

# SEQUENCE LISTING

<110> Givaudan SA

<120> METHOD FOR THE PRODUCTION OF MUSK FRAGRANCE INGREDIENT

<130> IEC210226PCT

<150> GB2011259.5

<151> 2020-07-21

<160> 16

<170> PatentIn version 3.5

<210> 1

<211> 280

<212> PRT

<213> Mycobacterium avium

<400> 1

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Thr Ala Ser Phe Ala Gly Leu Val Pro Asn Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 2  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 2

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Thr Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg

245

250

255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
                   260                  265                  270

Gln Ala Ala Glu Gly Trp Thr His  
           275                  280

<210> 3

<211> 280

<212> PRT

<213> Escherichia coli

<400> 3

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
                   20                  25                  30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
   65                  70                  75                  80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
                   100                  105                  110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
           115                  120                  125

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

Thr Ala Ser Phe Ala Gly Leu Val Pro Asn Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 4  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 4

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Asn Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu

260

265

270

Gln Ala Ala Glu Gly Trp Thr His  
 275 280

&lt;210&gt; 5

&lt;211&gt; 280

&lt;212&gt; PRT

&lt;213&gt; Escherichia coli

&lt;400&gt; 5

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
 20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
 65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
 100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
 115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
 145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

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

<400> 6

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His

275

280

&lt;210&gt; 7

&lt;211&gt; 280

&lt;212&gt; PRT

&lt;213&gt; Escherichia coli

&lt;400&gt; 7

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
 20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
 65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
 100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
 115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
 145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

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

<400> 8

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Ala Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

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

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Ser Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 9

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Gly Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Glu Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 10  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 10

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

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Phe Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Gly Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 11

<211> 280

<212> PRT

<213> Escherichia coli

<400> 11

Met Asp Gly Phe Leu Ser Gly Phe Asp Gly Val Ala Ala Val Val Thr  
1 5 10 15

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Met Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val His Gly Gly Pro Leu Ala Gln Thr Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Tyr Gly Met Ser Ala Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 12  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 12

Met Asp Gly Phe Leu Ser Gly Phe Asp Gly Val Ala Ala Val Val Thr  
1 5 10 15

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Leu Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val His Gly Gly Pro Leu Ala Gln Thr Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Tyr Gly Met Ser Gly Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 13  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 13

Met Asp Gly Phe Leu Ser Gly Phe Asp Gly Val Ala Ala Val Val Thr  
1 5 10 15

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Met Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Gly Gly Pro Leu Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Tyr Gly Met Ser Gly Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 14  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 14

Met Asp Gly Phe Leu Ser Gly Phe Asp Gly Val Ala Ala Val Val Thr  
1 5 10 15

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Met Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Gly Gly Pro Ile Ala Thr Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Gly Gly Pro Ser Gly Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280

<210> 15  
<211> 280  
<212> PRT  
<213> Escherichia coli

<400> 15

Met Asp Gly Phe Leu Ser Gly Phe Asp Gly Val Ala Ala Val Val Thr  
1 5 10 15

Gly Gly Ala Ser Gly Ile Gly Leu Ala Thr Ala Thr Glu Met Ala Arg  
20 25 30

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Gly Gly Pro Met Ala Gln Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Gly Gly Arg Ser Gly Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
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<400> 16

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

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

Val Cys Asp Val Arg His Leu Asp Glu Met Val Arg Leu Ala Asp Glu  
65 70 75 80

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

Ile Val Val Gly Gly Pro Met Ala Thr Met Asn His Asp Asp Trp Arg  
100 105 110

Trp Val Ile Asp Ile Asp Leu Trp Gly Ser Ile His Ala Val Glu Ala  
115 120 125

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

Asn Ala Ser Phe Ala Gly Leu Val Pro Val Ala Gly Leu Gly Thr Tyr  
145 150 155 160

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

Glu Val Lys Pro Asn Gly Ile Gly Val Ser Val Leu Cys Pro Met Tyr  
180 185 190

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

Gly Gly Arg Ser Gly Thr Pro Glu Gly Ala Phe Gly Pro Leu Pro Thr  
210 215 220

Gln Asp Tyr Ser Val Ser Ala Asp Asp Val Ala Arg Leu Thr Ala Asp  
225 230 235 240

Ala Ile Leu Ala Asn Arg Leu Tyr Ile Leu Pro His Ala Ala Ala Arg  
245 250 255

Glu Arg Ile Arg Arg Arg Phe Glu Arg Ile Asp Arg Thr Phe Asp Glu  
260 265 270

Gln Ala Ala Glu Gly Trp Thr His  
275 280