

202663_ST25.txt
SEQUENCE LISTING

<110> Lonza AG

<120> A process for the identification and preparation of a (R)-specific
omega-transaminase

<130> 202663

<160> 50

<170> PatentIn version 3.5

<210> 1

<211> 322

<212> PRT

<213> Mesorhizobium loti

<400> 1

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Thr Thr His Lys Asp Thr Arg Arg Tyr Pro His Gly Val Ala Phe Met
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Asp Gly Gln Tyr Leu Pro Met Ser Glu Ala Lys Ile Ser Val Leu Asp
35 40 45

Trp Gly Phe Leu His Ser Asp Ala Thr Tyr Asp Thr Val His Val Trp
50 55 60

Glu Gly Arg Phe Phe Arg Leu Asp Leu His Leu Asp Arg Phe Phe Arg
65 70 75 80

Gly Met Asp Arg Leu Arg Met Lys Leu Pro Tyr His Arg Arg Glu Val
85 90 95

Glu Arg Val Leu Ser Asn Cys Val Ala Leu Ser Gly His Lys Ser Ala
100 105 110

Tyr Val Glu Met Ile Cys Thr Arg Gly Gly Ser Pro Thr Phe Ser Arg
115 120 125

Asp Pro Arg Glu Ala Glu Asn Arg Phe Ile Ala Phe Ala Val Pro Phe
130 135 140

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

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

Lys Asn Tyr His Trp Leu Asp Leu Val Arg Gly Leu Tyr Asp Ala Tyr
180 185 190

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

Ala Glu Gly Pro Gly Phe Asn Val Phe Thr Val Lys Asn Arg Gln Leu
210 215 220

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

Phe Asp Leu Cys Gly Glu Val Gly Leu Ala Val Thr Ala Ala Asp Leu
245 250 255

Pro Arg Leu Glu Leu Gly Glu Ala Asp Glu Val Phe Ile Thr Ser Thr
260 265 270

Ala Gly Gly Ile Met Pro Val Thr Arg Val Asp Gly Ser Ser Ile Gly
275 280 285

Ser Gly Lys Val Gly Val Val Thr Arg Gln Leu Met Asp Leu Tyr Trp
290 295 300

Gln Lys His Ser Asp Asp Ala Trp Ser Thr Pro Val Lys Tyr Ala Ser
305 310 315 320

Gly Ser

<210> 2
<211> 969
<212> DNA
<213> Mesorhizobium loti

<400> 2
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<210> 3
 <211> 328
 <212> PRT
 <213> Aspergillus terreus

<400> 3

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20 25 30	

Trp Val Glu Gly Glu Leu Val Pro Leu Ala Glu Ala Arg Ile Pro Leu	
35 40 45	

Leu Asp Gln Gly Phe Met His Ser Asp Leu Thr Tyr Asp Val Pro Ser	
50 55 60	

Val Trp Asp Gly Arg Phe Phe Arg Leu Asp Asp His Ile Thr Arg Leu	
65 70 75 80	

Glu Ala Ser Cys Thr Lys Leu Arg Leu Arg Leu Pro Leu Pro Arg Asp	
85 90 95	

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

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

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

Pro Tyr Val Trp Val Met Glu Pro Asp Met Gln Arg Val Gly Gly Ser	
145 150 155 160	

Ala Val Val Ala Arg Thr Val Arg Arg Val Pro Pro Gly Ala Ile Asp	
165 170 175	

Pro Thr Val Lys Asn Leu Gln Trp Gly Asp Leu Val Arg Gly Met Phe	
180 185 190	

Glu Ala Ala Asp Arg Gly Ala Thr Tyr Pro Phe Leu Thr Asp Gly Asp	
195 200 205	

Ala His Leu Thr Glu Gly Ser Gly Phe Asn Ile Val Leu Val Lys Asp
 210 215 220

Gly Val Leu Tyr Thr Pro Asp Arg Gly Val Leu Gln Gly Val Thr Arg
 225 230 235 240

Lys Ser Val Ile Asn Ala Ala Glu Ala Phe Gly Ile Glu Val Arg Val
 245 250 255

Glu Phe Val Pro Val Glu Leu Ala Tyr Arg Cys Asp Glu Ile Phe Met
 260 265 270

Cys Thr Thr Ala Gly Gly Ile Met Pro Ile Thr Thr Leu Asp Gly Met
 275 280 285

Pro Val Asn Gly Gly Gln Ile Gly Pro Ile Thr Lys Lys Ile Trp Asp
 290 295 300

Gly Tyr Trp Ala Met His Tyr Asp Ala Ala Tyr Ser Phe Glu Ile Asp
 305 310 315 320

Tyr Asn Glu Arg Asn Ser Gly Ser
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<210> 4
 <211> 987
 <212> DNA
 <213> *Aspergillus terreus*

<400> 4
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<210> 5
 <211> 339
 <212> PRT
 <213> Mycobacterium aurum

<400> 5

Met Thr Ala Leu Ser Asp Leu Gly Thr Ser Asn Leu Val Ala Val Glu
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Pro Gly Ala Ile Arg Glu Asp Thr Pro Ala Gly Ser Val Ile Gln Tyr
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Ser Asp Tyr Glu Leu Asp Thr Ser Ser Pro Phe Ala Gly Gly Val Ala
 35 40 45

Trp Ile Glu Gly Glu Tyr Leu Pro Ala Glu Glu Ala Lys Ile Ser Ile
 50 55 60

Phe Asp Thr Gly Phe Gly His Ser Asp Leu Thr Tyr Thr Val Ala His
 65 70 75 80

Val Trp His Gly Asn Ile Phe Arg Leu Gly Asp His Leu Asp Arg Leu
 85 90 95

Leu Asp Gly Ala Ser Lys Leu Arg Leu Asp Ala Gly Tyr Ser Lys Asp
 100 105 110

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

Glu Ser Phe Val Asn Leu Thr Val Thr Arg Gly Tyr Gly Lys Arg Lys
 130 135 140

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

Ile Pro Tyr Leu Trp Ala Phe Pro Pro Ala Glu Gln Ile Phe Gly Thr
 165 170 175

Thr Ala Ile Val Pro Arg His Val Arg Arg Ala Gly Arg Asn Thr Val
 180 185 190

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

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

Asp Asn Cys Val Ala Glu Gly Pro Gly Phe Asn Val Cys Ile Val Lys
 225 230 235 240

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

Arg Lys Thr Val Phe Glu Leu Ala Asp Gln Met Gly Ile Glu Ala Thr
 260 265 270

Leu Arg Asp Val Thr Ser Arg Glu Leu Tyr Asp Ala Asp Glu Leu Met
 275 280 285

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

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

Asp Arg Phe Trp Ala Leu Met Asp Glu Pro Gly Pro Leu Ile Glu Thr
 325 330 335

Ile Glu Tyr

<210> 6
 <211> 1020
 <212> DNA
 <213> Mycobacterium aurum

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<210> 7
<211> 330
<212> PRT
<213> Arthrobacter

<400> 7

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Gly Leu Asp Tyr Ile Thr Tyr Ser Asp Tyr Glu Leu Asp Pro Ala Asn
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Pro Leu Ala Gly Gly Ala Ala Trp Ile Glu Gly Ala Phe Val Pro Pro
35 40 45

Ser Glu Ala Arg Ile Ser Ile Phe Asp Gln Gly Tyr Leu His Ser Asp
50 55 60

Val Thr Tyr Thr Val Phe His Val Trp Asn Gly Asn Ala Phe Arg Leu
65 70 75 80

Asp Asp His Ile Glu Arg Leu Phe Ser Asn Ala Glu Ser Met Arg Ile
85 90 95

Ile Pro Pro Leu Thr Gln Asp Glu Val Lys Glu Ile Ala Leu Glu Leu
100 105 110

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

Arg Gly Tyr Ser Ser Thr Pro Gly Glu Arg Asp Ile Thr Lys His Arg
130 135 140

Pro Gln Val Tyr Met Tyr Ala Val Pro Tyr Gln Trp Ile Val Pro Phe
145 150 155 160

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

Arg Thr Pro Arg Ser Ser Ile Asp Pro Gln Val Lys Asn Phe Gln Trp
180 185 190

Gly Asp Leu Ile Arg Ala Val Gln Glu Thr His Asp Arg Gly Phe Glu
195 200 205

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

Phe Asn Val Val Val Ile Lys Asp Gly Val Val Arg Ser Pro Gly Arg
 225 230 235 240

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

Ser Leu Gly His Glu Ala Ile Leu Ala Asp Ile Thr Leu Ala Glu Leu
 260 265 270

Leu Asp Ala Asp Glu Val Leu Gly Cys Thr Thr Ala Gly Gly Val Trp
 275 280 285

Pro Phe Val Ser Val Asp Gly Asn Pro Ile Ser Asp Gly Val Pro Gly
 290 295 300

Pro Ile Thr Gln Ser Ile Ile Arg Arg Tyr Trp Glu Leu Asn Val Glu
 305 310 315 320

Ser Ser Ser Leu Leu Thr Pro Val Gln Tyr
 325 330

<210> 8
 <211> 993
 <212> DNA
 <213> *Arthrobacter* sp.

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 <212> PRT
 <213> Escherichia coli

<400> 9

Thr Ser Ala Tyr Ile Arg Pro Leu Ile
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<210> 10
 <211> 8
 <212> PRT
 <213> Escherichia coli

<400> 10

Val Phe Glu Gly Ile Arg Cys Tyr
 1 5

<210> 11
 <211> 8
 <212> PRT
 <213> Escherichia coli

<400> 11

Asp Val Gly Met Gly Val Asn Pro
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<210> 12
 <211> 9
 <212> PRT
 <213> Escherichia coli

<400> 12

Pro Thr Ala Ala Lys Ala Gly Gly Asn
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<210> 13
 <211> 960
 <212> DNA
 <213> Penicillium chrysogenum

<400> 13
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accagtcttg atggcaagcc cgtgaacgac ggaaagggtg ggtctgttac caagaagatc      900
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<210> 14
<211> 319
<212> PRT
<213> Penicillium chrysogenum

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<400> 14
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Met Ala Thr Met Glu Lys Ile Phe Ala Ala Tyr His Glu Arg Gln Lys
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Leu Leu Ala Ala Asn Thr His Pro Phe Ala Lys Gly Val Ala Trp Val
          20          25          30

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Glu Gly Glu Leu Thr Pro Leu His Glu Ala Arg Ile Pro Ile Leu Asp
          35          40          45

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Gln Gly Phe Met His Ser Asp Leu Thr Tyr Asp Val Pro Ser Val Trp
          50          55          60

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Asp Gly Arg Phe Phe Arg Leu Asp Asp His Ile Thr Arg Leu Glu Ala
65          70          75          80

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Ser Cys Thr Lys Leu Arg Met Lys Leu Pro Leu Pro Arg Asp Glu Val
          85          90          95

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

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

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Arg Pro Glu Asp Ile Val Asn Arg Ile Tyr Met Phe Ile Gln Pro Tyr
          130          135          140

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Val Trp Cys Met Glu Pro Glu Val Gln Pro Val Gly Gly Ser Ala Ile
          145          150          155          160

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Ile Ala Arg Thr Val Arg Arg Val Pro Pro Gly Cys Ile Asp Pro Thr
          165          170          175

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Val Lys Asn Leu Gln Trp Gly Asp Leu Val Arg Gly Leu Phe Glu Ala

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

Leu Thr Glu Gly Ser Gly Phe Asn Ile Val Leu Val Lys Asp Asn Ile
210 215 220

Leu Tyr Thr Pro Ala Arg Gly Val Leu Glu Gly Val Thr Arg Lys Ser
225 230 235 240

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

Val Pro Val Gln Met Ala Tyr Asp Ala Asp Glu Ile Phe Met Cys Thr
260 265 270

Thr Ala Gly Gly Ile Met Pro Ile Thr Ser Leu Asp Gly Lys Pro Val
275 280 285

Asn Asp Gly Lys Val Gly Ser Val Thr Lys Lys Ile Trp Asp Gly Tyr
290 295 300

Trp Ala Ile His Tyr Asp Pro Ala Tyr Ser Phe Glu Ile Ala Tyr
305 310 315

<210> 15
<211> 984
<212> DNA
<213> Aspergillus niger

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<210> 16
 <211> 327
 <212> PRT
 <213> Aspergillus niger
 <400> 16

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Thr Leu Glu Ala Ser Lys Asn Pro Tyr Ala Lys Gly Ile Ala Trp Val
 20 25 30

Glu Gly Gln Leu Val Pro Leu Arg Glu Ala Arg Ile Pro Leu Ile Asp
 35 40 45

Gln Gly Phe Leu Arg Ser Asp Leu Thr Tyr Asp Val Ile Ser Val Trp
 50 55 60

Asp Gly Trp Phe Phe Arg Leu Asp Asp His Leu Ser Arg Leu Glu Leu
 65 70 75 80

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

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

Tyr Val Ala Leu Ile Val Thr Arg Gly Leu Gln Ser Val Arg Gly Ala
 115 120 125

Lys Pro Glu Asp Leu Val Asn Asn Leu Tyr Met Phe Val Gln Pro Tyr
 130 135 140

Val Trp Val Met Glu Pro Glu Val Gln Arg Val Gly Gly Ser Ala Val
 145 150 155 160

Val Thr Arg Thr Val Arg Arg Val Pro Pro Gly Ala Ile Tyr Pro Thr
 165 170 175

Val Lys Asn Leu Gln Trp Gly Asp Leu Thr Arg Gly Met Leu Glu Ala
 180 185 190

Ala Asp Arg Gly Ser Met Tyr Pro Phe Leu Thr Asp Gly Asp Gly His
 195 200 205

Leu Thr Glu Gly Ser Gly Tyr Asn Ile Val Leu Ile Lys Ala Gly Ala

210

215

Ile Tyr Thr Pro Asp Arg Gly Val Leu His Gly Val Thr Arg Thr Ser
225 230 235 240

Val Ile Asp Val Ala Arg Ala Cys Gly Ile Gln Val His Leu Glu Ala
245 250 255

Val Pro Val Glu Leu Val Tyr Gln Cys Asp Glu Ile Phe Met Cys Thr
260 265 270

Thr Ala Gly Gly Ile Met Pro Ile Thr Glu Leu Asp Gly Lys Pro Val
275 280 285

Asn Gly Gly Arg Ile Gly Pro Ile Thr Lys Lys Ile Trp Asp Gly Tyr
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Trp Gly Met His Tyr Asp Pro Ala Tyr Ser Phe Ala Val Ser Tyr Asp
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Asp Gly Ser Lys Ala Lys Leu
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<210> 17
<211> 981
<212> DNA
<213> Aspergillus oryzae

<400> 17
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gttaaagatg gtattatcta cacgcccgaac cgtgggtgttc tgggaaggcat tacacgtaag 720
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gaacatgcct atcacgccga tgagatatc atgtgtacta ctgctgggtg cattatgcct 840
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981

<210> 18
 <211> 326
 <212> PRT
 <213> Aspergillus oryzae

<400> 18

Met Thr Ser Met Asn Lys Val Phe Ser Gly Tyr Tyr Glu Arg Lys Ala
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Arg Leu Asp Asn Ser Asp Asn Arg Phe Ala Lys Gly Ile Ala Tyr Val
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Gln Gly Ser Phe Val Pro Leu Ala Asp Ala Arg Val Pro Leu Leu Asp
 35 40 45

Glu Gly Phe Met His Ser Asp Leu Thr Tyr Asp Val Pro Ser Val Trp
 50 55 60

Asp Gly Arg Phe Phe Arg Leu Asp Asp His Leu Ser Arg Leu Glu Asp
 65 70 75 80

Ser Cys Glu Lys Met Arg Leu Lys Ile Pro Leu Ser Arg Asp Glu Val
 85 90 95

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

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

Lys Pro Glu Asp Leu Phe Asp Asn His Leu Tyr Leu Ile Val Met Pro
 130 135 140

Tyr Val Trp Val Met Glu Pro Ala Ile Gln His Thr Gly Gly Thr Ala
 145 150 155 160

Ile Ile Ala Arg Thr Val Arg Arg Thr Pro Pro Gly Ala Phe Asp Pro
 165 170 175

Thr Ile Lys Asn Leu Gln Trp Gly Asp Leu Thr Arg Gly Leu Phe Glu
 180 185 190

Ala Ala Asp Arg Gly Ala Asp Tyr Pro Phe Leu Ser Asp Gly Asp Thr
 195 200 205

Asn Leu Thr Glu Gly Ser Gly Phe Asn Ile Val Leu Val Lys Asp Gly
 210 215 220

Ile Ile Tyr Thr Pro Asp Arg Gly Val Leu Glu Gly Ile Thr Arg Lys
 Page 14

225 230 235 240
 Ser Val Phe Asp Ile Ala Gln Val Lys Asn Ile Glu Val Arg Val Gln
 245 250 255
 Val Val Pro Leu Glu His Ala Tyr His Ala Asp Glu Ile Phe Met Cys
 260 265 270
 Thr Thr Ala Gly Gly Ile Met Pro Ile Thr Lys Leu Asp Gly Lys Pro
 275 280 285
 Ile Arg Asn Gly Glu Val Gly Pro Leu Thr Thr Lys Ile Trp Asp Glu
 290 295 300
 Tyr Trp Ala Met His Tyr Asp Pro Lys Tyr Ser Ser Ala Ile Asp Tyr
 305 310 315 320
 Arg Gly His Glu Gly Asn
 325

<210> 19
 <211> 972
 <212> DNA
 <213> *Aspergillus fumigatus*

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 cttgttcttc catacatttg gggtatggcg cctgagaacc agctccatgg tggcgaggct 480
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<210> 20
 <211> 323
 <212> PRT
 <213> Aspergillus fumigatus

<400> 20

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

Glu Gly Lys Leu Val Leu Pro Ser Asp Ala Arg Ile Pro Leu Leu Asp
 35 40 45

Glu Gly Phe Met His Ser Asp Leu Thr Tyr Asp Val Ile Ser Val Trp
 50 55 60

Asp Gly Arg Phe Phe Arg Leu Asp Asp His Leu Gln Arg Ile Leu Glu
 65 70 75 80

Ser Cys Asp Lys Met Arg Leu Lys Phe Pro Leu Ala Leu Ser Ser Val
 85 90 95

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

Phe Val Glu Val Ile Val Thr Arg Gly Leu Thr Gly Val Arg Gly Ser
 115 120 125

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

Tyr Ile Trp Val Met Ala Pro Glu Asn Gln Leu His Gly Gly Glu Ala
 145 150 155 160

Ile Ile Thr Arg Thr Val Arg Arg Thr Pro Pro Gly Ala Phe Asp Pro
 165 170 175

Thr Ile Lys Asn Leu Gln Trp Gly Asp Leu Thr Lys Gly Leu Phe Glu
 180 185 190

Ala Met Asp Arg Gly Ala Thr Tyr Pro Phe Leu Thr Asp Gly Asp Thr
 195 200 205

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

Ile Ile Tyr Thr Pro Asp Arg Gly Val Leu Arg Gly Ile Thr Arg Lys
 225 230 235 240

Ser Val Ile Asp Val Ala Arg Ala Asn Ser Ile Asp Ile Arg Leu Glu
 Page 16

Val Val Pro Val Glu Gln Ala Tyr His Ser Asp Glu Ile Phe Met Cys
260 265 270

Thr Thr Ala Gly Gly Ile Met Pro Ile Thr Leu Leu Asp Gly Gln Pro
275 280 285

Val Asn Asp Gly Gln Val Gly Pro Ile Thr Lys Lys Ile Trp Asp Gly
290 295 300

Tyr Trp Glu Met His Tyr Asn Pro Ala Tyr Ser Phe Pro Val Asp Tyr
305 310 315 320

Gly Ser Gly

<210> 21
<211> 972
<212> DNA
<213> Neosartorya fischeri

<400> 21
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agcgacaatc ctttctctaa gggcattgcc tatgtggaag gaaagctcgt cttaccacgc 120
gacgccagaa taccgctact tgacgaaggc ttcattgcacg gtgacctaac ttatgatgtt 180
acaacggttt gggatggacg cttctttcga ttggatgatc atatgcaacg gatcctggaa 240
agctgcgata aaatgctggc caagttccca cttgcaccga gcacggtgaa aaatatcctg 300
gctgagatgg tcgccaagag tggatttcgg gatgcgtttg tggaaagtat cgtgacacgt 360
ggctctgacag gtgtacgtgg ttcgaagccc gaggatctgt ataataacaa catatacctg 420
cttgttctcc catacgtttg ggttatggcg cctgagaacc agctccttgg tggcagtgc 480
atcattacaa ggacagtgcg acgaacaccc ccgggtgcat ttgatcctac gatcaaaaat 540
ctacagtggg gtgacttaac aaagggactt tttgaggcaa tggaccgtgg cgcaacgtac 600
ccatttctca ctgacggaga caccaacctt accgaaggat ctggatttaa cattgtcttg 660
gtgaagaacg gtattatcta taccctgat cgagggtgtc tgcgagggat cacacgtaaa 720
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gagcaggttt atcactccga tgaaatcttc atgtgcacaa cagccggtgg cattatgcct 840
ataacgttgc ttgatgggtca accagttaat gacggccagg ttggcccgat cacaagaag 900
atatgggatg gttactggga gatgcactac aatccggcgt atagttttcc ggtcgactat 960
ggcagtggct aa 972

<210> 22
<211> 323
<212> PRT
<213> Neosartorya fischeri

<400> 22

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

Glu Gly Lys Leu Val Leu Pro Ser Asp Ala Arg Ile Pro Leu Leu Asp
 35 40 45

Glu Gly Phe Met His Gly Asp Leu Thr Tyr Asp Val Thr Thr Val Trp
 50 55 60

Asp Gly Arg Phe Phe Arg Leu Asp Asp His Met Gln Arg Ile Leu Glu
 65 70 75 80

Ser Cys Asp Lys Met Arg Leu Lys Phe Pro Leu Ala Pro Ser Thr Val
 85 90 95

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

Phe Val Glu Val Ile Val Thr Arg Gly Leu Thr Gly Val Arg Gly Ser
 115 120 125

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

Tyr Val Trp Val Met Ala Pro Glu Asn Gln Leu Leu Gly Gly Ser Ala
 145 150 155 160

Ile Ile Thr Arg Thr Val Arg Arg Thr Pro Pro Gly Ala Phe Asp Pro
 165 170 175

Thr Ile Lys Asn Leu Gln Trp Gly Asp Leu Thr Lys Gly Leu Phe Glu
 180 185 190

Ala Met Asp Arg Gly Ala Thr Tyr Pro Phe Leu Thr Asp Gly Asp Thr
 195 200 205

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

Ile Ile Tyr Thr Pro Asp Arg Gly Val Leu Arg Gly Ile Thr Arg Lys
 225 230 235 240

Ser Val Ile Asp Val Ala Arg Ala Asn Asn Ile Asp Ile Arg Leu Glu
 245 250 255

Val Val Pro Val Glu Gln Val Tyr His Ser Asp Glu Ile Phe Met Cys
 Page 18

Thr Thr Ala Gly Gly Ile Met Pro Ile Thr Leu Leu Asp Gly Gln Pro
 275 280 285

Val Asn Asp Gly Gln Val Gly Pro Ile Thr Lys Lys Ile Trp Asp Gly
 290 295 300

Tyr Trp Glu Met His Tyr Asn Pro Ala Tyr Ser Phe Pro Val Asp Tyr
 305 310 315 320

Gly Ser Gly

<210> 23
 <211> 978
 <212> DNA
 <213> Gibberella zeae

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 cctgcagtct gggatggctg tttcttccgt ctgatgacc atctcgaccg tctcgaggca 240
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 ggcttgaagc ctgttcgtga ggccaagcct ggtgaggtct tgaacaacca cctctacttg 420
 atcgtccaac cctacgtctg ggtcatgagc cccgaagctc agtacgtcgg cggtaatgcc 480
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 cccttctca ccgacggcga cacaacatc accgaaggat ctggtttcaa cgttgtcttt 660
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 agtgtgatcg acgctgcaa gtggtgtggt catgaagttc gaggaggagta tgtccctggt 780
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 atctgggatc ggtactgggc gatgcactgg gaggatgagt tcagtttcaa gattgactac 960
 cagaaactga agctgtag 978

<210> 24
 <211> 325
 <212> PRT
 <213> Gibberella zeae

<400> 24

Met Ser Thr Met Asp Lys Ile Phe Ala Gly His Ala Gln Arg Gln Ala

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 Thr Leu Val Ala Ser Asp Asn Ile Phe Ala Asn Gly Ile Ala Trp Ile
 20 25 30
 Gln Gly Glu Leu Val Pro Leu Asn Glu Ala Arg Ile Pro Leu Met Asp
 35 40 45
 Gln Gly Phe Met His Gly Asp Leu Thr Tyr Asp Val Pro Ala Val Trp
 50 55 60
 Asp Gly Arg Phe Phe Arg Leu Asp Asp His Leu Asp Arg Leu Glu Ala
 65 70 75 80
 Ser Val Lys Lys Met Arg Met Gln Phe Pro Ile Pro Arg Asp Glu Ile
 85 90 95
 Arg Met Thr Leu Leu Asp Met Leu Ala Lys Ser Gly Ile Lys Asp Ala
 100 105 110
 Phe Val Glu Leu Ile Val Thr Arg Gly Leu Lys Pro Val Arg Glu Ala
 115 120 125
 Lys Pro Gly Glu Val Leu Asn Asn His Leu Tyr Leu Ile Val Gln Pro
 130 135 140
 Tyr Val Trp Val Met Ser Pro Glu Ala Gln Tyr Val Gly Gly Asn Ala
 145 150 155 160
 Val Ile Ala Arg Thr Val Arg Arg Ile Pro Pro Gly Ser Met Asp Pro
 165 170 175
 Thr Ile Lys Asn Leu Gln Trp Ser Asp Phe Thr Arg Gly Met Phe Glu
 180 185 190
 Ala Tyr Asp Arg Gly Ala Gln Tyr Pro Phe Leu Thr Asp Gly Asp Thr
 195 200 205
 Asn Ile Thr Glu Gly Ser Gly Phe Asn Val Val Phe Val Lys Asn Asn
 210 215 220
 Val Ile Tyr Thr Pro Asn Arg Gly Val Leu Gln Gly Ile Thr Arg Lys
 225 230 235 240
 Ser Val Ile Asp Ala Ala Lys Trp Cys Gly His Glu Val Arg Val Glu
 245 250 255
 Tyr Val Pro Val Glu Met Ala Tyr Glu Ala Asp Glu Ile Phe Met Cys
 260 265 270
 Thr Thr Ala Gly Gly Ile Met Pro Ile Thr Thr Met Asp Gly Lys Pro

275

280

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285

Val Lys Asp Gly Lys Val Gly Pro Val Thr Lys Ala Ile Trp Asp Arg
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Tyr Trp Ala Met His Trp Glu Asp Glu Phe Ser Phe Lys Ile Asp Tyr
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Gln Lys Leu Lys Leu
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<210> 25
 <211> 966
 <212> DNA
 <213> Hyphomonas neptunium

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 aaggcgcgga taccgatact tgatcagggc ttcctgcatt cggatctgac ctatgacgtc 180
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 gcactctatg aatgcgatga attgttcatg tgttcgacgg caggcggcac aatgccactc 840
 gtccttctgg atgggaacat tgtgggtgat ggaacagtcg gtccgggttac acggatgatt 900
 tgggaggctt actgggatct tcatgatgat cctcagctca gcgagcctgt gacttacgcg 960
 ccctga 966

<210> 26
 <211> 321
 <212> PRT
 <213> Hyphonmonas neptunium

<400> 26

Met Leu Thr Phe Gln Lys Val Leu Thr Gly Phe Gln Thr Arg Ala Asp
 1 5 10 15

Ala Arg Ala Glu Arg Thr Asp Ala Phe Ala Asp Gly Ile Ala Trp Ile

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

Gln Gly Phe Leu His Ser Asp Leu Thr Tyr Asp Val Pro Ala Val Trp
50 55 60

Asn Gly Arg Ile Phe Arg Leu Asp Asp His Leu Asp Arg Leu Glu Val
65 70 75 80

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

Arg Arg Leu Val Met Glu Leu Val Ser Arg Ser Gly Leu Arg Asp Ala
100 105 110

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

Gln Ala Glu Asp Ile Ile Pro Asn Leu Tyr Leu Met Ala Val Pro Tyr
130 135 140

Val Trp Ile Leu Pro Leu Glu Tyr Gln Asn His Gly Ala Pro Ala Val
145 150 155 160

Val Thr Arg Thr Val Arg Arg Thr Pro Pro Gly Ala Leu Asp Pro Thr
165 170 175

Ile Lys Asn Leu Gln Trp Gly Asp Leu Val Arg Gly Leu Met Glu Ala
180 185 190

Gly Asp Arg Asp Ser Phe Phe Pro Ile Leu Pro Asp Gly Asp Gly Asn
195 200 205

Ala Thr Glu Gly Ala Gly Tyr Asn Ile Val Leu Val Arg Asn Gly Glu
210 215 220

Leu His Thr Pro Arg Arg Gly Val Leu Glu Gly Ile Thr Arg Arg Thr
225 230 235 240

Val Leu Glu Ile Ala Ala Ala Arg Gly Leu Lys Thr His Val Thr Glu
245 250 255

Ile Pro Ile Gln Ala Leu Tyr Glu Cys Asp Glu Leu Phe Met Cys Ser
260 265 270

Thr Ala Gly Gly Ile Met Pro Leu Val Leu Leu Asp Gly Asn Ile Val
275 280 285

Gly Asp Gly Thr Val Gly Pro Val Thr Arg Met Ile Trp Glu Ala Tyr
Page 22

290

295

Trp Asp Leu His Asp Asp Pro Gln Leu Ser Glu Pro Val Thr Tyr Ala
305 310 315 320

Pro

<210> 27
<211> 963
<212> DNA
<213> Mesorhizobium loti MAFF303099

<400> 27
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ttcgccgtac ccttcggctc ggctcgccaa gccgagcagt tgcagcgcgg cctgcgcgtc 480
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ctcattctcg acttcaacgg caatgtcgcc gagggcccgg gcttcaacgt cttctgcgtc 660
aaggacggca aactgtcgac gccggccatc ggctgtgctc ccggcatcac gcgccgcaca 720
gtcttcgata tctgcgccga agaaggtctt gccgccgccg ccgccgatgt cagcgtcgcc 780
gcgctcaagg cggccgacga ggtcttcac acctcgaccg ccggcggcat catgccggtg 840
accgagatcg acggcgcggc gatcgccgac ggcaaggtcg ggccgggttac cagccggcta 900
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tga 963

<210> 28
<211> 320
<212> PRT
<213> Mesorhizobium loti MAFF303099

<400> 28

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

Gly Asp Arg His Val Asp Pro His Ser Tyr Pro Asp Gly Ile Ala Phe
20 25 30

Leu Asp Gly Gln Tyr Leu Pro Met Ser Gln Ala Lys Val Ser Val Leu

35

40

45

Asp Trp Gly Phe Leu His Ser Asp Ala Thr Tyr Asp Thr Val His Val
50 55 60

Trp Asn Gly Arg Phe Phe Arg Leu Asp Leu His Leu Asp Arg Phe Phe
65 70 75 80

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

Val Ala Glu Ile Leu His Asn Cys Val Ala Leu Ser Gly His Arg Ala
100 105 110

Ala Tyr Val Glu Met Leu Cys Thr Arg Gly Ala Ser Pro Thr Phe Ser
115 120 125

Arg Asp Pro Arg Gln Ala Ile Asn Arg Phe Met Ala Phe Ala Val Pro
130 135 140

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

Ala Ile Ser Asp Lys Val Arg Ile Pro Pro Ala Ser Val Asp Pro Ser
165 170 175

Ile Lys Asn Tyr His Trp Leu Asp Leu Val Arg Gly Leu Tyr Asp Ala
180 185 190

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

Val Ala Glu Gly Pro Gly Phe Asn Val Phe Cys Val Lys Asp Gly Lys
210 215 220

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

Val Phe Asp Leu Cys Ala Glu Glu Gly Leu Ala Ala Ala Ala Ala Asp
245 250 255

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

Thr Ala Gly Gly Ile Met Pro Val Thr Glu Ile Asp Gly Ala Ala Ile
275 280 285

Ala Asp Gly Lys Val Gly Pro Val Thr Ser Arg Leu Met Ala Leu Tyr
290 295 300

Trp Gln Lys His Asp Asp Pro Ala Trp Ser Ser Gln Val Lys Tyr Pro
Page 24

305

310

320

<210> 29
<211> 936
<212> DNA
<213> Roseobacter sp.

<400> 29
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ttcacttggg gccagatcat ccgtcgcgca ggtgatctgt aattcgtcac aaagatcaaa 240
gattgtttgg cgtgttattc ccattcagcac cccaaacttg ggcgaggaaa ttttgccgtt 300
tttcacggcg aagacgttga aaccggggccc ttccgctatg ttcccggtgg cgtctaaaag 360
aatggcgggt tcggctccct gcgcatacgc cgcatacaaa cttttgacca ggtccagcca 420
gtgatagttc ttacggttg gatcaacgga gctgggtgga atgcggacaa ggtcgggtgac 480
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gaaggcgatg aagcggttga cggcatcgcg agggtcgcgg ctaaactgtag gagaagtgcc 600
gcgtgtgcag atgaactcga catacgcatt ctggagacct gatagagcaa cgcaattgtg 660
caaaatctca gtcattctcg cagcaccaaa cgggatcgac atgtgcaact tttccatccc 720
tgcaagaac cgggtcaagat gatcatcaag cctgaaaaat gctcccttcc acacatgcgc 780
aacatcgatg gtcgcattct agtggaggaa gccattatcc aacaccgaaa tctttgcctc 840
gctgatcgga agatattggc catccatgaa ggcaatgccg ggaggggtacg ttgccgggtc 900
agaatgacga tcagacagcg caggcaattt atacat 936

<210> 30
<211> 311
<212> PRT
<213> Roseobacter sp.

<400> 30

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

Tyr Pro Pro Gly Ile Ala Phe Met Asp Gly Gln Tyr Leu Pro Ile Ser
20 25 30

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

Thr Tyr Asp Val Ala His Val Trp Lys Gly Ala Phe Phe Arg Leu Asp
50 55 60

Asp His Leu Asp Arg Phe Phe Ala Gly Met Glu Lys Leu His Met Ser
65 70 75 80

Ile Pro Phe Gly Arg Ala Glu Met Thr Glu Ile Leu His Asn Cys Val
 85 90 95
 Ala Leu Ser Gly Leu Gln Asp Ala Tyr Val Glu Phe Ile Cys Thr Arg
 100 105 110
 Gly Thr Ser Pro Thr Phe Ser Arg Asp Pro Arg Asp Ala Val Asn Arg
 115 120 125
 Phe Ile Ala Phe Ala Ile Pro Phe Gly Ser Val Ala Asn Pro Glu Gln
 130 135 140
 Met Arg Arg Gly Leu His Ala Ala Val Thr Asp Leu Val Arg Ile Pro
 145 150 155 160
 Pro Ser Ser Val Asp Pro Thr Val Lys Asn Tyr His Trp Leu Asp Leu
 165 170 175
 Val Lys Gly Leu Tyr Ala Ala Tyr Ala Gln Gly Ala Glu Thr Ala Ile
 180 185 190
 Leu Leu Asp Ala Thr Gly Asn Ile Ala Glu Gly Pro Gly Phe Asn Val
 195 200 205
 Phe Ala Val Lys Asn Gly Lys Ile Ser Ser Pro Lys Phe Gly Val Leu
 210 215 220
 Met Gly Ile Thr Arg Gln Thr Ile Phe Asp Leu Cys Asp Glu Leu Gln
 225 230 235 240
 Ile Thr Cys Ala Thr Asp Asp Leu Ala Pro Ser Glu Leu Arg Ala Ala
 245 250 255
 Asp Glu Val Phe Val Thr Ser Thr Ala Gly Gly Val Met Pro Val Thr
 260 265 270
 Lys Ile Asp Glu Thr Ser Ile Gly Ser Gly Leu Val Gly Pro Ile Thr
 275 280 285
 Lys Glu Ile Thr Glu Ala Tyr Trp Arg Met His Glu Asp Asp Arg Phe
 290 295 300
 Arg Lys Ala Ile Arg Tyr Pro
 305 310

<210> 31
 <211> 945
 <212> DNA
 <213> Marinomonas sp.

<400> 31
 ctatatatttt gccgggggat aatgaatggg taggcaccaa tcagagtttt tgtgcttttc

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ccaatatgca gattttaaca attggaagat aggtccggtt gtgccacttc caatcacatt      120
atggtcgatt ttggtaatgg gcataatgcc acccgccggt gacgtaatga atacttcgtc      180
agcatttcctt aaatcggtag gcgttacctc agttgcacag cagcttatgt gtaattcgtc      240
acaaagatca aagacgggtt ggcgagttat gcctggcaaa accccttttt ctggtgttgt      300
aattatcttt cccttaacac aaaaaacatt aaagccaggg ccttcggcga tattaccctc      360
tgaatccaac aggatggcgg tctcaccacc tttttcatag gcatcgata acccggttac      420
caaatcaagc caatggtaat ttttgacctt tgaatcaacc gagtttggcg gaatacggac      480
aatagagcta ataatggcat gcagtccatt tttcatttga tcttgatttg cgaccgagcc      540
aaagggaaacg gcgaaagcca taaaacgatt gattgagtct cttgggtccc ggctgaaatc      600
cggcgaattc cctcttgtgc atatcatttc gacataggcg tttttatgac ccgataaggc      660
cacgcaatta tgcaaaatct cagcgacctc ttctttggag taaggcattg tcatatgaat      720
tttctctaac cctgagaaaa aacgttcaag gtacaaatcc aacctgaaaa atgcaccttg      780
ccagacatgg acaacatcat aggttgcgtc agaattgcaa aagccataat caagaatgga      840
tagttttgct tttgacatat ctaaattatt accatccatg taggcgacgc cttttggata      900
attatgtggg tccttatatt cattggacaa ttgcagtaaa gccat                      945

```

<210> 32
 <211> 314
 <212> PRT
 <213> *Marinomonas* sp.

<400> 32

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

Pro Lys Gly Val Ala Tyr Met Asp Gly Gln Tyr Leu Asp Met Ser Lys
 20 25 30

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

Tyr Asp Val Val His Val Trp Gln Gly Ala Phe Phe Arg Leu Asp Leu
 50 55 60

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

Pro Tyr Ser Lys Glu Glu Val Ala Glu Ile Leu His Asn Cys Val Ala
 85 90 95

Leu Ser Gly His Lys Asn Ala Tyr Val Glu Met Ile Cys Thr Arg Gly
 100 105 110

Asn Ser Pro Asp Phe Ser Arg Asp Pro Arg Asp Ser Ile Asn Arg Phe

115

120

125

Met Ala Phe Ala Val Pro Phe Gly Ser Val Ala Asn Gln Asp Gln Met
 130 135 140

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

Asn Ser Val Asp Ser Lys Val Lys Asn Tyr His Trp Leu Asp Leu Val
 165 170 175

Thr Gly Leu Tyr Asp Ala Tyr Glu Lys Gly Gly Glu Thr Ala Ile Leu
 180 185 190

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

Cys Val Lys Gly Lys Ile Ile Thr Thr Pro Glu Lys Gly Val Leu Pro
 210 215 220

Gly Ile Thr Arg Arg Thr Val Phe Asp Leu Cys Asp Glu Leu His Ile
 225 230 235 240

Ser Cys Cys Ala Thr Glu Val Thr Pro Thr Asp Leu Arg Asn Ala Asp
 245 250 255

Glu Val Phe Ile Thr Ser Thr Ala Gly Gly Ile Met Pro Ile Thr Lys
 260 265 270

Ile Asp His Asn Val Ile Gly Ser Gly Thr Thr Gly Pro Ile Phe Gln
 275 280 285

Leu Leu Lys Ser Ala Tyr Trp Glu Lys His Lys Asn Ser Asp Trp Cys
 290 295 300

Leu Pro Ile His Tyr Pro Pro Ala Lys Ile
 305 310

<210> 33

<211> 939

<212> DNA

<213> Rhizobium etli

<400> 33

gtgctcgatc gcggcgagga atccgccttt cagaaaggct ccgcctatgt cgatggaaaa 60

attataccaa tcgaagaggc gaaggtacca cttttagact ggggctttct gcgttcggac 120

gcgtgtcagg acacagtgtc ggtgtgggat ggcagctttt tccgtttgac tgaccacctg 180

gatcgatttg agcgatctgt ccagcgcctt cggatggata cagctcctgt tacaagaagc 240

gatatccacc ggatagtcca caaactcggt gccgtgtgcg gtttccgtga tgcttacggt 300

caaatcatca tgaccgcgg gcggccccc atcggtagtc gggatcttcg tttatgctcg 360

```

aacagcttcc aggcattctg cgtgccgtac atgtggatcg cgaaccccga aaagcaggaa      420
attggcatgg cagtgcacgt cagccggcgc gtccgaatcc cacctcagtc cgtagatccg      480
ttggtgaagc attaccattg gctcgacttt gagatgggct tggtcgaagc ttacgagaac      540
ggtgccgata cggtggttct cactgatctc gatggcaata tcacagaggg gcccggttc      600
aacgttttcg cggtgatcga cggagttctg aggacccctt ctttcggcat gctggatgga      660
atgaccagga ggacagttat ggaactgtgc aacgagctga atctcgatgt cacgcaagag      720
accatttctt tggagcggct tctaactgcc tcggaaatct tccttacgac gaccgcaggc      780
gggattatcc cggtctcttc ggtgaacgga accggaatcg gtttcggatc agtgggtgaa      840
caaactcgcc gcattcaccg gtcatactgg gataagcgaa gcagcggatg gtatggcgag      900
cctgtcgctt acgccccaaa agctctcttg gagccctag      939

```

```

<210> 34
<211> 312
<212> PRT
<213> Rhizobium etli

```

```
<400> 34
```

```

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

```

```

Val Asp Gly Lys Ile Ile Pro Ile Glu Glu Ala Lys Val Pro Leu Leu
20          25          30

```

```

Asp Trp Gly Phe Leu Arg Ser Asp Ala Cys Gln Asp Thr Val Ser Val
35          40          45

```

```

Trp Asp Gly Ser Phe Phe Arg Leu Thr Asp His Leu Asp Arg Phe Glu
50          55          60

```

```

Arg Ser Val Gln Arg Leu Arg Met Asp Thr Ala Pro Val Thr Arg Ser
65          70          75          80

```

```

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

```

```

Asp Ala Tyr Val Gln Ile Ile Met Thr Arg Gly Arg Pro Pro Ile Gly
100         105         110

```

```

Ser Arg Asp Leu Arg Leu Cys Ser Asn Ser Phe Gln Ala Phe Cys Val
115        120        125

```

```

Pro Tyr Met Trp Ile Ala Asn Pro Glu Lys Gln Glu Ile Gly Met Ala
130        135        140

```

```

Val His Val Ser Arg Arg Val Arg Ile Pro Pro Gln Ser Val Asp Pro
145        150        155        160

```

Leu Val Lys His Tyr His Trp Leu Asp Phe Glu Met Gly Leu Phe Glu
 165 170 175

Ala Tyr Glu Asn Gly Ala Asp Thr Val Val Leu Thr Asp Leu Asp Gly
 180 185 190

Asn Ile Thr Glu Gly Pro Gly Phe Asn Val Phe Ala Val Ile Asp Gly
 195 200 205

Val Leu Arg Thr Pro Ser Phe Gly Met Leu Asp Gly Met Thr Arg Arg
 210 215 220

Thr Val Met Glu Leu Cys Asn Glu Leu Asn Leu Asp Val Thr Gln Glu
 225 230 235 240

Thr Ile Ser Leu Glu Arg Leu Leu Ile Ala Ser Glu Ile Phe Leu Thr
 245 250 255

Thr Thr Ala Gly Gly Ile Ile Pro Val Ser Ser Val Asn Gly Thr Gly
 260 265 270

Ile Gly Phe Gly Ser Val Gly Glu Gln Thr Arg Arg Ile His Arg Ser
 275 280 285

Tyr Trp Asp Lys Arg Ser Ser Gly Trp Tyr Gly Glu Pro Val Ala Tyr
 290 295 300

Ala Gln Lys Ala Leu Leu Glu Pro
 305 310

<210> 35
 <211> 906
 <212> DNA
 <213> Rhodoferax ferrireducens

<400> 35
 atgccagcac ccgatctttc caaaggcgctc gcctttgtac gtgggcagta cgtccccatt 60
 ggtgaagcaa gcattccgat aactgactgg ggtttcctgc gctctgacgc cacctatgac 120
 gtgggtgacgg tgtgggatgg ttccctttttt cgcttgacgc cccatctgga gcgcttcatt 180
 cgcagctgcc aacgctggcg gcttgacccg gggctgacgc cggggcaaat caccggcgctg 240
 ttgtcgcaat gcgtgcgctt gagcgggctt cgcgcctctt atgtcgagat gatctgcacc 300
 cggggccagc cgcttgggg atcgcgcgac ccacgcctgg ccgtcaatca gttctatgcc 360
 tttgcggtgc cctatgtctg gcttgccaat gccagcagc gtgaagcggg actgcacctg 420
 atgatcagcg acgtgcaacg tattcctgcg acctccgtgg acccttcggc caagaactac 480
 cactggaacg acttgacgat gggactgctg ggggcgctgg acgccggggc cgacagtgtt 540
 gtgctggctc actcagtcgg gaacgtggc gagggaccg ggttcaacgt gttttgtgtc 600
 agccacggcg cgcttgtagc gccagcagc ggcattgctg aaggggtgtc gcgtcgcacc 660

```

gtcatcgaga tggcgcgcg c tctggggctg gagacacaac tgcgtgcctt gcccgccgat      720
gagttgcgtg gagccgagga ggtgttcac tccacctcgg gcggtgggtg actgcccgtg      780
agccgggtgg acaaacgtcc ggttggtgat ggccgtccgg ggccgatcac gcagcgctg      840
gtacagacct actgggcctg gcatgccgat ccggtgtaca gccagccgat agattattcg      900
ctttga      906

```

```

<210> 36
<211> 301
<212> PRT
<213> Rhodoferax ferrireducens

```

```
<400> 36
```

```
Met Pro Ala Pro Asp Leu Ser Lys Gly Val Ala Phe Val Arg Gly Gln
1      5      10      15
```

```
Tyr Val Pro Ile Gly Glu Ala Ser Ile Pro Ile Thr Asp Trp Gly Phe
      20      25      30
```

```
Leu Arg Ser Asp Ala Thr Tyr Asp Val Val Thr Val Trp Asp Gly Ser
      35      40      45
```

```
Phe Phe Arg Leu Asp Ala His Leu Glu Arg Phe Met Arg Ser Cys Gln
      50      55      60
```

```
Arg Trp Arg Leu Asp Pro Gly Leu Thr Pro Gly Gln Ile Thr Gly Val
65      70      75      80
```

```
Leu Ser Gln Cys Val Arg Leu Ser Gly Leu Arg Ala Ser Tyr Val Glu
      85      90      95
```

```
Met Ile Cys Thr Arg Gly Gln Pro Pro Trp Gly Ser Arg Asp Pro Arg
      100      105      110
```

```
Leu Ala Val Asn Gln Phe Tyr Ala Phe Ala Val Pro Tyr Val Trp Leu
      115      120      125
```

```
Ala Asn Ala Gln Gln Arg Glu Ala Gly Leu His Leu Met Ile Ser Asp
      130      135      140
```

```
Val Gln Arg Ile Pro Ala Thr Ser Val Asp Pro Ser Ala Lys Asn Tyr
      145      150      155      160
```

```
His Trp Asn Asp Leu Thr Met Gly Leu Leu Gly Ala Leu Asp Ala Gly
      165      170      175
```

```
Ala Asp Ser Val Val Leu Val Asp Ser Val Gly Asn Val Val Glu Gly
      180      185      190
```

```
Pro Gly Phe Asn Val Phe Cys Val Ser His Gly Ala Leu Val Thr Pro
      195      200      205
```

195

200

205

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

Ala Arg Ala Leu Gly Leu Glu Thr Gln Leu Arg Ala Leu Pro Ala Asp
 225 230 235 240

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

Val Leu Pro Val Ser Arg Val Asp Lys Arg Pro Val Gly Asp Gly Arg
 260 265 270

Pro Gly Pro Ile Thr Gln Arg Leu Val Gln Thr Tyr Trp Ala Trp His
 275 280 285

Ala Asp Pro Val Tyr Ser Gln Pro Ile Asp Tyr Ser Leu
 290 295 300

<210> 37
 <211> 900
 <212> DNA
 <213> Jannaschia sp.

<400> 37
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 cagggtccagc gccacggggc ctgccgcacg gttggagaag acgcgggttat cgacccgcgc 120
 caccgggcatc acgccgccgc ccgaggacga caggaagacc tcatcggcct ccaggaattc 180
 gtccaggggc agcgggcgtg tttcgaccgt caggcccgcc tctcggcca tttccagcac 240
 cgtgcggcgg gtgatgccat gcaacacacc gtggtccgac gtcacgatcc ggtcaccgaa 300
 cagggcgaag gcgttgaagc ccggcccttc ggtcacatgg cccgcgtggg ccagcagcaa 360
 gaccgtctca aaccccttgt ctttcgcctc gaacaacccg ccggtgaaat cgccccaatg 420
 gtagtttttc acggtgggat caacgctgtc ggcggggatg cggcgggtgc gtttggcgat 480
 ccagacggag gttccacgct cggcgatttc gggtttcacg atgtgcacgt acggcacgca 540
 ccaggcgtag aagtgggttg cacaatcgcg cgggtcccgc gatccgggca ccgggttgcg 600
 cccccgcgcg gcgaccatgg cgacatagct gtcgcgcaat ccgcttgcg ccaccatccg 660
 ggtcagggcc gttttcacgc cgtccccgtc gcgcccgcata tccatccgca gcgcgccgac 720
 ggaggccatg aaccgcgcca cgtaatcatc cagccggaag aagccgcccc gccagaccgg 780
 caccacgtca taggcgatgt cggaatgggt caggcccaa tcggtgacgg ggatcgcggc 840
 ctctgcgatg gggatgatgc ggctcccat ccaggccgcg ccgttgata aatcattcat 900

<210> 38
 <211> 299
 <212> PRT
 <213> Jannaschia sp.

<400> 38

Met Asn Asp Leu Ser Asn Gly Ala Ala Trp Met Gly Ser Arg Ile Ile
 1 5 10 15

Pro Ile Ala Glu Ala Ala Ile Pro Val Thr Asp Trp Gly Leu Thr His
 20 25 30

Ser Asp Ile Ala Tyr Asp Val Val Pro Val Trp Arg Gly Gly Phe Phe
 35 40 45

Arg Leu Asp Asp Tyr Val Ala Arg Phe Met Ala Ser Val Gly Ala Leu
 50 55 60

Arg Met Asp Ile Gly Arg Asp Gly Asp Gly Val Lys Thr Ala Leu Thr
 65 70 75 80

Arg Met Val Ala Ala Ser Gly Leu Arg Asp Ser Tyr Val Ala Met Val
 85 90 95

Ala Ala Arg Gly Arg Asn Pro Val Pro Gly Ser Arg Asp Pro Arg Asp
 100 105 110

Cys Ala Asn His Phe Tyr Ala Trp Cys Val Pro Tyr Val His Ile Val
 115 120 125

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

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

His Trp Gly Asp Phe Thr Gly Gly Leu Phe Glu Ala Lys Asp Lys Gly
 165 170 175

Phe Glu Thr Val Leu Leu Leu Asp His Ala Gly His Val Thr Glu Gly
 180 185 190

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

Asp His Gly Val Leu His Gly Ile Thr Arg Arg Thr Val Leu Glu Met
 210 215 220

Ala Ala Glu Ala Gly Leu Thr Val Glu Thr Arg Pro Leu Pro Leu Asp
 225 230 235 240

Glu Phe Leu Glu Ala Asp Glu Val Phe Leu Ser Ser Ser Gly Gly Gly
 245 250 255

Val Ile Pro Val Ala Arg Val Asp Asn Arg Val Phe Ser Asn Asp Ala
 Page 33

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

Thr Arg Ala Glu His Arg Thr Asp Ile Ala Tyr
 290 295

<210> 39
 <211> 936
 <212> DNA
 <213> Labrenzia alexandrii

<400> 39
 ctaatcccga taagaaatct ccgtccggtt atccggacgg gcggccatt caaaataggc 60
 cttgtgaagt gctgtcgtaa tcggacccgg cgcattcatc gaaaagatcc ggtcatccac 120
 ccgggtgacc ggtgcaacgc cgccaccgga cgtggtgatg aaaacttcgt cgctctcaaa 180
 gaactcacta agcgccaagg cccgtatctc gatctcaagc ccctgttctg ccgcgatatc 240
 cagcaccgtc tgacggctga tgccttccaa aacaccgctt tcagccgtca ccagcggtcg 300
 gccctttaca gcaaacacat tgaagcccgg cccttcggtc acgttgccat catcatcgag 360
 caagatgaca gtctccgcgc cgtggtcctt ggctcaaac agacccttgg tgaaatcacc 420
 ccagtggtag tttttgacct tcggattgac actgccgggc gaaatccggt gcacggtctt 480
 ggcgatatga acatgggcgc ctctttccgc gatctccggc cggatgacgt gaacataggg 540
 caccgacat gcaaagaatt gggtcttgca gtcccgggga tcgcgcgaac ccggcacctg 600
 gttcacaccc cgggaagtga ccattgccac gtaggccttt cgcagccccg tcgccgccac 660
 gagcgattga agggcgcttt ccattcctc atcgctcaac ccagggtcca accgcagttc 720
 gtccatcgag cggcggaac gggccagata atggggcaaa cgaaagaatg caccatccaa 780
 gaccgggacc acatcatagg taatgtccga atggatcagc cccaatctg taacaggcaa 840
 tgcggcctcg gaaatcggca tgagcctgcc gcccatccac gcggcaccgt tggacaaatc 900
 tgagatggta acgcgaacat cgacgggtgga ggacat 936

<210> 40
 <211> 311
 <212> PRT
 <213> Labrenzia alexandrii

<400> 40

Met Ser Ser Thr Val Asp Val Arg Val Thr Ile Ser Asp Leu Ser Asn
 1 5 10 15

Gly Ala Ala Trp Met Gly Gly Arg Leu Met Pro Ile Ser Glu Ala Ala
 20 25 30

Leu Pro Val Thr Asp Trp Gly Leu Ile His Ser Asp Ile Thr Tyr Asp
 35 40 45

Val Val Pro Val Leu Asp Gly Ala Phe Phe Arg Leu Pro His Tyr Leu
 50 55 60
 Ala Arg Phe Arg Arg Ser Met Asp Glu Leu Arg Leu Asp Pro Gly Leu
 65 70 75 80
 Ser Asp Glu Glu Met Glu Asp Ala Leu Gln Ser Leu Val Ala Ala Thr
 85 90 95
 Gly Leu Arg Lys Ala Tyr Val Ala Met Val Thr Ser Arg Gly Val Asn
 100 105 110
 Gln Val Pro Gly Ser Arg Asp Pro Arg Asp Cys Lys Asn Gln Phe Phe
 115 120 125
 Ala Trp Cys Val Pro Tyr Val His Val Ile Arg Pro Glu Ile Ala Glu
 130 135 140
 Arg Gly Ala His Val His Ile Ala Lys Thr Val His Arg Ile Ser Pro
 145 150 155 160
 Gly Ser Val Asn Pro Lys Val Lys Asn Tyr His Trp Gly Asp Phe Thr
 165 170 175
 Lys Gly Leu Phe Glu Ala Lys Asp His Gly Ala Glu Thr Val Ile Leu
 180 185 190
 Leu Asp Asp Asp Gly Asn Val Thr Glu Gly Pro Gly Phe Asn Val Phe
 195 200 205
 Ala Val Lys Gly Arg Thr Leu Val Thr Ala Glu Ser Gly Val Leu Glu
 210 215 220
 Gly Ile Ser Arg Gln Thr Val Leu Asp Ile Ala Ala Glu Gln Gly Leu
 225 230 235 240
 Glu Ile Glu Ile Arg Ala Leu Ala Leu Ser Glu Phe Phe Glu Ser Asp
 245 250 255
 Glu Val Phe Ile Thr Thr Ser Gly Gly Gly Val Ala Pro Val Thr Arg
 260 265 270
 Val Asp Asp Arg Ile Phe Ser Asn Asp Ala Pro Gly Pro Ile Thr Thr
 275 280 285
 Ala Leu His Lys Ala Tyr Phe Glu Trp Ala Ala Arg Pro Asp Asn Arg
 290 295 300
 Thr Glu Ile Ser Tyr Arg Asp
 305 310

<210> 41
 <211> 981
 <212> DNA
 <213> Burkholderia sp.

<400> 41
 ttatgccggg accgacgaga agtattcagc cggctgcgcg tgccatcctg cccagcgctt 60
 ctcccagtag aggttgtaga tcttctcggg gatcggggccg gggccgttgc ggttgccgag 120
 cggctgatcg tcgattgcgc tgacgggcat gatcccgccct gccgacgacg aggtgaatgc 180
 ttcgtcagcc tcgcgagcgt gggtcgcggg gtacttgccc atgttcacct tgatgccgag 240
 ctcggcgggc atatacgaaga cgctctggcg cgtgatgccc agcaggcagc cttcggcggg 300
 cgtatagagc tccccgttct tggcgaaaaa cacgttcgca ccggctgctt cggtgagggt 360
 gtcgctttcg tcgacgagaa ccgcccagtc cttctcctgc gtcattggctt cgaacagcgc 420
 gagcttcatg tccatccagt ggaagttctt ggccgtggga tcgaccgcct tcgcggaat 480
 gcggttgtag agcttgctga tcagcagggt cgagcctcgc gtgcggacct cgtcgtcagc 540
 ctggaagaag aacggcacgg caaacgcgaa catcgcgctt ttcattggcg cgcggtcgcg 600
 gcgatcgacg ctcagcgggc cgcgggtgac gcaccaccag acgtacgcgt cttcaggcc 660
 ggcgttgccg acgagggtgt ggagaatctc cttgacctgg tcgcgattga acgattctc 720
 aaggaagaac ttcgccgacg actcttccat gcgcgtgagg tgatcgtcga gccggaagaa 780
 gttgccccgc gagacggtga cgacatcgta ggccgcgtcg gcatgcagga atcctgcgtc 840
 gacgagcggg acggtcgtt cgggtgatgg gacgtagttg ccgtcacaga aggcgctgcc 900
 atcttcgtag cgggggtcat gcggagcgcg agcatgcagc gggttctcgt gcatgatctg 960
 ctggacttga atgattgcca t 981

<210> 42
 <211> 326
 <212> PRT
 <213> Burkholderia sp.

<400> 42
 Met Ala Ile Ile Gln Val Gln Gln Ile Met His Glu Asn Pro Leu His
 1 5 10 15
 Ala Arg Ala Pro His Glu Pro Arg Tyr Glu Asp Gly Ser Ala Phe Cys
 20 25 30
 Asp Gly Asn Tyr Val Pro Ile Thr Glu Ala Thr Val Pro Leu Val Asp
 35 40 45
 Ala Gly Phe Leu His Ala Asp Ala Ala Tyr Asp Val Val Thr Val Ser
 50 55 60
 Arg Gly Asn Phe Phe Arg Leu Asp Asp His Leu Thr Arg Met Glu Glu
 65 70 75 80

ser Ser Ala Lys Phe Phe Leu Glu Asn Pro Phe Asn Arg Asp Gln Val
 85 90 95
 Lys Glu Ile Leu His Asn Leu Val Arg Asn Ala Gly Leu Lys Asp Ala
 100 105 110
 Tyr Val Trp Trp Cys Val Thr Arg Gly Pro Leu Ser Val Asp Arg Arg
 115 120 125
 Asp Arg Gly Ala Met Lys Asn Ala Met Phe Ala Phe Ala Val Pro Phe
 130 135 140
 Phe Phe Gln Ala Asp Asp Glu Val Arg Thr Arg Gly Ser Asn Leu Leu
 145 150 155 160
 Ile Ser Lys Leu Tyr Asn Arg Ile Ser Ala Lys Ala Val Asp Pro Thr
 165 170 175
 Ala Lys Asn Phe His Trp Met Asp Met Lys Leu Ala Leu Phe Glu Ala
 180 185 190
 Met Thr Gln Glu Lys Asp Trp Ala Val Leu Val Asp Glu Ser Asp Asn
 195 200 205
 Leu Thr Glu Ala Ala Gly Ala Asn Val Phe Phe Ala Lys Asn Gly Glu
 210 215 220
 Leu Tyr Thr Pro Ala Glu Gly Cys Leu Leu Gly Ile Thr Arg Gln Ser
 225 230 235 240
 Val Phe Asp Ile Ala Ala Glu Leu Gly Ile Lys Val Asn Ile Gly Lys
 245 250 255
 Tyr Thr Ala Thr Gln Leu Arg Glu Ala Asp Glu Ala Phe Thr Ser Ser
 260 265 270
 Ser Ala Gly Gly Ile Met Pro Val Ser Ala Ile Asp Asp Gln Pro Leu
 275 280 285
 Gly Asn Arg Asn Gly Pro Gly Pro Ile Ser Glu Lys Ile His Asn Leu
 290 295 300
 Tyr Trp Glu Lys Arg Trp Ala Gly Trp His Ala Gln Pro Ala Glu Tyr
 305 310 315 320
 Phe Ser Ser Val Pro Ala
 325

<210> 43
 <211> 954
 <212> DNA

<213> Burkholderia cenocepacia

<400> 43

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tcagccgtcc gcgtagtcga ccgccaggct ccacgccgga tcgccgtgct tcgcccagta      60
cgcgtcgaac agccggcgcg tcatcgggcc cggacggccg tcgccgatcg tcgcgctcgtt    120
cagccgcgtg accggcatga tgccgccggc cgtcgacgtg atgaacactt cgtccgcgtc      180
gcgcaactgt gcatcgtcga tgcgcgcagc ctgggcgtcg atgcccacatg ccgtcgccag      240
ctcgaacacc gtctgccgcg tgatgccatg cagcacgccg cgctcgggcg tccgcagccg      300
gccgtcgcg acgacgaaca cgttgaaccc gggcccttcg gcgatgctgc cgtccgtgca      360
cttcagcagg accgactccg cgcccgcgtc atagcccttc agcagcccgg cgacgaggtc      420
cagccagtga tagttcttga tctgcggatc gaccgattcg ggcggaatgc gccgcacgtc      480
gtcgatcacg tggagggtgca gcccttcgcg caactgccgc tcgttcgcga ccgatccgta      540
cggcaccgcg aacgcgatga actgggtcac cgcatcgcg cggtcgcggc tgaaggtcgg      600
cgacacgccg cgcgtacaca gcatctcgac gtaggcgtgg cgcagccccg agcggcgcac      660
gcattcgacg aggatgtcgc gcagcgcac gtcgggtcaac ggcacgttca gccgcaaccg      720
cgcaagcgag cgcctgaatc gctcgatatg cttgtcgagg cggaagaagc ggccgttcca      780
aacatgcacg gtgtcgtacg tgacgtcggg gtgcagaaag ccccgatcga gcaccgatac      840
gcgcgcgtcg gcgatcggaa tgaagcggcc gttcatgtag gcggcgccct gcggaaacgc      900
gggcgcttcg acggatggaa tgccatgatg ggccgaacgt gtctcccgcg gcac          954

```

<210> 44

<211> 317

<212> PRT

<213> Burkholderia cenocepacia

<400> 44

```

Met Pro Arg Glu Thr Arg Ser Ala His His Gly Ile Pro Ser Val Glu
1           5           10          15

```

```

Ala Pro Ala Phe Pro Gln Gly Ala Ala Tyr Met Asn Gly Arg Phe Ile
20          25          30

```

```

Pro Ile Ala Asp Ala Arg Val Ser Val Leu Asp Trp Gly Phe Leu His
35          40          45

```

```

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

```

```

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

```

```

Arg Leu Asn Val Pro Leu Thr Asp Asp Ala Leu Arg Asp Ile Leu Val
85          90          95

```

```

Glu Cys Val Arg Arg Ser Gly Leu Arg His Ala Tyr Val Glu Met Leu

```

100

105

110

Cys Thr Arg Gly Val Ser Pro Thr Phe Ser Arg Asp Pro Arg Asp Ala
 115 120 125
 Val Asn Gln Phe Ile Ala Phe Ala Val Pro Tyr Gly Ser Val Ala Asn
 130 135 140
 Glu Arg Gln Leu Arg Glu Gly Leu His Leu His Val Ile Asp Asp Val
 145 150 155 160
 Arg Arg Ile Pro Pro Glu Ser Val Asp Pro Gln Ile Lys Asn Tyr His
 165 170 175
 Trp Leu Asp Leu Val Ala Gly Leu Leu Lys Gly Tyr Asp Ala Gly Ala
 180 185 190
 Glu Ser Val Leu Leu Lys Cys Thr Asp Gly Ser Ile Ala Glu Gly Pro
 195 200 205
 Gly Phe Asn Val Phe Val Val Arg Asp Gly Arg Leu Arg Thr Pro Glu
 210 215 220
 Arg Gly Val Leu His Gly Ile Thr Arg Gln Thr Val Phe Glu Leu Ala
 225 230 235 240
 Thr Ala Met Gly Ile Asp Ala Gln Ala Ala Arg Ile Asp Asp Ala Gln
 245 250 255
 Leu Arg Asp Ala Asp Glu Val Phe Ile Thr Ser Thr Ala Gly Gly Ile
 260 265 270
 Met Pro Val Thr Arg Leu Asn Asp Ala Thr Ile Gly Asp Gly Arg Pro
 275 280 285
 Gly Pro Met Thr Arg Arg Leu Phe Asp Ala Tyr Trp Ala Lys His Gly
 290 295 300
 Asp Pro Ala Trp Ser Leu Ala Val Asp Tyr Ala Asp Gly
 305 310 315

<210> 45

<211> 864

<212> DNA

<213> alpha proteobacterium

<400> 45

ttaatatcca actggatcac gatgtttacc ttcattgtgc agctgccaat aggcattcat 60
 tatacgtttc gacaaaaggcc cgatattgcc ggaagcaatt ggtcgttcgt caattcttgt 120
 aacaggcatc acgccccgg cagtcgaggt tatgaagacc tcgtcagcgg ttttaagctt 180
 gtcgacagta atgtcttgcg catgacatct aacttccaat tcttcgcaaa tgtcaaaaat 240

```

ggtttgccgc gtaattccca acaagacact tacgtcgggc gttgaaacca caccattggt      300
gatcgagaaa atattgaatc ctggcccttc ggacacgttg ccattaaggt caatcagagt      360
ggctgtgtct gctccacgtt cgtaggcagc ataaagccct ttgaccatat ccaaccaatg      420
gtaattcttg acggtaggat caacagagct tgggtggaatg cgaacgacat ccgtgatcgc      480
cagatgcaaa ccacactcca actgttcttt gctggccact gaaccgaacg gaatggcaaa      540
agctatgaag cggttttctg catctcttgg atctcgactg aagttgggtg acgttcctct      600
tgtgcagatg aactcaacat atgcattttt gagcttggac aacgccacgc aattatgaag      660
aatttctatg atttgcgctt tgggtgtaagg aattgacata tgcaaagcgt ccattccacg      720
ggaaaatcga tctaaatgat cacctaactt gaaaaatgct ccgccccata catgggcaac      780
gtcataagtc gcgtctgaat gaagaaaccc ataatccaaa acggacaatt tcgcctcatg      840
gataggtagg tactgcccac ccat                                             864

```

```

<210> 46
<211> 287
<212> PRT
<213> alpha proteobacterium

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```
<400> 46
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```

Met Asp Gly Gln Tyr Leu Pro Ile His Glu Ala Lys Leu Ser Val Leu
1          5          10          15

```

```

Asp Tyr Gly Phe Leu His Ser Asp Ala Thr Tyr Asp Val Ala His Val
20          25          30

```

```

Trp Gly Gly Ala Phe Phe Lys Leu Gly Asp His Leu Asp Arg Phe Ser
35          40          45

```

```

Arg Gly Met Asp Ala Leu His Met Ser Ile Pro Tyr Thr Lys Ala Gln
50          55          60

```

```

Ile Ile Glu Ile Leu His Asn Cys Val Ala Leu Ser Lys Leu Lys Asn
65          70          75          80

```

```

Ala Tyr Val Glu Phe Ile Cys Thr Arg Gly Thr Ser Pro Asn Phe Ser
85          90          95

```

```

Arg Asp Pro Arg Asp Ala Glu Asn Arg Phe Ile Ala Phe Ala Ile Pro
100         105         110

```

```

Phe Gly Ser Val Ala Ser Lys Glu Gln Leu Glu Cys Gly Leu His Leu
115         120         125

```

```

Ala Ile Thr Asp Val Val Arg Ile Pro Pro Ser Ser Val Asp Pro Thr
130         135         140

```

```

Val Lys Asn Tyr His Trp Leu Asp Met Val Lys Gly Leu Tyr Ala Ala

```

145 150 155 160

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

Val Ser Glu Gly Pro Gly Phe Asn Ile Phe Ser Ile Thr Asn Gly Val
180 185 190

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

Ile Phe Asp Ile Cys Glu Glu Leu Glu Val Arg Cys His Ala Gln Asp
210 215 220

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

Thr Ala Gly Gly Val Met Pro Val Thr Arg Ile Asp Glu Arg Pro Ile
245 250 255

Ala Ser Gly Asn Ile Gly Pro Leu Ser Lys Arg Ile Met His Ala Tyr
260 265 270

Trp Gln Leu His Asn Glu Gly Lys His Arg Asp Pro Val Glu Tyr
275 280 285

```
<210> 47
<211> 882
<212> DNA
<213> gamma proteobacterium
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<400>	47						
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gtatccccgg	tggatcaggg	attcctgctc	ggtgatggcg	tattcgatgt	ggtctccgcc		120
tggaagggca	acatcttcaa	gctcgacgcc	catctcgatc	ggttctttga	ctcgattcag		180
gccgcgcgac	tcaatcacga	catgagtcga	gacgcgtgga	aggaagcgat	catcgaaacc		240
acgcgtcgca	atggactcga	cgatgcctcg	attcgcttta	tcgtgacccg	cggcgagccc		300
aaaggggtgg	ttgtgatcc	ccgggatttt	aaaccgacgt	gcatcgctctg	ggtggcgcct		360
tatatcttcc	tcgcggatga	ggagaaacgc	cgcaatggta	ttcgcttgat	gattagcgcg		420
acgcgggggtt	tccctgctga	caccctggac	cctcgttaca	aatgcctcga	ccgcctgcat		480
tcacagctga	ttcggttga	ggccctggag	gcgggttatg	acgatgcgct	ttggctcgat		540
cattccgggtc	acgtgtccga	gtcagcagcg	agcaacctgt	ttatcgtcaa	gaatggtgtg		600
ttgtacaccc	cttcagcagg	aattctgcgc	ggcattacac	gggacaccat	tctcgagctc		660
gcgaccgagc	tggacatccc	ctggaaagag	cgacagctca	gtgcgttcga	tgtctatatc		720
gccgatgagg	tcttcacctg	cagcacagcg	ggtggcgcgc	ttccggtcag	ggaggtcgca		780
ggtcgaacga	ttcgcggcac	aacccccggc	ccgattaccc	aggcaatcga	caacgcgtat		840

tgggcatgac gtgaaacaga ccggtacgcg acgccgcttt aa

882

<210> 48
 <211> 293
 <212> PRT
 <213> gamma proteobacterium

<400> 48

Met Ser Asp Glu Pro Ile Ile Tyr Ile Asn Gly Asp Tyr Leu Pro Leu
 1 5 10 15

Ser Gln Ala Arg Val Ser Pro Val Asp Gln Gly Phe Leu Leu Gly Asp
 20 25 30

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

Asp Ala His Leu Asp Arg Phe Phe Asp Ser Ile Gln Ala Ala Arg Leu
 50 55 60

Asn His Asp Met Ser Arg Asp Ala Trp Lys Glu Ala Ile Ile Glu Thr
 65 70 75 80

Thr Arg Arg Asn Gly Leu Asp Asp Ala Ser Ile Arg Phe Ile Val Thr
 85 90 95

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

Thr Cys Ile Val Trp Val Ala Pro Tyr Ile Phe Leu Ala Asp Glu Glu
 115 120 125

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

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

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

Leu Trp Leu Asp His Ser Gly His Val Ser Glu Ser Ala Ala Ser Asn
 180 185 190

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

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

Asp Ile Pro Trp Lys Glu Arg Gln Leu Ser Ala Phe Asp Val Tyr Ile

225

230

235

240

Ala Asp Glu Val Phe Thr Cys Ser Thr Ala Gly Gly Ala Leu Pro Val
 245 250 255

Arg Glu Val Ala Gly Arg Thr Ile Arg Gly Thr Thr Pro Gly Pro Ile
 260 265 270

Thr Gln Ala Ile Asp Asn Ala Tyr Trp Ala Met Arg Glu Thr Asp Arg
 275 280 285

Tyr Ala Thr Pro Leu
 290

<210> 49
 <211> 1014
 <212> DNA
 <213> Mycobacterium vanbaalenii

<400> 49
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 gatacaccgg caggcagcgt tattcagtat agcgattatg aaattgatta tagcagccccg 120
 tttgccggtg gtgttgcattg gattgaaggt gaatatctgc ctgcagaaga tgcaaaaatt 180
 agcattttttg ataccgggtt tggatcatagc gatctgacct ataccgttgc acatgtttgg 240
 catggcaata tttttcgtct gggcgatcat ctggatcgtc tgctggatgg tgcacgtaaa 300
 ctgcgtctgg atagcgggta taccaaagat gaactggccg atattaccaa aaaatgtgtg 360
 agcctgagcc agctgcgtga aagctttgtt aatctgacca ttaccctggg ttatggtaaa 420
 cgtaaaggcg aaaaagatct gagcaaaactg acccatcagg tgtatatatta tgccattccg 480
 tatctgtggg catttcctcc ggcagagcag atttttggca ccaccgcagt tgttccgcgt 540
 catgttcgtc gtgccggtcg taataccgtt gatccgacca ttaaaaatta tcagtgggggt 600
 gatctgaccg cagcaagctt tgaagcaaaa gatcgtgggtg cacgtaccgc aattctgatg 660
 gatgccgata attgtgttgc agaaggtccg ggttttaacg tgtgcattgt gaaagatggt 720
 aaactggcaa gcccagagccg taatgcactg ccgggtatta cacgtaaaac cgtgtttgaa 780
 attgccggtg caatgggtat tgaagcagca ctgcgtgatg ttaccagcca tgaactgtat 840
 gatgccgatg aaattatggc agttaccacc gcaggcgggtg ttaccccgat taataccctg 900
 gatgggtgtc cgattgggtg tgggtgaaccg ggtccgggta ccgttgccat tcgtgatcgt 960
 ttttgggcac tgatggatga acctgggtccg ctgattgaag caattcagta ttaa 1014

<210> 50
 <211> 337
 <212> PRT
 <213> Mycobacterium vanbaalenii

<400> 50

Met Gly Ile Asp Thr Gly Thr Ser Asn Leu Val Ala Val Glu Pro Gly

1 5 10 15
 Ala Ile Arg Glu Asp Thr Pro Ala Gly Ser Val Ile Gln Tyr Ser Asp
 20 25 30
 Tyr Glu Ile Asp Tyr Ser Ser Pro Phe Ala Gly Gly Val Ala Trp Ile
 35 40 45
 Glu Gly Glu Tyr Leu Pro Ala Glu Asp Ala Lys Ile Ser Ile Phe Asp
 50 55 60
 Thr Gly Phe Gly His Ser Asp Leu Thr Tyr Thr Val Ala His Val Trp
 65 70 75 80
 His Gly Asn Ile Phe Arg Leu Gly Asp His Leu Asp Arg Leu Leu Asp
 85 90 95
 Gly Ala Arg Lys Leu Arg Leu Asp Ser Gly Tyr Thr Lys Asp Glu Leu
 100 105 110
 Ala Asp Ile Thr Lys Lys Cys Val Ser Leu Ser Gln Leu Arg Glu Ser
 115 120 125
 Phe Val Asn Leu Thr Ile Thr Arg Gly Tyr Gly Lys Arg Lys Gly Glu
 130 135 140
 Lys Asp Leu Ser Lys Leu Thr His Gln Val Tyr Ile Tyr Ala Ile Pro
 145 150 155 160
 Tyr Leu Trp Ala Phe Pro Pro Ala Glu Gln Ile Phe Gly Thr Thr Ala
 165 170 175
 Val Val Pro Arg His Val Arg Arg Ala Gly Arg Asn Thr Val Asp Pro
 180 185 190
 Thr Ile Lys Asn Tyr Gln Trp Gly Asp Leu Thr Ala Ala Ser Phe Glu
 195 200 205
 Ala Lys Asp Arg Gly Ala Arg Thr Ala Ile Leu Met Asp Ala Asp Asn
 210 215 220
 Cys Val Ala Glu Gly Pro Gly Phe Asn Val Cys Ile Val Lys Asp Gly
 225 230 235 240
 Lys Leu Ala Ser Pro Ser Arg Asn Ala Leu Pro Gly Ile Thr Arg Lys
 245 250 255
 Thr Val Phe Glu Ile Ala Gly Ala Met Gly Ile Glu Ala Ala Leu Arg
 260 265 270
 Asp Val Thr Ser His Glu Leu Tyr Asp Ala Asp Glu Ile Met Ala Val

275

280

285

Thr Thr Ala Gly Gly Val Thr Pro Ile Asn Thr Leu Asp Gly Val Pro
290 295 300

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

Phe Trp Ala Leu Met Asp Glu Pro Gly Pro Leu Ile Glu Ala Ile Gln
325 330 335

Tyr