gly Thr Gly Ala  
210 215 220

Gly Tyr  
225

<210> 20  
<211> 669  
<212> DNA  
<213> Erwinia carotovora

<400> 20  
atgactgact acgcacgcta tatcgaccac accctgctgg cagcaaatgc caccgaacag

60

~4559687.txt

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caaatcgta cgctgtgcga tgaagcgata gcgcaccatt tttatgccgt ctgtgttaat 120
tccggctacg ttcccttagt agctgaaaaa ttgaaaggtt cagcgggtaca ggtgtgctcg 180
gttattggat ttcctctcgg tgcaggcctg acttccagca aagcatttga agcgaaagcc 240
gcgattgatg ccggtgcaca ggaaatcgac atggtgatta acgtcggctg gctgaaaagc 300
gggaagattg atgccgtcaa agcggatatt caggccgtgc gtgggggttg cgccgctata 360
ccgttgaagg taatattgga aacctgtctg cttgatgacg aacagattgt gctggtgtgt 420
gaaatgtgtc gtcagttgga tgtcgcgttc gtcaaaacgt ctaccggttt cagcaccgac 480
ggcgcacgcg aagaacacgt tcgactgatg cgtagcactg tcggcagcga gatgggtgta 540
aaagcctccg gcgcggttcg cgatcgcgaa acggcacaac gaatgattga agcaggcgcc 600
acgcgtattg gcaccagttc aggcgttgct atcgtttctg atgacgctgc cgcagcaggg 660
aactactaa 669
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<210> 21  
<211> 222  
<212> PRT  
<213> Erwinia carotovora

<400> 21

Met Thr Asp Tyr Ala Arg Tyr Ile Asp His Thr Leu Leu Ala Ala Asn  
1 5 10 15

Ala Thr Glu Gln Gln Ile Val Thr Leu Cys Asp Glu Ala Ile Ala His  
20 25 30

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

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

Pro Leu Gly Ala Gly Leu Thr Ser Ser Lys Ala Phe Glu Ala Lys Ala  
65 70 75 80

Ala Ile Asp Ala Gly Ala Gln Glu Ile Asp Met Val Ile Asn Val Gly  
85 90 95

Trp Leu Lys Ser Gly Lys Ile Asp Ala Val Lys Ala Asp Ile Gln Ala  
100 105 110

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

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

Gln Leu Asp Val Ala Phe Val Lys Thr Ser Thr Gly Phe Ser Thr Asp

145 150 155 160

Gly Ala Arg Glu Glu His Val Arg Leu Met Arg Ser Thr Val Gly Ser  
165 170 175

Glu Met Gly Val Lys Ala Ser Gly Ala Val Arg Asp Arg Glu Thr Ala  
180 185 190

Gln Arg Met Ile Glu Ala Gly Ala Thr Arg Ile Gly Thr Ser Ser Gly  
195 200 205

Val Ala Ile Val Ser Asp Asp Ala Ala Ala Ala Gly Asn Tyr  
210 215 220

<210> 22  
<211> 684  
<212> DNA  
<213> Desulfotalea psychrophila

<400> 22  
atgaatacaa tcattagccc gaaagaaatt gccttgtata ttgatcacac tctcctcaaa 60  
cctgaggcaa gccctgcagc tttcgtacc ctatgcgcag aagctcgtga gtactctttc 120  
aagactgtat gcgtcaactc ttgctatgtc cctctctgtg tggaagaact tcaagcttgc 180  
cccgttgatg tttgctcggg ggtgggggtc ccacttgggg ctatgctgag ttcggcaaag 240  
gcctacgagg caaaacttgc agtggcagcc ggggccgacg aaattgatat ggttatcaat 300  
attggtctct tgaaggcagg agaacttgaa gctgttcggg cagatattga aacagttttt 360  
gccgcctgtg gagaggcaga ccttaagggtg atcattgaga caggcctgct cagcgatgcg 420  
gagaaaaaaa gcgtctgtca gatatgcaag gaagttgggtg tcgcctttgt taagacctcc 480  
acgggttttg gtcattggtg cgcaaccgtt gccgatgtag aacttatgcg tgctgttgtt 540  
ggtgagagat gtaagggttaa ggcctctggc ggggtacgca accttgccga tgcccgcgcc 600  
ctgatagcgg caggagccaa tagaattggg gcaagtgccg gtatcgcaat tgtcaatgga 660  
gaagaggtcc ccccttctcg ttaa 684

<210> 23  
<211> 227  
<212> PRT  
<213> Desulfotalea psychrophila

<400> 23

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

Thr Leu Leu Lys Pro Glu Ala Ser Pro Ala Ala Ile Arg Thr Leu Cys  
20 25 30

Ala Glu Ala Arg Glu Tyr Ser Phe Lys Thr Val Cys Val Asn Ser Cys  
35 40 45



~4559687.txt

Tyr Val Pro Leu Cys Val Glu Glu Leu Gln Ala Cys Pro Val Asp Val  
50 55 60

Cys Ser Val Val Gly Phe Pro Leu Gly Ala Met Leu Ser Ser Ala Lys  
65 70 75 80

Ala Tyr Glu Ala Lys Leu Ala Val Ala Ala Gly Ala Asp Glu Ile Asp  
85 90 95

Met Val Ile Asn Ile Gly Leu Leu Lys Ala Gly Glu Leu Glu Ala Val  
100 105 110

Arg Ala Asp Ile Glu Thr Val Phe Ala Ala Cys Gly Glu Ala Asp Leu  
115 120 125

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

Val Cys Gln Ile Cys Lys Glu Val Gly Val Ala Phe Val Lys Thr Ser  
145 150 155 160

Thr Gly Phe Gly His Gly Gly Ala Thr Val Ala Asp Val Glu Leu Met  
165 170 175

Arg Ala Val Val Gly Glu Arg Cys Lys Val Lys Ala Ser Gly Gly Val  
180 185 190

Arg Asn Leu Ala Asp Ala Arg Ala Leu Ile Ala Ala Gly Ala Asn Arg  
195 200 205

Ile Gly Ala Ser Ala Gly Ile Ala Ile Val Asn Gly Glu Glu Val Pro  
210 215 220

Pro Ser Arg  
225

<210> 24  
<211> 636  
<212> DNA  
<213> Bacillus subtilis

<400> 24  
atgtcattag ccaacataat tgatcataca gctttgaaac cgcatacaca aaaagcggac 60  
attctaaaac taattgaaga agcgaaaaca tacaaatttg cttcagtatg tgtcaatccg 120  
acatgggttg agcttgctgc aaaagagctt aagggaactg gagtcgacgt ttgtacggtc 180  
atcggcttcc cgctcggctgc caatacaact gaaacaaaag cgttcgaaac aaaagacgcc 240  
atttcaaaag gcgccactga agtggatatg gtcattaata ttgccgcttt aaaagacaag 300  
gaagacgatg tgggtggaagc tgatatccgc ggtgtagtgg aagctgtagc cggaaaagcg 360  
cttgtcaaag tcattatcga aacgtgcctt ctgactgatg aagaaaaaga acgtgcatgc 420

~4559687.txt

cgtttagcgg tgtctgcggg agcggatttc gtaaaaacat caacaggctt ttctacaggc	480
ggcgcaacga aggaagatat cgccttaatg cgcaaaacag tagggcctga tatcggcgtg	540
aaagcatctg gcggcgtcag aacgaaagaa gatgtagaca caatggtaga ggccggagca	600
agccgaattg cgccagcgca ggcgtttcta tcgtaa	636

<210> 25  
 <211> 211  
 <212> PRT  
 <213> Bacillus subtilis

<400> 25

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

Gln Lys Ala Asp Ile Leu Lys Leu Ile Glu Glu Ala Lys Thr Tyr Lys  
 20 25 30

Phe Ala Ser Val Cys Val Asn Pro Thr Trp Val Glu Leu Ala Ala Lys  
 35 40 45

Glu Leu Lys Gly Thr Gly Val Asp Val Cys Thr Val Ile Gly Phe Pro  
 50 55 60

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

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

Leu Lys Asp Lys Glu Asp Asp Val Val Glu Ala Asp Ile Arg Gly Val  
 100 105 110

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

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

Ser Ala Gly Ala Asp Phe Val Lys Thr Ser Thr Gly Phe Ser Thr Gly  
 145 150 155 160

Gly Ala Thr Lys Glu Asp Ile Ala Leu Met Arg Lys Thr Val Gly Pro  
 165 170 175

Asp Ile Gly Val Lys Ala Ser Gly Gly Val Arg Thr Lys Glu Asp Val  
 180 185 190

Asp Thr Met Val Glu Ala Gly Ala Ser Arg Ile Ala Pro Ala Gln Ala  
 195 200 205

Phe Leu Ser  
210

<210> 26  
<211> 672  
<212> DNA  
<213> *Listeria innocua*

<400> 26  
atgacaattg ccaaaatgat cgaccacact gctttaaaac cagacacaac gaaagaacaa 60  
attttaacat taacaaaaga agcaagagaa tatggttttg cttccgatg cgtgaatcca 120  
acttgggtga aattatccgc tgaacagctt tcaggagcag aatccgttgt atgtacagtt 180  
atcggtttcc cacttggagc aaatacacca gaagtaaaag cttttgaagt gaaaaatgcc 240  
atcgaaaacg gcgctaaaga agtggatatg gttattaata tcggcgcatc aaaagacaaa 300  
gacgatgaat tagtagaacg tgatattcgt gctgtagttg atgctgccaa agggaaagca 360  
ttagtaaaag taattattga aacttgccta ttaacagacg aagaaaaagt tcgcgcatgt 420  
gaaatcgctg taaaagcagg aacagacttc gttaaaacat ccactggatt ctccacaggt 480  
ggcgcaactg ccgaagatat tgctttaatg cgtaaaactg taggaccaa catcggcgta 540  
aaagcatctg gcggagtctg tacaaaagaa gacgtagaaa aaatgattga agcaggtgca 600  
actcgtatcg gcgcaagtgc aggtgtcgca attgtttccg gcgaaaaacc agctaaacca 660  
gataattact aa 672

<210> 27  
<211> 223  
<212> PRT  
<213> *Listeria innocua*

<400> 27  
Met Thr Ile Ala Lys Met Ile Asp His Thr Ala Leu Lys Pro Asp Thr  
1 5 10 15  
Thr Lys Glu Gln Ile Leu Thr Leu Thr Lys Glu Ala Arg Glu Tyr Gly  
20 25 30  
Phe Ala Ser Val Cys Val Asn Pro Thr Trp Val Lys Leu Ser Ala Glu  
35 40 45  
Gln Leu Ser Gly Ala Glu Ser Val Val Cys Thr Val Ile Gly Phe Pro  
50 55 60  
Leu Gly Ala Asn Thr Pro Glu Val Lys Ala Phe Glu Val Lys Asn Ala  
65 70 75 80  
Ile Glu Asn Gly Ala Lys Glu Val Asp Met Val Ile Asn Ile Gly Ala  
85 90 95  
Leu Lys Asp Lys Asp Asp Glu Leu Val Glu Arg Asp Ile Arg Ala Val

100

105

110

Val Asp Ala Ala Lys Gly Lys Ala Leu Val Lys Val Ile Ile Glu Thr  
115 120 125

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

Lys Ala Gly Thr Asp Phe Val Lys Thr Ser Thr Gly Phe Ser Thr Gly  
145 150 155 160

Gly Ala Thr Ala Glu Asp Ile Ala Leu Met Arg Lys Thr Val Gly Pro  
165 170 175

Asn Ile Gly Val Lys Ala Ser Gly Gly Val Arg Thr Lys Glu Asp Val  
180 185 190

Glu Lys Met Ile Glu Ala Gly Ala Thr Arg Ile Gly Ala Ser Ala Gly  
195 200 205

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

<210> 28  
<211> 648  
<212> DNA  
<213> Clostridium acetobutylicum

<400> 28  
atgaatatg ctaaaattat agatcataca gcattaaagc cagatacaac aaaggagcag 60  
atactaaaac taatagaaga agctaaacaa aataactttg catcagtttg tgtaaattcca 120  
aagtgggtta aagaggcaag ctgtgcatta aaggacagca gtgttaaagt gtgtactgta 180  
atagggtttc ctcttgagc taatacaact gctacaaaag tatttgaaac acaagatgct 240  
attaaaaatg gtgcagaaga agtagatatg gttgttttcta taggagaatt aaaagataaa 300  
aatgatgatt atgtagaaaa agatatagaa gaagttgtta aggcagctag tggaaaggcc 360  
ttagttaaag taattattga aacttgtctt cttaccgaag aagagaagat aagagcgtgt 420  
aaactagcta aaaaagcagg tgcagatttt gttaaaacat caacagggtt ttcaacagga 480  
ggggctaagg cagaagatat taaattaatg agaaaaacag ttggagctgg tatgggagtt 540  
aaggcctcag gtggtattca tacaagagaa gaagcaatta aacttataga agctggagct 600  
acacgtattg gagctagtgc aagtatatag ataatttcag aaaattaa 648

<210> 29  
<211> 215  
<212> PRT  
<213> Clostridium acetobutylicum

<400> 29  
Met Asn Ile Ala Lys Ile Ile Asp His Thr Ala Leu Lys Pro Asp Thr

1 5 10 15

Thr Lys Glu Gln Ile Leu Lys Leu Ile Glu Glu Ala Lys Gln Asn Asn  
20 25 30

Phe Ala Ser Val Cys Val Asn Pro Lys Trp Val Lys Glu Ala Ser Cys  
35 40 45

Ala Leu Lys Asp Ser Ser Val Lys Val Cys Thr Val Ile Gly Phe Pro  
50 55 60

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

Ile Lys Asn Gly Ala Glu Glu Val Asp Met Val Val Ser Ile Gly Glu  
85 90 95

Leu Lys Asp Lys Asn Asp Asp Tyr Val Glu Lys Asp Ile Glu Glu Val  
100 105 110

Val Lys Ala Ala Ser Gly Lys Ala Leu Val Lys Val Ile Ile Glu Thr  
115 120 125

Cys Leu Leu Thr Glu Glu Glu Lys Ile Arg Ala Cys Lys Leu Ala Lys  
130 135 140

Lys Ala Gly Ala Asp Phe Val Lys Thr Ser Thr Gly Phe Ser Thr Gly  
145 150 155 160

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

Gly Met Gly Val Lys Ala Ser Gly Gly Ile His Thr Arg Glu Glu Ala  
180 185 190

Ile Lys Leu Ile Glu Ala Gly Ala Thr Arg Ile Gly Ala Ser Ala Ser  
195 200 205

Ile Asp Ile Ile Ser Glu Asn  
210 215

<210> 30  
<211> 822  
<212> DNA  
<213> Geobacillus kaustophilus

<400> 30  
atggagctca taaccagcc tagttgctgg gttttttctg tctttttccg gagacaatac 60  
ggatggctag tttttgtcga gggagcatgg tatgatggta gacgtcagac tttccatctt 120  
gacggaaatg gcagaaagg gtttctccga atgacgatga atatcgcgaa aatgatcgat 180  
catacgctgc tcaaaccgga agcgacagaa caacaaatcg tgcaactgtg cacggaagca 240

~4559687.txt

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aagcaatacg gctttgcttc cgtgtgctgc aacccaacgt gggtgaaaac ggcggcgcgc 300
gagctttccg gcacggatgt ccgctgtctgc acgggtcatcg gctttccact tggggcaacg 360
acgccggaaa caaaggcggt tgaacaacg aacgccatcg aaaacggcgc tcgcgaagtc 420
gacatggtga tcaacatcgg cgcgttaaaa agcgggcaag acgagcttgt cgagcgcgac 480
attcgtgcgg ttgtcgaagc ggcggctggc agggcgcttg tcaaagtgat cgttgaaacg 540
gcgcttttga ccgatgagga aaaagtgcgc gcctgccagc tcgcagtgaa agccggcgct 600
gattatgtga aaacgtcgac cgggttttcc ggcggaggtg cgacggtgga ggatgtggcg 660
ttgatgcgga aaacggtcgg cgacagagca ggcgtcaaag catcaggcgg cgtccgtgac 720
tggaataaccg ctgaggcgat gatcaacgcc ggcgcgacgc gcatcggcac aagctctggg 780
gtggcgatcg tcaccggcgg gacgggccgc gctgactact aa 822

```

<210> 31  
 <211> 273  
 <212> PRT  
 <213> *Geobacillus kaustophilus*  
 <400> 31

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

Arg Arg Gln Tyr Gly Trp Leu Val Phe Val Glu Gly Ala Trp Tyr Asp  
 20 25 30

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

Leu Arg Met Thr Met Asn Ile Ala Lys Met Ile Asp His Thr Leu Leu  
 50 55 60

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

Lys Gln Tyr Gly Phe Ala Ser Val Cys Val Asn Pro Thr Trp Val Lys  
 85 90 95

Thr Ala Ala Arg Glu Leu Ser Gly Thr Asp Val Arg Val Cys Thr Val  
 100 105 110

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

Thr Thr Asn Ala Ile Glu Asn Gly Ala Arg Glu Val Asp Met Val Ile  
 130 135 140

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

~4559687.txt

Ile Arg Ala Val Val Glu Ala Ala Ala Gly Arg Ala Leu Val Lys Val  
165 170 175

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

Gln Leu Ala Val Lys Ala Gly Ala Asp Tyr Val Lys Thr Ser Thr Gly  
195 200 205

Phe Ser Gly Gly Gly Ala Thr Val Glu Asp Val Ala Leu Met Arg Lys  
210 215 220

Thr Val Gly Asp Arg Ala Gly Val Lys Ala Ser Gly Gly Val Arg Asp  
225 230 235 240

Trp Lys Thr Ala Glu Ala Met Ile Asn Ala Gly Ala Thr Arg Ile Gly  
245 250 255

Thr Ser Ser Gly Val Ala Ile Val Thr Gly Gly Thr Gly Arg Ala Asp  
260 265 270

Tyr

<210> 32  
<211> 675  
<212> DNA  
<213> Bacillus halodurans

<400> 32  
atgtcacggtt cgattgcaca aatgattgat catacgctac ttaaaccaaa tacaacagaa 60  
gaccaaattg taaagctctg tgaggaagca aaggaatatt catttgcatac tgtttgtgtg 120  
aatcctactt gggctgctct tgctgcgagc ttgctaaaag atgcacctga tgtgaaagta 180  
tgtacagtta tcggctttcc gttaggggca acgactccgg aagtgaaagc gtttgaaacg 240  
actaatgcca ttgaaaatgg agcgacagaa gtggacatgg tcattaacat tggagcggtta 300  
aaagataaac aatacgagct tgttggacgc gacattcaag cggttgttaa agcagcagaa 360  
gggaaagcat taacgaaagt aatcattgaa acatcggtat taacggagga agagaagaag 420  
gctgctgtgt agcttgccgt aaaagcagga gccgactttg tcaaaacgtc gactggattc 480  
tctggcggag gtgctacggc tgaggatata gcgctcatgc gaaaagtggc cggaccaaata 540  
ttaggagtca aagcttctgg aggtgttaga gatctgtccg acgcgaaagc gatgattgat 600  
gctggtgcta ctcgattggg tgcgagtgcg ggggtggcga ttgttaacgg ggagcgtagc 660  
gaagggagtt attaa 675

<210> 33  
<211> 224  
<212> PRT  
<213> Bacillus halodurans

<400> 33

Met Ser Arg Ser Ile Ala Gln Met Ile Asp His Thr Leu Leu Lys Pro  
1 5 10 15

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

Tyr Ser Phe Ala Ser Val Cys Val Asn Pro Thr Trp Val Ala Leu Ala  
35 40 45

Ala Gln Leu Leu Lys Asp Ala Pro Asp Val Lys Val Cys Thr Val Ile  
50 55 60

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

Thr Asn Ala Ile Glu Asn Gly Ala Thr Glu Val Asp Met Val Ile Asn  
85 90 95

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

Gln Ala Val Val Lys Ala Ala Glu Gly Lys Ala Leu Thr Lys Val Ile  
115 120 125

Ile Glu Thr Ser Leu Leu Thr Glu Glu Glu Lys Lys Ala Ala Cys Glu  
130 135 140

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

Ser Gly Gly Gly Ala Thr Ala Glu Asp Ile Ala Leu Met Arg Lys Val  
165 170 175

Val Gly Pro Asn Leu Gly Val Lys Ala Ser Gly Gly Val Arg Asp Leu  
180 185 190

Ser Asp Ala Lys Ala Met Ile Asp Ala Gly Ala Thr Arg Ile Gly Ala  
195 200 205

Ser Ala Gly Val Ala Ile Val Asn Gly Glu Arg Ser Glu Gly Ser Tyr  
210 215 220

<210> 34

<211> 672

<212> DNA

<213> Bacillus licheniformis

<400> 34

atgacaaaac aaattgcgcg aatgatcgat cacactgcat tgaagccaga taccgtcaaa 60

tccgaaatcg aagcgctttg caaagaagcg cgtgttttacg gttttgcctc cgtttgtgtc 120



~4559687.txt

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aacccttgct ggggtgaagct ttgcgccgag cttcttaaag agtcagaggt gaaagtatgt 180
acagttatcg gctttccttt aggtgcagcg tctccggaac caaaagcctt tgaaaccagg 240
caggcaattg cagacggtgc cgggtgaagtt gatatggtga tcaacatcgg tgcactaaaa 300
gaccgcgata cgggaacagt ggaacatgac atcagggcgg tgacagacgc ggccgacggc 360
aaagctcttg taaaagtcac catagagacg tcgcttttga cggatgaaga aaaaaggctg 420
gcttgtgaac tggccgtaaa agcaggcgcc gactttgtca aaacatcgac cggtttttcc 480
ggcggcggtg cgacagtccg ggatataaaa ctgatgcggg aagctgtcgg acctgatatc 540
ggcgttaaag cttcaggtgg cgtccgcgat aaggaaagcg cacttgccat gattgaagcc 600
ggagcgacga gaatcggagc gagcgccggc gtgtcgattg tcaaagggtt aacagcggat 660
gaagactact aa 672

```

```

<210> 35
<211> 223
<212> PRT
<213> Bacillus licheniformis

```

<400> 35

```

Met Thr Lys Gln Ile Ala Arg Met Ile Asp His Thr Ala Leu Lys Pro
1          5          10          15

```

```

Asp Thr Val Lys Ser Glu Ile Glu Ala Leu Cys Lys Glu Ala Arg Val
          20          25          30

```

```

Tyr Gly Phe Ala Ser Val Cys Val Asn Pro Cys Trp Val Lys Leu Cys
          35          40          45

```

```

Ala Glu Leu Leu Lys Glu Ser Glu Val Lys Val Cys Thr Val Ile Gly
          50          55          60

```

```

Phe Pro Leu Gly Ala Ala Ser Pro Glu Thr Lys Ala Phe Glu Thr Arg
65          70          75          80

```

```

Gln Ala Ile Ala Asp Gly Ala Gly Glu Val Asp Met Val Ile Asn Ile
          85          90          95

```

```

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

```

```

Ala Val Thr Asp Ala Ala Asp Gly Lys Ala Leu Val Lys Val Ile Ile
          115          120          125

```

```

Glu Thr Ser Leu Leu Thr Asp Glu Glu Lys Arg Leu Ala Cys Glu Leu
          130          135          140

```

```

Ala Val Lys Ala Gly Ala Asp Phe Val Lys Thr Ser Thr Gly Phe Ser
145          150          155          160

```

~4559687.txt

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

Gly Pro Asp Ile Gly Val Lys Ala Ser Gly Gly Val Arg Asp Lys Glu  
180 185 190

Ser Ala Leu Ala Met Ile Glu Ala Gly Ala Thr Arg Ile Gly Ala Ser  
195 200 205

Ala Gly Val Ser Ile Val Lys Gly Leu Thr Ala Asp Glu Asp Tyr  
210 215 220

<210> 36  
<211> 663  
<212> DNA  
<213> Streptococcus mutans

<400> 36  
atgaaaatca atcaatatat tgaccataact ttattaaaac cagaaagtag gcaagatcag 60  
attgataaac tgattcgaga agctaagaca tataattttg ccagtgtctg tatcaatcca 120  
acttggggttt cttatgcggc taaagctctt gaaggaacag acattaaagt ttgtactggt 180  
attgggttttc ctttaggagc aacgactagt gctgtaaaag cttttgaaac caaggatgct 240  
attagtcatg gagctgacga agttgatatg gttatcaata ttgggtcaagc taaatctggt 300  
cattttgctt ttgttgaaga agatattcgg gcagttgttg aagccagtgg tgacaaattg 360  
gtgaaagtta ttattgaaac ttgtctcctt acagataaag aaaaaattaa agcttgtcaa 420  
gctgcagtag cagcagggtgc tgatttcggt aaaacatcaa ctgggtttttc aactgctgga 480  
gctaggttag atgatgttcg tcttatgcgt caaacggtag gacctgatgt tggagtaaag 540  
gcggcaggag gaacgcgatc tttagaagat gcgcaagctt ttattgaagc aggtgcaaca 600  
cgtattggga catctgctgg agttactatt atggaaggaa agcaaacaaa cagtggttat 660  
tga 663

<210> 37  
<211> 220  
<212> PRT  
<213> Streptococcus mutans

<400> 37  
Met Lys Ile Asn Gln Tyr Ile Asp His Thr Leu Leu Lys Pro Glu Ser  
1 5 10 15

Arg Gln Asp Gln Ile Asp Lys Leu Ile Arg Glu Ala Lys Thr Tyr Asn  
20 25 30

Phe Ala Ser Val Cys Ile Asn Pro Thr Trp Val Ser Tyr Ala Ala Lys  
35 40 45

Ala Leu Glu Gly Thr Asp Ile Lys Val Cys Thr Val Ile Gly Phe Pro  
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50

55

Leu Gly Ala Thr Thr Ser Ala Val Lys Ala Phe Glu Thr Lys Asp Ala  
65 70 75 80  
Ile Ser His Gly Ala Asp Glu Val Asp Met Val Ile Asn Ile Gly Gln  
85 90 95  
Ala Lys Ser Gly His Phe Ala Phe Val Glu Glu Asp Ile Arg Ala Val  
100 105 110  
Val Glu Ala Ser Gly Asp Lys Leu Val Lys Val Ile Ile Glu Thr Cys  
115 120 125  
Leu Leu Thr Asp Lys Glu Lys Ile Lys Ala Cys Gln Ala Ala Val Ala  
130 135 140  
Ala Gly Ala Asp Phe Val Lys Thr Ser Thr Gly Phe Ser Thr Ala Gly  
145 150 155 160  
Ala Arg Leu Asp Asp Val Arg Leu Met Arg Gln Thr Val Gly Pro Asp  
165 170 175  
Val Gly Val Lys Ala Ala Gly Gly Thr Arg Ser Leu Glu Asp Ala Gln  
180 185 190  
Ala Phe Ile Glu Ala Gly Ala Thr Arg Ile Gly Thr Ser Ala Gly Val  
195 200 205  
Thr Ile Met Glu Gly Lys Gln Thr Asn Ser Gly Tyr  
210 215 220

<210> 38  
<211> 663  
<212> DNA  
<213> Staphylococcus epidermidis

<400> 38  
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atagatacta ttataaatga agcaaaagca tatcagttta agtctgtatg tgtgaaccct 120  
acacatgtac aatatgcac tgaacaactt aaaggaacag acgttttagt gtgtactgtt 180  
attggatttc cactaggtgc aacaactaca gcggttaaat cttatgaaac aaaagatgcg 240  
attaacaatg gtgccaaga gattgatatg gtgataaata ttggagcact taaggatggc 300  
cgttttgatg aagtgcaaaa tgatatcgaa gccgtcgttc aagcagccaa tggtaaaaca 360  
gttaaggtaa ttattgagac tgttttatta actgagaaag agaagattaa agcatgtcaa 420  
ttatctgaag cggcaggtgc acattttgtt aaaacatcca caggttttgc tgggtgggggt 480  
gcaacagttg aagatgtaaa attaatgaaa gatactgttg gtgatcgttt agaagtaaaa 540  
gcgtcaggcg gcgtgagaaa tctagaagat ttttaataata tgattgaagc gggtgctaca 600

cgtattggtg ctagtgccgg tgtgcaaatt attcaaggac ttgaatcaaa tactgattac 660  
taa 663

<210> 39  
<211> 220  
<212> PRT  
<213> Staphylococcus epidermidis

<400> 39

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

Thr Lys Glu Gln Ile Asp Thr Ile Ile Asn Glu Ala Lys Ala Tyr Gln  
20 25 30

Phe Lys Ser Val Cys Val Asn Pro Thr His Val Gln Tyr Ala Ser Glu  
35 40 45

Gln Leu Lys Gly Thr Asp Val Leu Val Cys Thr Val Ile Gly Phe Pro  
50 55 60

Leu Gly Ala Thr Thr Thr Ala Val Lys Ser Tyr Glu Thr Lys Asp Ala  
65 70 75 80

Ile Asn Asn Gly Ala Gln Glu Ile Asp Met Val Ile Asn Ile Gly Ala  
85 90 95

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

Val Gln Ala Ala Asn Gly Lys Thr Val Lys Val Ile Ile Glu Thr Val  
115 120 125

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

Ala Gly Ala His Phe Val Lys Thr Ser Thr Gly Phe Ala Gly Gly Gly  
145 150 155 160

Ala Thr Val Glu Asp Val Lys Leu Met Lys Asp Thr Val Gly Asp Arg  
165 170 175

Leu Glu Val Lys Ala Ser Gly Gly Val Arg Asn Leu Glu Asp Phe Asn  
180 185 190

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

Gln Ile Ile Gln Gly Leu Glu Ser Asn Thr Asp Tyr  
210 215 220

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<210> 40
<211> 648
<212> DNA
<213> Lactobacillus plantarum

<400> 40
atgaaattga atcgttatatt agatcacacg ttattaaaac cggaagcgac tgagcaacaa      60
attgatcagg tagtacggga ggcactcgaa aatcactttt attcagttat ggtcaatcca      120
tactgggtca agcacgtcca tgcgcaactt gctggttcgg atgttgcgac tgcatgcgtg      180
attggtttcc ctctgggcgc gaatacaacc gccattaaag ttgcggaagc caaacaggca      240
attgctgacg gtgtggatga gctggatatg gtcattaata tcggcgaatt gaaaggcgac      300
cactatgatg cagttcaaca agacattgaa agtgtggtaa cagttggaca tacggctgat      360
aaggctcgtca aagtgattat tgaaacggcg ctgttgacgg atggggaaat cgттаaggct      420
agtgaatttg ttgccgatgc acacgctgat tttgtgaaga catcgactgg attttcaacc      480
cgtggtgctt cggttcatga tattagtttg atgaagggtg cgttcagga tcgaatcggg      540
gtcaaagcat ctgggggaat ccatacacgc gatgaagcat tagcgatgat tgatgctgga      600
gcaacgcgcc tcggtgtatc agcaagtatg gcaattattg gtaagtag      648

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<210> 41
<211> 215
<212> PRT
<213> Lactobacillus plantarum

<400> 41
Met Lys Leu Asn Arg Tyr Leu Asp His Thr Leu Leu Lys Pro Glu Ala
1          5          10
Thr Glu Gln Gln Ile Asp Gln Val Val Arg Glu Ala Leu Glu Asn His
20          25          30
Phe Tyr Ser Val Met Val Asn Pro Tyr Trp Val Lys His Val His Ala
35          40          45
Gln Leu Ala Gly Ser Asp Val Ala Thr Ala Cys Val Ile Gly Phe Pro
50          55          60
Leu Gly Ala Asn Thr Thr Ala Ile Lys Val Ala Glu Ala Lys Gln Ala
65          70          75          80
Ile Ala Asp Gly Val Asp Glu Leu Asp Met Val Ile Asn Ile Gly Glu
85          90          95
Leu Lys Gly Asp His Tyr Asp Ala Val Gln Gln Asp Ile Glu Ser Val
100         105         110
Val Thr Val Gly His Thr Ala Asp Lys Val Val Lys Val Ile Ile Glu
115         120         125

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

Ala Asp Ala His Ala Asp Phe Val Lys Thr Ser Thr Gly Phe Ser Thr  
145 150 155 160

Arg Gly Ala Ser Val His Asp Ile Ser Leu Met Lys Gly Ala Val Gln  
165 170 175

Asp Arg Ile Gly Val Lys Ala Ser Gly Gly Ile His Thr Arg Asp Glu  
180 185 190

Ala Leu Ala Met Ile Asp Ala Gly Ala Thr Arg Leu Gly Val Ser Ala  
195 200 205

Ser Met Ala Ile Ile Gly Lys  
210 215

<210> 42  
<211> 728  
<212> DNA  
<213> Lactobacillus acidophilus

<400> 42  
cagaggtaaa aattatgaaa tatacttttag acgacttttgc acgtttaatt gatcacacta 60  
acttacacgc tgatgcaact gaagccgata tgaagaagtt atgtgatgaa gcaaagaaat 120  
atcatttttaa aatggtagct attaatacaag ttcaatccaa gttttgctca gagcaattaa 180  
agggaacaga cattgatact ggtgctgcaa ttgcttttcc tttaggacaa caaactattg 240  
aatccaaggt atttgatact agggatgcaa ttaagaatgg tgctaatagaa attgattatg 300  
tgattaatat tactcaatta aaagctaaag actacgatta tataaagcaa gaaatgcaag 360  
agatgggttaa tgcttgtcat gaaaatcatg ttccatgtaa agtgattttt gaaaattgct 420  
atttaaccaa agatgaaata aaaaaattag ctgagattgc taaagaagta aagcctgact 480  
ttattaagac ttctactggc tttggtagtt caggcgctaa ggtagaagac gtaaagctaa 540  
tgaaatcaat tgttggcgat gaagtaaaag taaaggctgc cggtaggtatt cgtaatagtg 600  
atgatttctt agccatgggtg cgcgctgggtg ctgatagaat tggttgttct gctggagtca 660  
aaatttatca agctttaaag tgtagaatga aagacgacca tgtggatagt attgagattg 720  
cacgttag 728

<210> 43  
<211> 237  
<212> PRT  
<213> Lactobacillus acidophilus

<400> 43

Met Lys Tyr Thr Leu Asp Asp Phe Ala Arg Leu Ile Asp His Thr Asn  
1 5 10 15

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Leu His Ala Asp<sub>20</sub> Ala Thr Glu Ala Asp<sub>25</sub> Met Lys Lys Leu Cys<sub>30</sub> Asp Glu

Ala Lys Lys<sub>35</sub> Tyr His Phe Lys Met<sub>40</sub> Val Ala Ile Asn Gln<sub>45</sub> Val Gln Ser

Lys Phe<sub>50</sub> Cys Ser Glu Gln Leu<sub>55</sub> Lys Gly Thr Asp Ile<sub>60</sub> Asp Thr Gly Ala

Ala Ile Ala Phe Pro Leu<sub>70</sub> Gly Gln Gln Thr Ile<sub>75</sub> Glu Ser Lys Val Phe<sub>80</sub>

Asp Thr Arg Asp<sub>85</sub> Ala Ile Lys Asn Gly Ala<sub>90</sub> Asn Glu Ile Asp Tyr<sub>95</sub> Val

Ile Asn Ile Thr<sub>100</sub> Gln Leu Lys Ala Lys<sub>105</sub> Asp Tyr Asp Tyr Ile<sub>110</sub> Lys Gln

Glu Met Gln<sub>115</sub> Glu Met Val Asn Ala<sub>120</sub> Cys His Glu Asn His<sub>125</sub> Val Pro Cys

Lys Val<sub>130</sub> Ile Phe Glu Asn Cys<sub>135</sub> Tyr Leu Thr Lys Asp<sub>140</sub> Glu Ile Lys Lys

Leu Ala Glu Ile Ala Lys<sub>150</sub> Glu Val Lys Pro Asp<sub>155</sub> Phe Ile Lys Thr Ser<sub>160</sub>

Thr Gly Phe Gly Ser<sub>165</sub> Ser Gly Ala Lys Val<sub>170</sub> Glu Asp Val Lys Leu<sub>175</sub> Met

Lys Ser Ile Val<sub>180</sub> Gly Asp Glu Val Lys<sub>185</sub> Val Lys Ala Ala Gly<sub>190</sub> Gly Ile

Arg Asn Ser<sub>195</sub> Asp Asp Phe Leu Ala<sub>200</sub> Met Val Arg Ala Gly<sub>205</sub> Ala Asp Arg

Ile Gly<sub>210</sub> Cys Ser Ala Gly Val<sub>215</sub> Lys Ile Tyr Gln Ala<sub>220</sub> Leu Lys Cys Arg

Met Lys Asp Asp His Val<sub>230</sub> Asp Ser Ile Glu Ile<sub>235</sub> Ala Arg

<210> 44  
<211> 672  
<212> DNA  
<213> Streptococcus pyogenes

<400> 44  
gtggaagtaa aagatatttt aaaaacggta gaccatactt tgctagcaac aacagcaacg 60

tggccagaaa tccaaacaat tttagatgat gccatggctt atgaaacagc ttcagcatgt 120

attccagctt cttacgtcaa aaaagcagca gaatacgttt caggtaaatt agctatttgt 180

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actgttattg ggttcccaaa tggctatagt acaactgcgg cgaaggtttt tgaatgtcaa 240  
 gatgctattc aaaatggtgc tgatgaaatt gacatggtca ttaatttgac agacgttaaa 300  
 aatggggatt ttgatactgt tgaagaagaa attcgtcaaa tcaaagctaa atgtcaagac 360  
 catatcttaa aagttatcgt tgagacatgt caattaacta aagaagaact tatcgaactt 420  
 tgtggagttg tcacacgttc aggtgcagac tttattaaaa cctctactgg tttttcgaca 480  
 gcaggtgcta catttgaaga tgttgaagtg atggcaaaat atgtcggcga aggtgttaaa 540  
 attaaggcag cagggtgaat ctcattcattg gaagatgcta aaacatttat tgcttttagga 600  
 gcttcacgct tgggtactag ccgtatcatc aagattgtta agaacgaagc tacaaaaccc 660  
 gatagctatt aa 672

<210> 45  
 <211> 223  
 <212> PRT  
 <213> Streptococcus pyogenes

<400> 45

Met Glu Val Lys Asp Ile Leu Lys Thr Val Asp His Thr Leu Leu Ala  
 1 5 10 15

Thr Thr Ala Thr Trp Pro Glu Ile Gln Thr Ile Leu Asp Asp Ala Met  
 20 25 30

Ala Tyr Glu Thr Ala Ser Ala Cys Ile Pro Ala Ser Tyr Val Lys Lys  
 35 40 45

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

Phe Pro Asn Gly Tyr Ser Thr Thr Ala Ala Lys Val Phe Glu Cys Gln  
 65 70 75 80

Asp Ala Ile Gln Asn Gly Ala Asp Glu Ile Asp Met Val Ile Asn Leu  
 85 90 95

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

Gln Ile Lys Ala Lys Cys Gln Asp His Ile Leu Lys Val Ile Val Glu  
 115 120 125

Thr Cys Gln Leu Thr Lys Glu Glu Leu Ile Glu Leu Cys Gly Val Val  
 130 135 140

Thr Arg Ser Gly Ala Asp Phe Ile Lys Thr Ser Thr Gly Phe Ser Thr  
 145 150 155 160

Ala Gly Ala Thr Phe Glu Asp Val Glu Val Met Ala Lys Tyr Val Gly



Glu Gly Val Lys Ile Lys Ala Ala Gly Gly Ile Ser Ser Leu Glu Asp  
180 185 190

Ala Lys Thr Phe Ile Ala Leu Gly Ala Ser Arg Leu Gly Thr Ser Arg  
195 200 205

Ile Ile Lys Ile Val Lys Asn Glu Ala Thr Lys Pro Asp Ser Tyr  
210 215 220

<210> 46  
<211> 783  
<212> DNA  
<213> Rhodopirellula baltica

<400> 46  
ttgcgcgaca cccgacctcc tgccgcatcg ctatcgcttc acggaaacct gctcaccatg 60  
gctgactatc aatatcacga cgtctccaag atgattgacc actcgctgct tccaccacaca 120  
ctgaccgaag cggacttggga ttccggcatc gatttggaac tcgcttatga agtcgccagc 180  
gtttgtatct tgccctacta cttgaaacgt tgtgctgcga agctcgcggg caccggcgtg 240  
aaagcgtcaa ccacgatcgg ttttctcat ggtggtcaca ccaccgcat caagaaagcc 300  
gaagccgaac aagccatcca agatggctgc gaagaactcg acttcgtcgt caacatctcg 360  
caagtctga gcggcggttg ggactacgtc caaaatgaaa ttggcgaggt caccgaactg 420  
acccatgcgg ccggacaaaa gatcaaggtg atcttcgaga actgctacct gcaggacgaa 480  
cacaagattc gtctgtgcga gatctgcacc gagctcaaag tggactgggt caaaacatcg 540  
actggttatg gaactggagg cgcgaccatg gacgacctgc gtctgatgcg acaacactca 600  
ggcgaaaacg tccaagtcaa agctgccggt ggcgtccgag atctcgcgac actgctggag 660  
gtccgagccc tcggagcatc ccgttgcggt gccagccgaa ccgccgagat gctgggagaa 720  
gcccgaagc aacttggcat gcccgcgatt gaaatcaccg cgaccggcag ctccggctac 780  
tga 783

<210> 47  
<211> 260  
<212> PRT  
<213> Rhodopirellula baltica

<400> 47

Met Arg Asp Thr Arg Pro Pro Ala Ala Ser Leu Ser Leu His Gly Asn  
1 5 10 15

Leu Leu Thr Met Ala Asp Tyr Gln Tyr His Asp Val Ser Lys Met Ile  
20 25 30

Asp His Ser Leu Leu Pro Pro Thr Leu Thr Glu Ala Asp Leu Asp Ser  
35 40 45

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Gly Ile Asp Leu Ala Ile Ala Tyr Glu Val Ala Ser Val Cys Ile Leu  
50 55 60

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

Lys Ala Ser Thr Thr Ile Gly Phe Pro His Gly Gly His Thr Thr Ala  
85 90 95

Ile Lys Lys Ala Glu Ala Glu Gln Ala Ile Gln Asp Gly Cys Glu Glu  
100 105 110

Leu Asp Phe Val Val Asn Ile Ser Gln Val Leu Ser Gly Gly Trp Asp  
115 120 125

Tyr Val Gln Asn Glu Ile Gly Glu Val Thr Glu Leu Thr His Ala Ala  
130 135 140

Gly Gln Lys Ile Lys Val Ile Phe Glu Asn Cys Tyr Leu Gln Asp Glu  
145 150 155 160

His Lys Ile Arg Leu Cys Glu Ile Cys Thr Glu Leu Lys Val Asp Trp  
165 170 175

Val Lys Thr Ser Thr Gly Tyr Gly Thr Gly Gly Ala Thr Met Asp Asp  
180 185 190

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

Ala Gly Gly Val Arg Asp Leu Ala Thr Leu Leu Glu Val Arg Ala Leu  
210 215 220

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

Ala Arg Lys Gln Leu Gly Met Pro Ala Ile Glu Ile Thr Ala Thr Gly  
245 250 255

Ser Ser Gly Tyr  
260

<210> 48  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> primer

<400> 48  
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30

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<210> 49  
<211> 26  
<212> DNA  
<213> Artificial sequence  
  
<220>  
<223> primer  
  
<400> 49  
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26