

## SEQUENCE LISTING

<110> Evonik Degussa GmbH

<120> omega-AMINOCARBONSÄUREN ODER IHRE LACTAME HERSTELLENDEN,  
REKOMBINANTE ZELLEN

<130> 200700667

<160> 47

<170> PatentIn version 3.4

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<213> Chromobacterium violaceum

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 <213> *Pseudomonas putida*

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 <213> *Pseudomonas putida*

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<212> DNA

<213> *Pseudomonas putida*

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<213> Pseudomonas putida

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<212> DNA

<213> Pseudomonas fluoreszenz

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<212> PRT

<213> Pseudomonas putida W619

<400> 19

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1 5 10 15

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

Leu Tyr Pro Arg Ala Asn Leu Ala Ala Thr Thr Ser Ile Val Ala Tyr  
35 40 45

Ser Phe Phe Glu Glu Pro Pro Met Asn Met Pro Glu Thr Ala Pro Ala  
50 55 60

Gly Ile Ala Ser Gln Leu Lys Leu Asp Ala His Trp Met Pro Tyr Thr  
65 70 75 80

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

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

Ser Gly Leu Trp Thr Cys Gly Ala Gly His Thr Arg Lys Glu Ile Thr  
115 120 125

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

Gln Phe Gly His Pro Leu Ser Phe Gln Leu Ala Glu Lys Ile Thr Ala  
 145                    150                    155                    160

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

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

Lys Gly Gln Ala Thr Lys Thr Lys Ile Ile Gly Arg Ala Arg Gly Tyr  
                   195                    200                    205

His Gly Val Asn Ile Ala Gly Thr Ser Leu Gly Gly Val Asn Gly Asn  
                   210                    215                    220

Arg Lys Met Phe Gly Gln Leu Leu Asp Val Asp His Leu Pro His Thr  
 225                    230                    235                    240

Val Leu Pro Val Asn Ala Phe Ser Lys Gly Leu Pro Glu Glu Gly Gly  
                   245                    250                    255

Ile Ala Leu Ala Asp Glu Met Leu Lys Leu Ile Glu Leu His Asp Ala  
                   260                    265                    270

Ser Asn Ile Ala Ala Val Ile Val Glu Pro Leu Ala Gly Ser Ala Gly  
                   275                    280                    285

Val Leu Pro Pro Pro Lys Gly Tyr Leu Lys Arg Leu Arg Glu Ile Cys  
                   290                    295                    300

Thr Gln His Asn Ile Leu Leu Ile Phe Asp Glu Val Ile Thr Gly Phe  
 305                    310                    315                    320

Gly Arg Met Gly Ala Met Thr Gly Ala Glu Ala Phe Gly Val Thr Pro  
                   325                    330                    335

Asp Leu Met Cys Ile Ala Lys Gln Val Thr Asn Gly Ala Ile Pro Met  
 340 345 350

Gly Ala Val Ile Ala Ser Ser Glu Ile Tyr Gln Thr Phe Met Asn Gln  
 355 360 365

Pro Thr Pro Glu Tyr Ala Val Glu Phe Pro His Gly Tyr Thr Tyr Ser  
 370 375 380

Ala His Pro Val Ala Cys Ala Ala Gly Ile Ala Ala Leu Asp Leu Leu  
 385 390 395 400

Gln Arg Glu Asn Leu Val Gln Ser Ala Ala Glu Leu Ala Pro His Phe  
 405 410 415

Glu Lys Leu Leu His Gly Val Lys Gly Thr Lys Asn Val Val Asp Ile  
 420 425 430

Arg Asn Tyr Gly Leu Ala Gly Ala Ile Gln Ile Ala Ala Arg Asp Gly  
 435 440 445

Asp Ala Ile Val Arg Pro Tyr Glu Val Ala Met Lys Leu Trp Lys Ala  
 450 455 460

Gly Phe Tyr Val Arg Phe Gly Gly Asp Thr Leu Gln Phe Gly Pro Thr  
 465 470 475 480

Phe Asn Thr Thr Pro Gln Gln Leu Asp Arg Leu Phe Asp Ala Val Gly  
 485 490 495

Glu Asn Leu Asn Leu Ile Asp  
 500

<210> 20

<211> 460

<212> PRT

<213> Pseudomonas aeruginosa PA01

&lt;400&gt; 20

Met Thr Ala Gln Leu Asn Pro Gln Arg Asp Thr Arg Asp Tyr Gln Gln  
 1 5 10 15

Leu Asp Ala Ala His His Ile His Ala Phe Leu Asp Gln Lys Ala Leu  
 20 25 30

Asn Arg Glu Gly Pro Arg Val Met Val Arg Gly Asp Gly Leu Gln Leu  
 35 40 45

Trp Asp Asn Asp Gly Lys Arg Tyr Leu Asp Gly Met Ser Gly Leu Trp  
 50 55 60

Cys Thr Asn Leu Gly Tyr Gly Arg Gln Asp Leu Ala Ala Ala Ala Ser  
 65 70 75 80

Arg Gln Leu Glu Gln Leu Pro Tyr Tyr Asn Met Phe Phe His Thr Thr  
 85 90 95

His Pro Ala Val Val Glu Leu Ser Glu Met Leu Phe Ser Leu Leu Pro  
 100 105 110

Asp His Tyr Ser His Ala Ile Tyr Thr Asn Ser Gly Ser Glu Ala Asn  
 115 120 125

Glu Val Leu Ile Arg Thr Val Arg Arg Tyr Trp Gln Ile Leu Gly Lys  
 130 135 140

Pro Gln Lys Lys Ile Met Ile Gly Arg Trp Asn Gly Tyr His Gly Ser  
 145 150 155 160

Thr Leu Gly Ser Thr Ala Leu Gly Gly Met Lys Phe Met His Glu Met  
 165 170 175

Gly Gly Met Leu Pro Asp Phe Ala His Ile Asp Glu Pro Tyr Trp Tyr



180

185

190

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

Leu Gln Leu Glu Glu Lys Ile Leu Glu Leu Gly Ala Glu Asn Val Ala  
 210 215 220

Ala Phe Val Ala Glu Pro Phe Gln Gly Ala Gly Gly Met Ile Phe Pro  
 225 230 235 240

Pro Gln Ser Tyr Trp Pro Glu Ile Gln Arg Ile Cys Arg Gln Tyr Asp  
 245 250 255

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

Glu Trp Phe Ala His Glu His Phe Gly Phe Gln Pro Asp Thr Leu Ser  
 275 280 285

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

Leu Gly Lys Arg Ile Ala Glu Val Leu Val Glu Gln Gly Gly Val Phe  
 305 310 315 320

Ala His Gly Leu Thr Tyr Ser Gly His Pro Val Ala Ala Val Ala  
 325 330 335

Ile Ala Asn Leu Lys Ala Leu Arg Asp Glu Gly Val Val Thr Arg Val  
 340 345 350

Arg Glu Glu Thr Gly Pro Tyr Leu Gln Arg Cys Leu Arg Glu Val Phe  
 355 360 365

Gly Asp His Pro Leu Val Gly Glu Val Gln Gly Ala Gly Phe Val Ala

370                      375                      380

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

Glu Asn Asp Leu Ala Trp Arg Cys Arg Thr Ile Gly Phe Glu Glu Gly  
405                      410                      415

Val Ile Ile Arg Ser Thr Leu Gly Arg Met Ile Met Ala Pro Ala Leu  
420                      425                      430

Val Ala Gly Arg Ala Glu Ile Asp Glu Leu Ile Asp Lys Thr Arg Ile  
435                      440                      445

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

<210> 21  
<211> 448  
<212> PRT  
<213> Pseudomonas aeruginosa PA01

<400> 21

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

Leu Arg Ala His Trp Met Pro Phe Ser Ala Asn Arg Asn Phe Gln Lys  
20                      25                      30

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

Lys Gly Arg Lys Val Tyr Asp Ser Leu Ser Gly Leu Trp Thr Cys Gly  
50                      55                      60

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

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

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

His Val Phe Phe Thr Gly Ser Gly Ser Glu Cys Ala Asp Thr Ser Ile  
          115                 120                 125

Lys Met Ala Arg Ala Tyr Trp Arg Leu Lys Gly Gln Pro Gln Lys Thr  
          130                 135                 140

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

Thr Ser Leu Gly Gly Ile Gly Gly Asn Arg Lys Met Phe Gly Gln Leu  
          165                 170                 175

Met Asp Val Asp His Leu Pro His Thr Leu Gln Pro Gly Met Ala Phe  
          180                 185                 190

Thr Arg Gly Met Ala Gln Thr Gly Gly Val Glu Leu Ala Asn Glu Leu  
          195                 200                 205

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

Val Glu Pro Met Ser Gly Ser Ala Gly Val Leu Val Pro Pro Val Gly  
          225                 230                 235                 240

Tyr Leu Gln Arg Leu Arg Glu Ile Cys Asp Gln His Asn Ile Leu Leu  
          245                 250                 255

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

Gly Ala Glu Tyr Phe Gly Val Thr Pro Asp Leu Met Asn Val Ala Lys  
 275 280 285

Gln Val Thr Asn Gly Ala Val Pro Met Gly Ala Val Ile Ala Ser Ser  
 290 295 300

Glu Ile Tyr Asp Thr Phe Met Asn Gln Ala Leu Pro Glu His Ala Val  
 305 310 315 320

Glu Phe Ser His Gly Tyr Thr Tyr Ser Ala His Pro Val Ala Cys Ala  
 325 330 335

Ala Gly Leu Ala Ala Leu Asp Ile Leu Ala Arg Asp Asn Leu Val Gln  
 340 345 350

Gln Ser Ala Glu Leu Ala Pro His Phe Glu Lys Gly Leu His Gly Leu  
 355 360 365

Gln Gly Ala Lys Asn Val Ile Asp Ile Arg Asn Cys Gly Leu Ala Gly  
 370 375 380

Ala Ile Gln Ile Ala Pro Arg Asp Gly Asp Pro Thr Val Arg Pro Phe  
 385 390 395 400

Glu Ala Gly Met Lys Leu Trp Gln Gln Gly Phe Tyr Val Arg Phe Gly  
 405 410 415

Gly Asp Thr Leu Gln Phe Gly Pro Thr Phe Asn Ala Arg Pro Glu Glu  
 420 425 430

Leu Asp Arg Leu Phe Asp Ala Val Gly Glu Ala Leu Asn Gly Ile Ala  
 435 440 445

<210> 22  
 <211> 444

<212> PRT

<213> *Pseudomonas aeruginosa* PA01

<400> 22

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

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

Glu Ser Ala Glu Gly Ile His Tyr Ile Ala Gln Gly Gly Arg Arg Ile  
35 40 45

Leu Asp Gly Thr Ala Gly Leu Trp Cys Cys Asn Ala Gly His Gly Arg  
50 55 60

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

Ala Pro Pro Phe Gln Met Gly His Pro Leu Pro Phe Glu Leu Ala Ala  
85 90 95

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

Asn Ser Gly Ser Glu Ser Ala Asp Thr Ala Leu Lys Ile Ala Leu Ala  
115 120 125

Tyr Gln Arg Ala Ile Gly Gln Gly Thr Arg Thr Arg Leu Ile Gly Arg  
130 135 140

Glu Leu Gly Tyr His Gly Val Gly Phe Gly Gly Leu Ser Val Gly Gly  
145 150 155 160

Met Val Asn Asn Arg Lys Ala Phe Ser Ala Asn Leu Leu Pro Gly Val  
165 170 175

Asp His Leu Pro His Thr Leu Asp Val Ala Arg Asn Ala Phe Thr Val  
 180 185 190

Gly Leu Pro Glu His Gly Val Glu Lys Ala Glu Glu Leu Glu Arg Leu  
 195 200 205

Val Thr Leu His Gly Ala Glu Asn Ile Ala Ala Val Ile Val Glu Pro  
 210 215 220

Met Ser Gly Ser Ala Gly Val Val Leu Pro Pro Lys Gly Tyr Leu Gln  
 225 230 235 240

Arg Leu Arg Glu Ile Thr Arg Lys His Gly Ile Leu Leu Ile Phe Asp  
 245 250 255

Glu Val Ile Thr Gly Phe Gly Arg Val Gly Glu Ala Phe Ala Ala Gln  
 260 265 270

Arg Trp Gly Val Val Pro Asp Leu Leu Thr Cys Ala Lys Gly Leu Thr  
 275 280 285

Asn Gly Ser Ile Pro Met Gly Ala Val Phe Val Asp Glu Lys Ile His  
 290 295 300

Ala Ala Phe Met Gln Gly Pro Gln Gly Ala Ile Glu Phe Phe His Gly  
 305 310 315 320

Tyr Thr Tyr Ser Gly His Pro Val Ala Cys Ala Ala Ala Leu Ala Thr  
 325 330 335

Leu Asp Ile Tyr Arg Arg Asp Asp Leu Phe Gln Arg Ala Val Glu Leu  
 340 345 350

Glu Gly Tyr Trp Gln Asp Ala Leu Phe Ser Leu Arg Asp Leu Pro Asn  
 355 360 365

Val Val Asp Ile Arg Ala Val Gly Leu Val Gly Gly Val Gln Leu Ala  
 370 375 380

Pro His Ala Asp Gly Pro Gly Lys Arg Gly Tyr Asp Val Phe Glu Arg  
 385 390 395 400

Cys Phe Trp Glu His Asp Leu Met Val Arg Val Thr Gly Asp Ile Ile  
 405 410 415

Ala Met Ser Pro Pro Leu Ile Ile Asp Lys Pro His Ile Asp Gln Ile  
 420 425 430

Val Glu Arg Leu Ala Gln Ala Ile Arg Ala Ser Val  
 435 440

<210> 23

<211> 468

<212> PRT

<213> Pseudomonas aeruginosa PA01

<400> 23

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

Val Arg Ala Asp Gln Ala His Tyr Met His Gly Tyr His Val Phe Asp  
 20 25 30

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

Tyr Ile Tyr Asp Thr Ala Gly Asn Arg Tyr Leu Asp Ala Val Gly Gly  
 50 55 60

Met Trp Cys Thr Asn Ile Gly Leu Gly Arg Glu Glu Met Ala Arg Thr  
 65 70 75 80

Val Ala Glu Gln Thr Arg Leu Leu Ala Tyr Ser Asn Pro Phe Cys Asp  
85 90 95

Met Ala Asn Pro Arg Ala Ile Glu Leu Cys Arg Lys Leu Ala Glu Leu  
100 105 110

Ala Pro Gly Asp Leu Asp His Val Phe Leu Thr Thr Gly Gly Ser Thr  
115 120 125

Ala Val Asp Thr Ala Ile Arg Leu Met His Tyr Tyr Gln Asn Cys Arg  
130 135 140

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

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

Pro Ala Glu Phe Asp Phe Leu Asp Glu Arg Ile His His Leu Ala Cys  
180 185 190

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

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

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

Val Ile Val Pro Pro Ala Gly Tyr His Arg Arg Met Trp Glu Leu Cys  
245 250 255

Gln Arg Tyr Asp Val Leu Tyr Ile Ser Asp Glu Val Val Thr Ser Phe  
260 265 270



Gly Arg Leu Gly His Phe Phe Ala Ser Gln Ala Val Phe Gly Val Gln  
 275 280 285

Pro Asp Ile Ile Leu Thr Ala Lys Gly Leu Thr Ser Gly Tyr Gln Pro  
 290 295 300

Leu Gly Ala Cys Ile Phe Ser Arg Arg Ile Trp Glu Val Ile Ala Glu  
 305 310 315 320

Pro Asp Lys Gly Arg Cys Phe Ser His Gly Phe Thr Tyr Ser Gly His  
 325 330 335

Pro Val Ala Cys Ala Ala Ala Leu Lys Asn Ile Glu Ile Ile Glu Arg  
 340 345 350

Glu Gly Leu Leu Ala His Ala Asp Glu Val Gly Arg Tyr Phe Glu Glu  
 355 360 365

Arg Leu Gln Ser Leu Arg Asp Leu Pro Ile Val Gly Asp Val Arg Gly  
 370 375 380

Met Arg Phe Met Ala Cys Val Glu Phe Val Ala Asp Lys Ala Ser Lys  
 385 390 395 400

Ala Leu Phe Pro Glu Ser Leu Asn Ile Gly Glu Trp Val His Leu Arg  
 405 410 415

Ala Gln Lys Arg Gly Leu Leu Val Arg Pro Ile Val His Leu Asn Val  
 420 425 430

Met Ser Pro Pro Leu Ile Leu Thr Arg Glu Gln Val Asp Thr Val Val  
 435 440 445

Arg Val Leu Arg Glu Ser Ile Glu Glu Thr Val Glu Asp Leu Val Arg  
 450 455 460

Ala Gly His Arg  
465

<210> 24  
<211> 460  
<212> PRT  
<213> *Pseudomonas putida* W619

<400> 24

Met Asn Ala Pro Phe Gln Pro Gln Arg Asp Thr Arg Asp Tyr Gln Ala  
1 5 10 15

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

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

Trp Asp Asn Asp Gly Arg Arg Tyr Leu Asp Gly Met Ser Gly Leu Trp  
50 55 60

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

Ala Gln Met Asp Gln Leu Ala Tyr Tyr Asn Met Phe Phe His Thr Thr  
85 90 95

His Pro Ala Val Ile Glu Leu Ser Glu Leu Leu Phe Ser Leu Leu Pro  
100 105 110

Gly His Tyr Ser His Ala Ile Tyr Thr Asn Ser Gly Ser Glu Ala Asn  
115 120 125

Glu Val Leu Ile Arg Thr Val Arg Arg Tyr Trp Gln Val Val Gly Gln  
130 135 140

Pro Asn Lys Lys Val Met Ile Gly Arg Trp Asn Gly Tyr His Gly Ser

145                      150                      155                      160

Thr Leu Ala Ala Thr Ala Leu Gly Gly Met Lys Phe Met His Glu Met  
165                      170                      175

Gly Gly Leu Ile Pro Asp Val Ala His Ile Asp Glu Pro Tyr Trp Tyr  
180                      185                      190

Ala Glu Gly Gly Glu Leu Thr Pro Ala Glu Phe Gly Arg Arg Cys Ala  
195                      200                      205

Leu Gln Leu Glu Glu Lys Ile Leu Glu Leu Gly Ala Glu Asn Val Ala  
210                      215                      220

Gly Phe Val Ala Glu Pro Phe Gln Gly Ala Gly Gly Met Ile Phe Pro  
225                      230                      235                      240

Pro Glu Ser Tyr Trp Pro Glu Ile Gln Arg Ile Cys Arg Gln Tyr Asp  
245                      250                      255

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

Glu Trp Phe Ala His Glu Tyr Phe Gly Phe Glu Pro Asp Thr Leu Ser  
275                      280                      285

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

Leu Ser Lys Arg Ile Ala Glu Ala Leu Val Glu Arg Gly Gly Val Phe  
305                      310                      315                      320

Ala His Gly Leu Thr Tyr Ser Gly His Pro Val Ala Ala Val Ala  
325                      330                      335

Ile Ala Asn Leu Lys Ala Leu Arg Asp Glu Gly Ile Val Arg Gln Val

340                      345                      350

Lys Asp Asp Thr Gly Pro Tyr Leu Gln Arg Ile Leu Arg Glu Val Phe  
355                      360                      365

Ala Asn His Pro Leu Ile Gly Gln Val Gln Gly Ala Gly Leu Val Ala  
370                      375                      380

Ala Leu Gln Phe Ala Glu Asp Lys Gly Ser Arg Lys Arg Tyr Ala Asn  
385                      390                      395                      400

Glu Asn Asp Leu Ala Trp Gln Cys Arg Thr Tyr Gly Phe Glu Glu Gly  
405                      410                      415

Val Ile Ile Arg Ser Thr Leu Gly Arg Met Ile Met Ala Pro Ala Leu  
420                      425                      430

Val Ala Thr His Gly Glu Leu Asp Glu Leu Val Asp Lys Thr Arg Ile  
435                      440                      445

Ala Val Asp Arg Thr Ala Arg Gly Leu Gly Ile Leu  
450                      455                      460

<210> 25  
<211> 459  
<212> PRT  
<213> Pseudomonas putida KT2440

<400> 25

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

His Pro Asn Thr Asn Leu Ala Gln His Arg Glu Val Gly Pro Leu Val  
20                      25                      30

Ile Ala Arg Gly Asp Gly Val Arg Val Phe Asp Glu Gln Gly Asn Ala  
35                      40                      45

Tyr Ile Glu Ala Met Ser Gly Leu Trp Ser Ala Ala Leu Gly Phe Ser  
 50 55 60

Glu Gln Arg Leu Val Asp Ala Ala Val Glu Gln Phe Lys Gln Leu Pro  
 65 70 75 80

Tyr Tyr His Ser Phe Ser His Lys Thr Asn Ala Pro Ala Ala Ala Leu  
 85 90 95

Ala Ala Lys Leu Ala Ala Leu Ala Pro Gly Asp Leu Asn His Val Phe  
 100 105 110

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

Trp Tyr Val Asn Asn Ala Leu Gly Arg Pro Ala Lys Lys Lys Phe Ile  
 130 135 140

Ser Arg Gln Gln Ala Tyr His Gly Ala Thr Val Ala Ala Ala Ser Leu  
 145 150 155 160

Thr Gly Ile Pro Ser Met His Arg Asp Phe Asp Leu Pro Ala Ile Pro  
 165 170 175

Val His His Leu Thr Cys Pro Asn Phe Tyr Arg Phe Ala Arg Pro Gly  
 180 185 190

Glu Ser Gln Glu Ala Phe Thr Val Arg Leu Ala Asn Glu Leu Glu Arg  
 195 200 205

Tyr Ile Leu Ala Glu Gly Pro Glu Thr Ile Ala Ala Phe Ile Gly Glu  
 210 215 220

Pro Val Ile Ala Ala Gly Gly Val Ile Pro Pro Pro Thr Gly Tyr Trp  
 225 230 235 240

Ala Ala Ile Gln Ala Val Cys Lys Arg Tyr Asp Ile Leu Val Val Ile  
 245 250 255

Asp Glu Ile Ile Thr Gly Phe Gly Arg Leu Gly Thr Met Phe Gly Ser  
 260 265 270

Gln Leu Tyr Gly Ile Gln Pro Asp Ile Met Val Leu Ser Lys Gln Leu  
 275 280 285

Thr Ser Ser Tyr Gln Pro Leu Ala Ala Val Val Val Ser Asp Ala Met  
 290 295 300

Asn Asp Val Leu Val Ser Gln Ser Gln Arg Leu Gly Ala Phe Ala His  
 305 310 315 320

Gly Leu Thr Cys Thr Gly His Pro Val Ala Thr Ala Val Ala Leu Glu  
 325 330 335

Asn Ile Arg Ile Ile Glu Glu Arg Asp Leu Val Gly His Val Gln His  
 340 345 350

Leu Ala Pro Val Phe Gln Arg His Leu Arg Ala Phe Glu Asp His Pro  
 355 360 365

Leu Val Gly Asn Val Arg Gly Val Gly Leu Met Gly Gly Ile Glu Leu  
 370 375 380

Val Ala Asp Lys Ala Thr Arg Gln Pro Phe Ala Gln Pro Gly Thr Leu  
 385 390 395 400

Gly Gly Tyr Val Phe Lys Gln Ala His Lys His Gly Leu Ile Ile Arg  
 405 410 415

Ala Ile Tyr Asp Thr Ile Ala Phe Cys Pro Pro Leu Ile Thr Thr Gln  
 420 425 430

Asp Asp Ile Glu Ala Ile Phe Ser Ala Phe Glu Arg Thr Leu Ala Asp  
 435 440 445

Ala Thr Asp Trp Ala Arg Ser Gln His Leu Leu  
 450 455

<210> 26

<211> 490

<212> PRT

<213> Pseudomonas putida W619

<400> 26

Met Arg Ile Ser Ser Val Ser Ser Ala Pro Gly Ser Val Ser Ser Cys  
 1 5 10 15

Cys Leu Leu Cys Asp Gln Pro Leu Arg Pro Pro Ala Gly Gly Leu Trp  
 20 25 30

Thr Leu Glu Lys His Met Ser Val Lys Asn Pro Gln Thr Arg Asp Trp  
 35 40 45

Gln Thr Leu Ser Gly Glu His His Leu Ala Pro Phe Ser Asp Tyr Lys  
 50 55 60

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

His Leu Trp Asp Ser Glu Gly His Lys Ile Leu Asp Gly Met Ala Gly  
 85 90 95

Leu Trp Cys Val Ala Val Gly Tyr Gly Arg Glu Glu Leu Val Gln Ala  
 100 105 110

Ala Glu Lys Gln Met Arg Glu Leu Pro Tyr Tyr Asn Leu Phe Phe Gln  
 115 120 125

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

Ala Pro Glu Gly Met Thr His Val Phe Phe Thr Gly Ser Gly Ser Glu  
145 150 155 160

Gly Asn Asp Thr Val Leu Arg Met Val Arg His Tyr Trp Ala Leu Lys  
165 170 175

Gly Lys Pro Gln Lys Gln Thr Ile Ile Gly Arg Ile Asn Gly Tyr His  
180 185 190

Gly Ser Thr Val Ala Gly Ala Ser Leu Gly Gly Met Ser Gly Met His  
195 200 205

Glu Gln Gly Gly Leu Pro Ile Pro Gly Ile Val His Ile Pro Gln Pro  
210 215 220

Tyr Trp Phe Gly Glu Gly Gly Asp Met Ser Pro Asp Asp Phe Gly Val  
225 230 235 240

Trp Ala Ala Glu Gln Leu Glu Lys Lys Ile Leu Glu Val Gly Glu Asp  
245 250 255

Asn Val Ala Ala Phe Ile Ala Glu Pro Ile Gln Gly Ala Gly Gly Val  
260 265 270

Ile Ile Pro Pro Glu Thr Tyr Trp Pro Lys Val Lys Glu Ile Leu Ala  
275 280 285

Lys Tyr Asp Ile Leu Phe Val Ala Asp Glu Val Ile Cys Gly Phe Gly  
290 295 300

Arg Thr Gly Glu Trp Phe Gly Ser Asp Tyr Tyr Asp Leu Lys Pro Asp  
305 310 315 320



Leu Met Thr Ile Ala Lys Gly Leu Thr Ser Gly Tyr Ile Pro Met Gly  
 325 330 335

Gly Val Ile Val Arg Asp Lys Val Ala Lys Val Leu Ser Glu Gly Gly  
 340 345 350

Asp Phe Asn His Gly Phe Thr Tyr Ser Gly His Pro Val Ala Ala Ala  
 355 360 365

Val Gly Leu Glu Asn Leu Arg Ile Leu Arg Glu Glu Lys Ile Val Glu  
 370 375 380

Lys Val Arg Thr Glu Val Ala Pro Tyr Leu Gln Lys Arg Leu Arg Glu  
 385 390 395 400

Leu Gln Asp His Pro Leu Val Gly Glu Val Arg Gly Leu Gly Leu Leu  
 405 410 415

Gly Ala Ile Glu Leu Val Lys Asp Lys Ala Ser Arg Ser Arg Tyr Glu  
 420 425 430

Gly Lys Gly Val Gly Met Val Cys Arg Asn Phe Cys Phe Asp Asn Gly  
 435 440 445

Leu Ile Met Arg Ala Val Gly Asp Thr Met Ile Ile Ala Pro Pro Leu  
 450 455 460

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

Cys Leu Asp Leu Thr Leu Glu Ala Ile Arg  
 485 490

<210> 27

<211> 457

<212> PRT

<213> *Streptomyces coelicolor* A3(2)

<400> 27

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

Leu Trp Met His Phe Thr Arg Met Ser Ser Tyr Glu Asn Ala Pro Val  
20 25 30

Pro Thr Ile Val Arg Gly Glu Gly Thr His Ile Tyr Asp Asp Lys Gly  
35 40 45

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

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

Leu Ala Phe Phe Pro Val Trp Ser Tyr Ala His Pro Lys Ala Val Glu  
85 90 95

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

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

Ala Lys Gln Tyr Phe Lys Leu Thr Gly Lys Pro Thr Lys Tyr Lys Val  
130 135 140

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

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

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

Gly Asp Asp Pro Glu Ala Tyr Gly Arg Trp Ala Ala Asp Gln Ile Glu  
 195 200 205

Gln Gln Ile Leu Phe Glu Gly Pro Glu Thr Val Ala Ala Val Phe Leu  
 210 215 220

Glu Pro Val Gln Asn Ala Gly Gly Cys Phe Pro Pro Pro Gly Tyr  
 225 230 235 240

Phe Gln Arg Val Arg Glu Ile Cys Asp Gln Tyr Asp Val Leu Leu Val  
 245 250 255

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

Cys Asp Lys Phe Gly Tyr Val Pro Asp Met Ile Thr Cys Ala Lys Gly  
 275 280 285

Met Thr Ser Gly Tyr Ser Pro Ile Gly Ala Cys Val Ile Ser Asp Arg  
 290 295 300

Leu Ala Glu Pro Phe Tyr Lys Gly Asp Asn Thr Phe Leu His Gly Tyr  
 305 310 315 320

Thr Phe Gly Gly His Pro Val Ser Ala Ala Val Gly Ile Ala Asn Leu  
 325 330 335

Asp Leu Phe Glu Arg Glu Gly Leu Asn Gln His Val Leu Asp Asn Glu  
 340 345 350

Gly Ala Phe Arg Ala Thr Leu Glu Lys Leu His Asp Leu Pro Ile Val  
 355 360 365

Gly Asp Val Arg Gly Asn Gly Phe Phe Tyr Gly Ile Glu Leu Val Lys  
 370 375 380

Asp Lys Ala Thr Lys Glu Ser Phe Asp Glu Glu Glu Thr Glu Arg Val  
 385 390 395 400

Leu Tyr Gly Phe Leu Ser Lys Lys Leu Phe Glu Asn Gly Leu Tyr Cys  
 405 410 415

Arg Ala Asp Asp Arg Gly Asp Pro Val Ile Gln Leu Ala Pro Pro Leu  
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Thr Leu Thr Glu Ala Trp Thr Lys Leu  
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<211> 459

<212> PRT

<213> Streptomyces avermitilis MA 4680

<400> 28

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

65

70

75

80

Gln Glu Leu Ala Phe Phe Pro Val Trp Ser Tyr Ala His Pro Lys Ala

85

90

95

Val Glu Leu Ala Glu Arg Leu Ala Asn Tyr Ala Pro Gly Asp Leu Asn

100

105

110

Lys Val Phe Phe Thr Thr Gly Gly Gly Glu Ala Val Glu Thr Ala Trp

115

120

125

Lys Leu Ala Lys Gln Tyr Phe Lys Leu Gln Gly Lys Pro Thr Lys Tyr

130

135

140

Lys Val Ile Ser Arg Ala Val Ala Tyr His Gly Thr Pro Gln Gly Ala

145

150

155

160

Leu Ser Ile Thr Gly Leu Pro Ala Leu Lys Ala Pro Phe Glu Pro Leu

165

170

175

Val Pro Gly Ala His Lys Val Pro Asn Thr Asn Ile Tyr Arg Ala Pro

180

185

190

Leu Phe Gly Asp Asp Pro Glu Ala Phe Gly Arg Trp Ala Ala Asp Gln

195

200

205

Ile Glu Gln Gln Ile Leu Phe Glu Gly Pro Glu Thr Val Ala Ala Val

210

215

220

Phe Leu Glu Pro Val Gln Asn Ala Gly Gly Cys Phe Pro Pro Pro Pro

225

230

235

240

Gly Tyr Phe Gln Arg Val Arg Glu Ile Cys Asp Gln Tyr Asp Val Leu

245

250

255

Leu Val Ser Asp Glu Val Ile Cys Ala Phe Gly Arg Leu Gly Thr Met

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Phe Ala Cys Asp Lys Phe Gly Tyr Val Pro Asp Met Ile Thr Cys Ala  
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Lys Gly Met Thr Ser Gly Tyr Ser Pro Ile Gly Ala Cys Ile Val Ser  
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Asp Arg Ile Ala Glu Pro Phe Tyr Lys Gly Asp Asn Thr Phe Leu His  
305                      310                      315                      320

Gly Tyr Thr Phe Gly Gly His Pro Val Ser Ala Ala Val Gly Val Ala  
325                      330                      335

Asn Leu Asp Leu Phe Glu Arg Glu Gly Leu Asn Gln His Val Leu Asp  
340                      345                      350

Asn Glu Ser Ala Phe Leu Thr Thr Leu Gln Lys Leu His Asp Leu Pro  
355                      360                      365

Ile Val Gly Asp Val Arg Gly Asn Gly Phe Phe Tyr Gly Ile Glu Leu  
370                      375                      380

Val Lys Asp Lys Ala Thr Lys Glu Thr Phe Thr Asp Glu Glu Ser Glu  
385                      390                      395                      400

Arg Val Leu Tyr Gly Phe Val Ser Lys Lys Leu Phe Glu Tyr Gly Leu  
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Tyr Cys Arg Ala Asp Asp Arg Gly Asp Pro Val Ile Gln Leu Ser Pro  
420                      425                      430

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

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455

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&lt;211&gt; 450

&lt;212&gt; PRT

<213> *Streptomyces avermitilis* MA 4680

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

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

Gly Tyr Gln His Pro Lys Val Val Ala Ala Ile Gln Glu Gln Ala Ala  
       65            70            75            80

Ser Leu Thr Thr Phe Ala Pro Ala Phe Ala Val Glu Ala Arg Ser Glu  
           85            90            95

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

Phe Phe Thr Asn Gly Gly Ala Asp Ala Ile Glu His Ala Val Arg Met  
           115            120            125

Ala Arg Ile His Thr Gly Arg Pro Lys Val Leu Ser Ala Tyr Arg Ser  
           130            135            140

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

Arg Trp Ala Ser Asp Ser Ala Ser Ala Gly Val Val His Phe Trp Ala  
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Pro Tyr Leu Tyr Arg Ser Arg Phe Tyr Ala Glu Thr Glu Gln Gln Glu  
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Cys Glu Arg Ala Leu Glu His Leu Glu Thr Thr Ile Ala Phe Glu Gly  
 195 200 205

Pro Gly Thr Ile Ala Ala Ile Val Leu Glu Thr Val Pro Gly Thr Ala  
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Gly Ile Met Val Pro Pro Pro Gly Tyr Leu Ala Gly Val Arg Glu Leu  
 225 230 235 240

Cys Asp Lys Tyr Gly Ile Val Phe Val Leu Asp Glu Val Met Ala Gly  
 245 250 255

Phe Gly Arg Thr Gly Glu Trp Phe Ala Ala Asp Leu Phe Asp Val Thr  
 260 265 270

Pro Asp Leu Met Thr Phe Ala Lys Gly Val Asn Ser Gly Tyr Val Pro  
 275 280 285

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



Glu Leu Ala Glu Arg His Pro Ser Val Gly Glu Val Arg Gly Val Gly  
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Met Phe Trp Ala Leu Glu Leu Val Lys Asp Arg Glu Thr Arg Glu Pro  
 370 375 380

Leu Val Pro Tyr Asn Ala Ala Gly Glu Ala Asn Ala Pro Met Ala Ala  
 385 390 395 400

Phe Gly Ala Ala Ala Lys Ala Asn Gly Leu Trp Pro Phe Ile Asn Met  
 405 410 415

Asn Arg Thr His Val Val Pro Pro Cys Asn Val Thr Glu Ala Glu Ala  
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Tyr Thr  
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<212> PRT

<213> Chromobacterium violaceum ATCC 12472

<400> 30

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

Gly Arg Arg Ile Phe Asp Ser Leu Ser Gly Leu Trp Cys Cys Gly Ala  
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Gly His Ser Arg Lys Glu Ile Ala Glu Ala Ala Tyr Arg Gln Leu Ser  
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Thr Leu Asp Tyr Ser Pro Gly Phe Gln Phe Gly His Pro Leu Ser Phe  
                     85                      90                      95

Arg Leu Ala Glu Arg Val Ala Ala Met Ala Pro Gly Ala Leu Asn His  
                     100                      105                      110

Val Phe Phe Thr Asn Ser Gly Ser Glu Cys Ala Asp Thr Ala Val Lys  
                     115                      120                      125

Met Ala Arg Ala Tyr Trp Arg Leu Lys Gly Gln Ala Ser Lys Thr Lys  
                     130                      135                      140

Leu Ile Gly Arg Ala Arg Gly Tyr His Gly Val Asn Ile Ala Gly Thr  
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Ser Leu Gly Gly Met Asn Gly Asn Arg Lys Leu Phe Gly Pro Leu Met  
                     165                      170                      175

Asp Ala Asp His Leu Pro His Thr Leu Leu Pro Ala Asn Ala Phe Ser  
                     180                      185                      190

Arg Gly Leu Pro Glu Gln Gly Ala Glu Leu Ala Asp Asp Leu Leu Arg  
                     195                      200                      205

Leu Ile Glu Leu His Asp Ala Ser Asn Ile Ala Ala Val Ile Val Glu  
                     210                      215                      220

Pro Met Ala Gly Ser Ala Gly Val Ile Val Pro Pro Gln Gly Tyr Leu  
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Gln Arg Leu Arg Glu Ile Cys Thr Gln His Gly Ile Leu Leu Ile Phe  
 245 250 255

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

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

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

Tyr Asp Ala Phe Met Ala Gln Ala Thr Pro Glu Tyr Ala Val Glu Phe  
 305 310 315 320

Ala His Gly Tyr Thr Tyr Ser Ala His Pro Val Ala Cys Ala Ala Ala  
 325 330 335

Leu Ala Ala Leu Asp Val Leu Glu Gln Glu Asn Leu Val Ala Arg Ala  
 340 345 350

Ala Glu Leu Ala Pro His Phe Glu Arg Gly Ile His Gly Leu Lys Gly  
 355 360 365

Leu Pro His Val Ile Asp Ile Arg Asn Cys Gly Leu Ala Gly Ala Val  
 370 375 380

Gln Ile Ala Pro Ser Gly Gly Asp Ala Ile Val Arg Pro Tyr Glu Ala  
 385 390 395 400

Ala Met Ala Leu Trp Arg Lys Gly Phe Tyr Val Arg Tyr Gly Gly Asp  
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His Ser Phe Trp Asn Arg Thr Thr Lys Pro Ser Leu Asp Leu Ala Lys  
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Val Leu Leu Glu Met Phe Thr Ala Asn Lys Met Ala Lys Ala Phe Phe  
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Thr Ser Gly Gly Ser Asp Ala Asn Asp Thr Gln Val Lys Leu Val Trp  
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Tyr Tyr Asn Asn Ala Leu Gly Arg Pro Glu Lys Lys Lys Phe Ile Ala  
115 120 125

Arg Lys Lys Ser Tyr His Gly Ser Thr Leu Ile Ser Ala Ser Leu Ser  
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Gly Leu Pro Pro Leu His Gln Asn Phe Asp Leu Pro Ala Pro Phe Val  
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Leu His Thr Asp Cys Pro His Tyr Trp Arg Phe His Leu Pro Gly Glu  
165 170 175

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

Val Met Gly Ala Gly Gly Val Ile Pro Pro Pro Ala Thr Tyr Phe Glu  
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Lys Val Gln Ala Val Val Lys Lys Tyr Asp Ile Leu Phe Ile Ala Asp  
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Glu Val Ile Cys Ala Phe Gly Arg Leu Gly Thr Met Phe Gly Cys Asp  
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Lys Tyr Asn Ile Lys Pro Asp Leu Val Thr Leu Ala Lys Ala Leu Ser  
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Ser Ala Tyr Met Pro Ile Gly Ala Ile Leu Met Ser Gln Glu Val Ala  
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Asp Val Ile Asn Ser His Ser Ser Lys Leu Gly Val Phe Ser His Gly  
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Phe Thr Tyr Ser Gly His Pro Val Ser Cys Ala Val Ala Ile Glu Ala  
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Ala Pro Arg Phe Gln Asp Gly Val Lys Ala Phe Ala Ser Gly Ser Pro  
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 385 390 395 400

Val Ala Gly Asp Gly Ile Leu Met Ser Pro Pro Leu Ile Ile Ser Pro  
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<211> 1359

<212> DNA

<213> Pseudomonas sp.

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<211> 5143

<212> DNA

<213> Artificial

<220>

<223> Vector

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