

eolf-seq1

SEQUENCE LISTING

<110> F. Hoffmann-La Roche AG

<120> Production of thioesters using sortase

<130> P33090-WO

<150> EP15186953.4

<151> 2015-09-25

<160> 154

<170> PatentIn version 3.5

<210> 1

<211> 5

<212> PRT

<213> Staphylococcus aureus

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X can be any amino acid residue

<400> 1

Leu Pro Xaa Thr Gly
1 5

<210> 2

<211> 4

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<213> Artificial Sequence

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<223> cystein sortase motif 1

<400> 2

Cys Gly Gly Gly
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<210> 3

<211> 4

eolf-seql

<212> PRT
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 <223> cystein sortase motif 2
 <400> 3

Cys Ala Ala Ala
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<210> 4
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 <400> 4

Leu Pro Glu Thr Gly
 1 5

<210> 5
 <211> 147
 <212> PRT
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 <223> Staphylococcus aureus Sortase A shortened version
 <400> 5

Gln Ala Lys Pro Gln Ile Pro Lys Asp Lys Ser Lys Val Ala Gly Tyr
 1 5 10 15

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

Ala Thr Pro Glu Gln Leu Asn Arg Gly Val Ser Phe Ala Glu Glu Asn
 35 40 45

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Glu Ser Leu Asp Asp Gln Asn Ile Ser Ile Ala Gly His Thr Phe Ile
50 55 60

Asp Arg Pro Asn Tyr Gln Phe Thr Asn Leu Lys Ala Ala Lys Lys Gly
65 70 75 80

Ser Met Val Tyr Phe Lys Val Gly Asn Glu Thr Arg Lys Tyr Lys Met
85 90 95

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

Gln Lys Gly Lys Asp Lys Gln Leu Thr Leu Ile Thr Cys Asp Asp Tyr
115 120 125

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

Glu Val Lys
145

<210> 6
<211> 150
<212> PRT
<213> Artificial Sequence

<220>
<223> Listeria monocytogenes Sortase A shortened version

<400> 6

Ala Asn Tyr Asp Lys Asp Ala Val Val Gly Ser Ile Ala Val Pro Ser
1 5 10 15

Val Asp Val Asn Leu Leu Val Phe Lys Gly Thr Asn Thr Ala Asn Leu
20 25 30

Leu Ala Gly Ala Thr Thr Met Arg Ser Asp Gln Val Met Gly Lys Gly
35 40 45

eolf-seql

Asn Tyr Pro Leu Ala Gly His His Met Arg Asp Glu Ser Met Leu Phe
 50 55 60

Gly Pro Ile Met Lys Val Lys Lys Gly Asp Lys Ile Tyr Leu Thr Asp
 65 70 75 80

Leu Glu Asn Leu Tyr Glu Tyr Thr Val Thr Glu Thr Lys Thr Ile Asp
 85 90 95

Glu Thr Glu Val Ser Val Ile Asp Asp Thr Lys Asp Ala Arg Ile Thr
 100 105 110

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

Val Gly Glu Leu Glu Lys Thr Glu Lys Leu Thr Lys Glu Leu Glu Asn
 130 135 140

Lys Tyr Phe Pro Ser Lys
 145 150

<210> 7
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<220>
 <223> Arg-tag

<400> 7

Arg Arg Arg Arg Arg
 1 5

<210> 8
 <211> 6
 <212> PRT
 <213> Artificial Sequence

eolf-seql

<220>

<223> Arg-tag 2

<400> 8

Arg Arg Arg Arg Arg Arg
1 5

<210> 9

<211> 6

<212> PRT

<213> Artificial Sequence

<220>

<223> His-tag

<400> 9

His His His His His His
1 5

<210> 10

<211> 19

<212> PRT

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<223> amino acid tag

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Lys Asp His Leu Ile His Asn Val His Lys Glu Phe His Ala His Ala
1 5 10 15

His Asn Lys

<210> 11

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<213> Artificial Sequence

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eolf-seql

<223> amino acid tag

<400> 11

Asp Tyr Lys Asp Asp Asp Asp Lys
1 5

<210> 12

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> amino acid tag

<400> 12

Asp Tyr Lys Asp His Asp Gly Asp Tyr Lys Asp His Asp Ile Asp Tyr
1 5 10 15

Lys Asp Asp Asp Asp Lys
20

<210> 13

<211> 9

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<220>

<223> amino acid tag#

<400> 13

Ala Trp Arg His Pro Gln Phe Gly Gly
1 5

<210> 14

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eolf-seql

<400> 14

Trp Ser His Pro Gln Phe Glu Lys
1 5

<210> 15

<211> 10

<212> PRT

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<223> amino acid tag

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Met Asp Val Glu Ala Trp Leu Gly Ala Arg
1 5 10

<210> 16

<211> 16

<212> PRT

<213> Artificial Sequence

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<223> amino acid tag

<400> 16

Met Asp Val Glu Ala Trp Leu Gly Ala Arg Val Pro Leu Val Glu Thr
1 5 10 15

<210> 17

<211> 38

<212> PRT

<213> Artificial Sequence

<220>

<223> amino acid tag

<400> 17

Met Asp Glu Lys Thr Thr Gly Trp Arg Gly Gly His Val Val Glu Gly
1 5 10 15

eolf-seql

Leu Ala Gly Glu Leu Glu Gln Leu Arg Ala Arg Leu Glu His His Pro
 20 25 30

Gln Gly Gln Arg Glu Pro
 35

<210> 18
 <211> 10
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> amino acid tag

<400> 18

Glu Gln Lys Leu Ile Ser Glu Glu Asp Leu
 1 5 10

<210> 19
 <211> 15
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> amino acid tag

<400> 19

Lys Glu Thr Ala Ala Ala Lys Phe Glu Arg Gln His Met Asp Ser
 1 5 10 15

<210> 20
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<220>
 <223> amino acid tag

<400> 20

Lys Arg Arg Trp Lys Lys Asn Phe Ile Ala Val Ser Ala Ala Asn Arg
 1 5 10 15

eolf-seql

Phe Lys Lys Ile Ser Ser Ser Gly Ala Leu
20 25

<210> 21
<211> 47
<212> PRT
<213> Artificial Sequence

<220>
<223> amino acid tag

<400> 21

Pro Ala Thr Thr Thr Gly Ser Ser Pro Gly Pro Thr Gln Ser His Tyr
1 5 10 15

Gly Gln Cys Gly Gly Ile Gly Tyr Ser Gly Pro Thr Val Cys Ala Ser
20 25 30

Gly Thr Thr Cys Gln Val Leu Asn Pro Tyr Tyr Ser Gln Cys Leu
35 40 45

<210> 22
<211> 32
<212> PRT
<213> Butyrivibrio fibrisolvens

<400> 22

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

Ile Gln Gly Ala Gly Ser Val Gly Asn Val Ile Asp Ile Thr Val Glu
20 25 30

<210> 23
<211> 51
<212> PRT
<213> Artificial Sequence

eolf-seql

<220>

<223> chitin-binding-domain

<400> 23

Thr Asn Pro Gly Val Ser Ala Trp Gln Val Asn Thr Ala Tyr Thr Ala
1 5 10 15

Gly Gln Leu Val Thr Tyr Asn Gly Lys Thr Tyr Lys Cys Leu Gln Pro
20 25 30

His Thr Ser Leu Ala Gly Trp Glu Pro Ser Asn Val Pro Ala Leu Trp
35 40 45

Gln Leu Gln
50

<210> 24

<211> 209

<212> PRT

<213> Chondrus crispus

<400> 24

Met Pro Glu Ile Lys Leu Thr Tyr Phe Asp Met Arg Gly Arg Ala Glu
1 5 10 15

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

Arg Val Val Phe Asp His Trp Lys Glu Ala Lys Pro Lys Thr Pro Tyr
35 40 45

Ala Ala Leu Pro Met Leu Thr Val Asp Gly Met Gln Val Ala Gln Ser
50 55 60

Asp Ala Ile Leu Arg Tyr Cys Gly Lys Leu Ala Gly Leu Tyr Pro Ser
65 70 75 80

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

Asp Val Thr His Ala Met Tyr Arg Tyr Arg Gly Asp Asp Lys Asp Lys
100 105 110

Leu Arg Glu Glu Arg Asp Lys Phe Ser Lys Val Asp Val Pro Arg Tyr
115 120 125

Val Gly Ala Leu Glu Lys Arg Leu Glu Ala Phe Gly Asp Gly Pro Trp
130 135 140

Ala Val Gly Gly Asn Met Thr Ile Ala Asp Leu His Ile Cys His Leu
145 150 155 160

Val Thr Asn Ile Arg Cys Gly Met Leu Asp Phe Val Asp Lys Asp Leu
165 170 175

Leu Glu Gly Tyr Val Arg Ile Val Lys Ser Tyr Ser Ala Val Met Glu
180 185 190

His Pro Lys Val Thr Glu Trp Tyr Glu Lys Lys Pro Val Lys Met Phe
195 200 205

Ser

<210> 25
<211> 396
<212> PRT
<213> Escherichia coli

<400> 25

Met Lys Ile Lys Thr Gly Ala Arg Ile Leu Ala Leu Ser Ala Leu Thr
1 5 10 15

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

eolf-seql

20

25

30

Leu Val Ile Trp Ile Asn Gly Asp Lys Gly Tyr Asn Gly Leu Ala Glu
35 40 45

Val Gly Lys Lys Phe Glu Lys Asp Thr Gly Ile Lys Val Thr Val Glu
50 55 60

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

Asp Gly Pro Asp Ile Ile Phe Trp Ala His Asp Arg Phe Gly Gly Tyr
85 90 95

Ala Gln Ser Gly Leu Leu Ala Glu Ile Thr Pro Asp Lys Ala Phe Gln
100 105 110

Asp Lys Leu Tyr Pro Phe Thr Trp Asp Ala Val Arg Tyr Asn Gly Lys
115 120 125

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

Lys Asp Leu Leu Pro Asn Pro Pro Lys Thr Trp Glu Glu Ile Pro Ala
145 150 155 160

Leu Asp Lys Glu Leu Lys Ala Lys Gly Lys Ser Ala Leu Met Phe Asn
165 170 175

Leu Gln Glu Pro Tyr Phe Thr Trp Pro Leu Ile Ala Ala Asp Gly Gly
180 185 190

Tyr Ala Phe Lys Tyr Glu Asn Gly Lys Tyr Asp Ile Lys Asp Val Gly
195 200 205

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

eolf-seql

210

215

220

Ile Lys Asn Lys His Met Asn Ala Asp Thr Asp Tyr Ser Ile Ala Glu
225 230 235 240

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

Ala Trp Ser Asn Ile Asp Thr Ser Lys Val Asn Tyr Gly Val Thr Val
260 265 270

Leu Pro Thr Phe Lys Gly Gln Pro Ser Lys Pro Phe Val Gly Val Leu
275 280 285

Ser Ala Gly Ile Asn Ala Ala Ser Pro Asn Lys Glu Leu Ala Lys Glu
290 295 300

Phe Leu Glu Asn Tyr Leu Leu Thr Asp Glu Gly Leu Glu Ala Val Asn
305 310 315 320

Lys Asp Lys Pro Leu Gly Ala Val Ala Leu Lys Ser Tyr Glu Glu Glu
325 330 335

Leu Ala Lys Asp Pro Arg Ile Ala Ala Thr Met Glu Asn Ala Gln Lys
340 345 350

Gly Glu Ile Met Pro Asn Ile Pro Gln Met Ser Ala Phe Trp Tyr Ala
355 360 365

Val Arg Thr Ala Val Ile Asn Ala Ala Ser Gly Arg Gln Thr Val Asp
370 375 380

Glu Ala Leu Lys Asp Ala Gln Thr Arg Ile Thr Lys
385 390 395

<210> 26

eolf-seql

<211> 206

<212> PRT

<213> Staphylococcus aureus

<400> 26

Met Lys Lys Trp Thr Asn Arg Leu Met Thr Ile Ala Gly Val Val Leu
1 5 10 15

Ile Leu Val Ala Ala Tyr Leu Phe Ala Lys Pro His Ile Asp Asn Tyr
20 25 30

Leu His Asp Lys Asp Lys Asp Glu Lys Ile Glu Gln Tyr Asp Lys Asn
35 40 45

Val Lys Glu Gln Ala Ser Lys Asp Lys Lys Gln Gln Ala Lys Pro Gln
50 55 60

Ile Pro Lys Asp Lys Ser Lys Val Ala Gly Tyr Ile Glu Ile Pro Asp
65 70 75 80

Ala Asp Ile Lys Glu Pro Val Tyr Pro Gly Pro Ala Thr Pro Glu Gln
85 90 95

Leu Asn Arg Gly Val Ser Phe Ala Glu Glu Asn Glu Ser Leu Asp Asp
100 105 110

Gln Asn Ile Ser Ile Ala Gly His Thr Phe Ile Asp Arg Pro Asn Tyr
115 120 125

Gln Phe Thr Asn Leu Lys Ala Ala Lys Lys Gly Ser Met Val Tyr Phe
130 135 140

Lys Val Gly Asn Glu Thr Arg Lys Tyr Lys Met Thr Ser Ile Arg Asp
145 150 155 160

Val Lys Pro Thr Asp Val Gly Val Leu Asp Glu Gln Lys Gly Lys Asp
165 170 175

eolf-seql

Lys Gln Leu Thr Leu Ile Thr Cys Asp Asp Tyr Asn Glu Lys Thr Gly
180 185 190

Val Trp Glu Lys Arg Lys Ile Phe Val Ala Thr Glu Val Lys
195 200 205

<210> 27

<211> 222

<212> PRT

<213> *Listeria monocytogenes*

<400> 27

Met Leu Lys Lys Thr Ile Ala Ala Ala Ala Leu Ala Ala Gly Leu Leu
1 5 10 15

Leu Ile Phe Ser Pro Phe Ile Lys Asn Gly Ile Val Lys Tyr Met Ser
20 25 30

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

Asn Glu Lys Asp Ala Thr Phe Asp Phe Glu Ser Val Gln Leu Pro Ser
50 55 60

Met Thr Ser Val Ile Lys Gly Ala Ala Asn Tyr Asp Lys Asp Ala Val
65 70 75 80

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

Lys Gly Thr Asn Thr Ala Asn Leu Leu Ala Gly Ala Thr Thr Met Arg
100 105 110

Ser Asp Gln Val Met Gly Lys Gly Asn Tyr Pro Leu Ala Gly His His
115 120 125

eolf-seql

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

Gly Asp Lys Ile Tyr Leu Thr Asp Leu Glu Asn Leu Tyr Glu Tyr Thr
 145 150 155 160

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

Asn Thr Lys Asp Ala Arg Ile Thr Leu Ile Thr Cys Asp Lys Pro Thr
 180 185 190

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

Lys Leu Thr Lys Glu Leu Glu Asn Lys Tyr Phe Pro Ser Lys
 210 215 220

<210> 28
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<220>
 <223> oligoglycine

<400> 28

Gly Gly
 1

<210> 29
 <211> 3
 <212> PRT
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<220>
 <223> oligoglycine

<400> 29

eolf-seql

Gly Gly Gly
1

<210> 30
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> oligoglycine

<400> 30

Gly Gly Gly Gly
1

<210> 31
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> oligoglycine

<400> 31

Gly Gly Gly Gly Gly
1 5

<210> 32
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> hexa-histidine tag with linker

<400> 32

Met Arg Gly Ser His His His His His His Gly Ser
1 5 10

<210> 33

eolf-seql

<211> 11
 <212> PRT
 <213> Artificial Sequence

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 <223> LCR640-ULPETGGGRRRC

<220>
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 <222> (1)..(1)
 <223> beta-analnine conjugated to LCR640-U

<400> 33

Xaa	Leu	Pro	Glu	Thr	Gly	Gly	Gly	Arg	Arg	Cys
1				5					10	

<210> 34
 <211> 5
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<220>
 <223> sortase recognition motif

<220>
 <221> MISC_FEATURE
 <222> (3)..(3)
 <223> X=any amino acid residue except P

<400> 34

Leu	Pro	Xaa	Thr	Gly
1			5	

<210> 35
 <211> 4
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

eolf-seql

<220>
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 <222> (3)..(3)
 <223> X=any amino acid residue except P

<400> 35

Leu Pro Xaa Thr
 1

<210> 36
 <211> 5
 <212> PRT
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<220>
 <223> sortase recognition motif

<400> 36

Leu Pro Thr Thr Gly
 1 5

<210> 37
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
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<400> 37

Leu Pro Asp Thr Gly
 1 5

<210> 38
 <211> 5
 <212> PRT
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<220>
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<400> 38

eolf-seql

Leu Pro Lys Thr Gly
1 5

<210> 39
<211> 5
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<220>
<223> sortase recognition motif

<400> 39

Leu Pro Asn Thr Gly
1 5

<210> 40
<211> 5
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<220>
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<400> 40

Pro Leu Ala Ala Gly
1 5

<210> 41
<211> 5
<212> PRT
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<220>
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<400> 41

Leu Pro Lys Ala Gly
1 5

<210> 42

eolf-seql

<211> 5
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 <400> 42

Leu Pro Gln Thr Gly
 1 5

<210> 43
 <211> 5
 <212> PRT
 <213> Artificial Sequence
 <220>
 <223> sortase recognition motif
 <400> 43

Leu Pro Met Thr Gly
 1 5

<210> 44
 <211> 5
 <212> PRT
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 <220>
 <223> sortase recognition motif
 <400> 44

Leu Pro Ile Thr Gly
 1 5

<210> 45
 <211> 5
 <212> PRT
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 <223> sortase recognition motif

eolf-seql

<400> 45

Leu Pro Asp Thr Ala
1 5

<210> 46

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 46

Ser Pro Lys Thr Gly
1 5

<210> 47

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 47

Leu Ala Glu Thr Gly
1 5

<210> 48

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 48

Leu Ala Ala Thr Gly
1 5

eolf-seql

<210> 49
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 49

Leu Ala His Thr Gly
1 5

<210> 50
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 50

Leu Ala Ser Thr Gly
1 5

<210> 51
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 51

Leu Pro Leu Thr Gly
1 5

<210> 52
<211> 5
<212> PRT
<213> Artificial Sequence

eolf-seql

<220>

<223> sortase recognition motif

<400> 52

Leu Ser Arg Thr Gly
1 5

<210> 53

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 53

Val Pro Asp Thr Gly
1 5

<210> 54

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 54

Ile Pro Gln Thr Gly
1 5

<210> 55

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 55

Tyr Pro Arg Thr Gly

eolf-seq1

1 5

<210> 56
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

<400> 56

Leu Ala Leu Thr Gly
 1 5

<210> 57
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

<400> 57

Leu Gly Asn Thr Gly
 1 5

<210> 58
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

<400> 58

Leu Pro Gln Thr Ser
 1 5

<210> 59
 <211> 5
 <212> PRT

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<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 59

Thr Leu Xaa Thr Cys

1 5

<210> 60

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 60

Asn Pro Gln Thr Asn

1 5

<210> 61

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (1)..(1)

<223> X=L or M

<220>

<221> MISC_FEATURE

<222> (3)..(3)

eolf-seql

<223> X=any amino acid residue except P

<220>

<221> MISC_FEATURE

<222> (4)..(4)

<223> X=A or L or S or T or V

<400> 61

Xaa Pro Xaa Xaa Gly

1 5

<210> 62

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 62

Ile Pro Lys Thr Gly

1 5

<210> 63

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 63

Ile Pro Ala Leu Gly

1 5

<210> 64

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

eolf-seql

<400> 64

Leu Ala Ala Ser Ser
1 5

<210> 65

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 65

Leu Ala Pro Thr Gly
1 5

<210> 66

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 66

Leu Pro Ile Ser Ser
1 5

<210> 67

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 67

Leu Pro Lys Thr Ser
1 5

eolf-seql

<210> 68
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 68

Tyr Ala Leu Pro Glu Thr
1 5

<210> 69
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 69

Tyr Ala Leu Pro Met Thr Gly Lys
1 5

<210> 70
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<400> 70

Leu Pro Xaa Ala
1

eolf-seql

<210> 71
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<400> 71

Ser Pro Xaa Thr
1

<210> 72
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<400> 72

Leu Ala Xaa Thr
1

<210> 73
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

eolf-seql

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<400> 73

Leu Ser Xaa Thr

1

<210> 74
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<400> 74

Asn Pro Xaa Thr

1

<210> 75
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<400> 75

eolf-seql

Val Pro Xaa Thr

1

<210> 76

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 76

Ile Pro Xaa Thr

1

<210> 77

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 77

Leu Gly Xaa Thr

1

<210> 78

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 78

Tyr Pro Xaa Arg

1

<210> 79

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 79

Leu Pro Ser Thr

1

<210> 80

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 80

Leu Pro Lys Thr

1

<210> 81

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 81

Leu Pro Ile Thr

1

<210> 82

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 82

Leu Pro Asp Thr

1

<210> 83

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 83

Ser Pro Lys Thr

1

<210> 84

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 84

eolf-seql

Leu Ala Glu Thr
1

<210> 85
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 85

Leu Ala Ala Thr
1

<210> 86
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 86

Leu Ala Ser Thr
1

<210> 87
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 87

Leu Pro Leu Thr
1

<210> 88

eolf-seql

<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 88

Leu Ser Arg Thr
1

<210> 89
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 89

Leu Pro Glu Thr
1

<210> 90
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 90

Val Pro Asp Thr
1

<210> 91
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

eolf-seql

<400> 91

Ile Pro Gln Thr
1

<210> 92

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 92

Tyr Pro Arg Arg
1

<210> 93

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 93

Leu Pro Met Thr
1

<210> 94

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 94

Leu Ala Phe Thr
1

eolf-seql

<210> 95
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<400> 95

Leu Pro Gln Thr
1

<210> 96
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> sortase recognition motif

<220>
<221> MISC_FEATURE
<222> (1)..(1)
<223> X= L or I or V or M

<220>
<221> MISC_FEATURE
<222> (3)..(3)
<223> X=any amino acid residue except P

<220>
<221> MISC_FEATURE
<222> (4)..(4)
<223> X=T or S or A

<400> 96

Xaa Pro Xaa Xaa
1

<210> 97
<211> 5
<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 97

Tyr Pro Pro Arg Gly
1 5

<210> 98

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 98

Leu Ala Phe Thr Gly
1 5

<210> 99

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 99

Leu Pro Xaa Ala Gly
1 5

<210> 100

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 100

Leu Pro Asn Ala Gly

1 5

<210> 101

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 101

Leu Pro Xaa Thr Ala

1 5

<210> 102

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 102

Leu Pro Asn Thr Ala

1 5

<210> 103

<211> 5

<212> PRT

eolf-seql

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 103

Leu Gly Xaa Thr Gly
1 5

<210> 104

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<400> 104

Leu Gly Ala Thr Gly
1 5

<210> 105

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=any amino acid residue except P

<400> 105

Ile Pro Xaa Thr Gly

eolf-seql

1 5

<210> 106
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

<400> 106

Ile Pro Asn Thr Gly
 1 5

<210> 107
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

<400> 107

Ile Pro Glu Thr Gly
 1 5

<210> 108
 <211> 5
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> sortase recognition motif

<400> 108

Leu Pro Glu Thr Ala
 1 5

<210> 109
 <211> 5
 <212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=D, E, A, N, Q, K, R

<220>

<221> MISC_FEATURE

<222> (5)..(5)

<223> X=A,G

<400> 109

Leu Pro Xaa Thr Xaa
1 5

<210> 110

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=D, E, A, N, Q, K, R

<400> 110

Leu Pro Xaa Thr Ala
1 5

<210> 111

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

eolf-seql

<223> sortase recognition motif

<220>

<221> MISC_FEATURE

<222> (3)..(3)

<223> X=D, E, A, N, Q, K, R

<400> 111

Leu Pro Xaa Thr Gly
1 5

<210> 112

<211> 85

<212> PRT

<213> Streptomyces coelicolor

<400> 112

Val Ala Gly His Val Asp Asn Ala Glu Gly Pro Ala Val Phe Tyr Arg
1 5 10 15

Leu Gly Ala Leu Glu Lys Gly Ser Ala Ile Glu Ile Asp Arg Arg Asp
20 25 30

Gly Gly Val Ala Val Phe Thr Val Asp Ala Val Glu Val Tyr Ala Ala
35 40 45

Asp Ala Phe Pro Asp Glu Lys Val Tyr Gly Ala Ala Asp Arg Pro Glu
50 55 60

Leu Arg Val Ile Thr Cys Gly Gly Pro Tyr Ser Arg Ser Thr Gly Tyr
65 70 75 80

Gln Gly Asn Val Val
85

<210> 113

<211> 85

<212> PRT

eolf-seql

<213> Streptomyces coelicolor

<400> 113

Val Val Gly His Val Asp Asn Gln Gln Gly Pro Ala Val Phe Tyr Gly
1 5 10 15

Leu Gly Ala Leu Lys Lys Gly Asn Lys Val Glu Val His Arg Gln Asp
20 25 30

Gly Lys Thr Ala Val Phe Glu Ile Tyr Gly Ile Glu Val Phe Glu Lys
35 40 45

Asn Asn Phe Pro Gly Asp Arg Val Tyr Gly Ser Lys Gly Ser Pro Glu
50 55 60

Leu Arg Val Ile Thr Cys Gly Gly Gly Phe Thr Lys Gln Asn Gly Tyr
65 70 75 80

Asp Gly Asn Val Val
85

<210> 114

<211> 86

<212> PRT

<213> Streptomyces coelicolor

<400> 114

Ile Ala Gly His Val Asp Thr Lys Thr Ser Ala Ala Val Phe Ala Arg
1 5 10 15

Leu Asp Gln Leu Asp Lys Gly Asp Lys Phe Gln Val Arg Arg Ala Asp
20 25 30

Gly Arg Ser Ala Thr Phe Val Val Asp Gly Leu Glu Thr Phe Ala Lys
35 40 45

Asp Glu Phe Pro Ser Asp Arg Val Tyr Gly Asp Ala Asp Arg Pro Glu

eolf-seql

50

55

60

Val Arg Leu Ile Thr Cys Ala Gly Asp Tyr Asp His Lys Val Lys Asp
65 70 75 80

Tyr Thr Asp Asn Leu Val
85

<210> 115

<211> 88

<212> PRT

<213> Streptomyces coelicolor

<400> 115

Met Val Gly His Val Asp Thr Glu Thr Arg Pro Ala Val Phe Tyr Gln
1 5 10 15

Leu Ser Thr Leu Glu Pro Gly Gln Thr Ile Arg Val Ala Arg Asp Asp
20 25 30

Asp Glu Val Ala Glu Phe Thr Val Asp Asp Val Gln Val Leu Thr Arg
35 40 45

Asp Gly Phe Asp Ala Gln Gln Ala Tyr Gly Pro Arg Asp Thr Gly Arg
50 55 60

Ser Glu Leu Arg Leu Ile Thr Cys Gly Gly Thr Phe Asp Gln Thr Thr
65 70 75 80

Asp Ser Tyr Thr Ala Asn Val Val
85

<210> 116

<211> 78

<212> PRT

<213> Bacillus halodurans

<400> 116

eolf-seql

Leu Ser Gly His Arg Asp Thr Val Phe Arg Asp Met Gly Lys Leu Glu
1 5 10 15

Ile Gly Asp Asp Leu Thr Val His Met Pro Tyr Gly Ser Tyr Thr Tyr
20 25 30

Arg Ile Val Asp Thr Glu Ile Val Asp Ala Asn Asp Thr Ser Val Ile
35 40 45

Arg Ser Thr Ala Pro Asp Glu Val Leu Thr Leu Ser Thr Cys Tyr Pro
50 55 60

Phe Asn Phe Ile Gly Ser Ala Pro Glu Arg Tyr Ile Ile Tyr
65 70 75

<210> 117

<211> 78

<212> PRT

<213> Bacillus subtilis

<400> 117

Leu Ser Gly His Arg Asp Thr Val Phe Arg Arg Thr Gly Glu Leu Glu
1 5 10 15

Lys Gly Asp Gln Leu Arg Leu Leu Leu Ser Tyr Gly Glu Phe Thr Tyr
20 25 30

Glu Ile Val Lys Thr Lys Ile Val Asp Lys Asp Asp Thr Ser Ile Ile
35 40 45

Thr Leu Gln His Glu Lys Glu Glu Leu Ile Leu Thr Thr Cys Tyr Pro
50 55 60

Phe Ser Tyr Val Gly Asn Ala Pro Lys Arg Tyr Ile Ile Tyr
65 70 75

eolf-seql

<210> 118
 <211> 77
 <212> PRT
 <213> Bacillus halodurans

<400> 118

Leu Ser Gly His Arg Asp Thr Val Phe Arg Glu Leu Gly Glu Val Gly
 1 5 10 15

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

Arg Val Arg Lys Val Arg Ile Val Asp Glu Asp Asp Arg Thr Val Ile
 35 40 45

Val Pro Lys Pro Arg Ala Thr Leu Thr Val Ser Thr Cys Tyr Pro Phe
 50 55 60

Asp Phe Ile Gly Ser Ala Pro Glu Arg Tyr Ile Leu Glu
 65 70 75

<210> 119
 <211> 77
 <212> PRT
 <213> Bacillus anthracis

<400> 119

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

Glu Lys Asp Thr Leu Val Leu Glu Tyr Asp Asn Lys Thr Tyr Thr Tyr
 20 25 30

Glu Ile Gln Lys Ile Trp Ile Thr His Ala Asp Asp Arg Thr Val Ile
 35 40 45

Ile Lys Lys Glu Glu Pro Ile Leu Thr Leu Thr Thr Cys Tyr Pro Phe
 50 55 60

eolf-seql

Asp Tyr Leu Gly Asp Ala Pro Asp Arg Tyr Leu Ile Asx
65 70 75

<210> 120
<211> 81
<212> PRT
<213> Bacillus halodurans

<400> 120

Ile Ala Ala His Arg Ser Arg Thr Tyr Gly Arg Gln Pro Asn Arg Leu
1 5 10 15

Asp Glu Val Glu Gly Asp Val Ile Thr Val Thr Thr Asn Asn His Met
20 25 30

Tyr Arg Tyr Thr Val Tyr Ser Ile Thr Val Val Glu Pro Thr Asn Ile
35 40 45

Asp Ile Leu Gln His Asp Gly Thr Ala Pro Val Leu Thr Leu Leu Thr
50 55 60

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

Met

<210> 121
<211> 81
<212> PRT
<213> Clostridium acetobutylicum

<400> 121

Leu Ala Gly His Arg Ser Tyr Thr Phe Gly Glu Tyr Phe Asn Arg Leu
1 5 10 15

eolf-seql

Gly Glu Ile Gly Ser Gly Asp Glu Ile Asp Val Glu Thr Val Asn Gly
20 25 30

Thr Phe Lys Tyr Lys Val Tyr Ser Thr Lys Val Val Leu Pro Ser Glu
35 40 45

Val His Val Leu Asp Gln Thr Lys Asp Pro Thr Met Thr Leu Val Thr
50 55 60

Cys Thr Pro Ile Arg Ile Ala Thr His Arg Leu Ile Ile Lys Ala Lys
65 70 75 80

Arg

<210> 122

<211> 89

<212> PRT

<213> Streptomyces coelicolor

<400> 122

Leu Ala Gly His Arg Asn Thr His Gly Glu Pro Phe Arg Tyr Ile Asn
1 5 10 15

Lys Leu Glu Pro Gly Asp Pro Ile Val Val Glu Thr Gln Asp Lys Tyr
20 25 30

Phe Val Tyr Lys Met Ala Ser Ile Leu Pro Val Thr Ser Pro Ser Asn
35 40 45

Val Ser Val Leu Asp Pro Val Pro Lys Gln Ser Gly Phe Lys Gly Pro
50 55 60

Gly Arg Tyr Ile Thr Leu Thr Thr Cys Thr Pro Glu Phe Thr Ser Lys
65 70 75 80

Tyr Arg Met Ile Val Asn Gly Lys Met

eolf-seql

85

<210> 123
 <211> 89
 <212> PRT
 <213> Streptomyces coelicolor

<400> 123

Leu Ala Ala His Arg Asp Gly His Gly Ala Arg Phe His Asn Ile Asp
 1 5 10 15

Lys Ile Glu Lys Gly Asp Pro Ile Val Phe Glu Thr Lys Asp Thr Trp
 20 25 30

Tyr Val Tyr Lys Thr Tyr Ala Val Leu Pro Glu Thr Ser Lys Tyr Asn
 35 40 45

Val Glu Val Leu Gly Gly Ile Pro Lys Glu Ser Gly Lys Lys Lys Ala
 50 55 60

Gly His Tyr Ile Thr Leu Thr Thr Cys Thr Pro Val Tyr Thr Ser Arg
 65 70 75 80

Tyr Arg Tyr Val Val Trp Gly Glu Leu
 85

<210> 124
 <211> 81
 <212> PRT
 <213> Actinomyces naeslundii

<400> 124

Ile Thr Gly His Arg Gly Leu Ala Glu Ala Thr Met Phe Thr Asn Leu
 1 5 10 15

Asp Lys Val Thr Gly Asp Ser Leu Ile Val Glu Val Phe Gly Glu Val
 20 25 30

eolf-seql

Leu Thr Tyr Arg Val Thr Ser Thr Lys Val Val Glu Pro Glu Glu Thr
35 40 45

Glu Ala Leu Arg Val Glu Glu Gly Lys Asp Leu Leu Thr Leu Val Thr
50 55 60

Cys Ile Pro Leu Gly Ile Asn Thr His Arg Ile Leu Leu Thr Gly Glu
65 70 75 80

Arg

<210> 125

<211> 81

<212> PRT

<213> Corynebacterium diphtheriae

<400> 125

Ile Thr Ala His Arg Gly Leu Ala Glu Ala Thr Met Phe Thr Asn Leu
1 5 10 15

Asn Lys Val Gly Val Gly Asp Arg Phe Thr Ile Glu Trp Gly Glu Val
20 25 30

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

Arg Phe Leu Gln Thr Gln Asp Asp Arg Asp Leu Val Ile Leu Val Thr
50 55 60

Cys Leu Pro Leu Gly Ile Asn Thr His Arg Ile Leu Val Thr Ala Glu
65 70 75 80

Arg

eolf-seql

<210> 126
 <211> 82
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 126

Ile Thr Ala Pro Thr Gly Leu Pro Thr Ala Lys Met Phe Thr Asp Leu
 1 5 10 15

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

Val Met Ala Tyr Gln Val Asp Gln Val Lys Val Ile Glu Pro Thr Asn
 35 40 45

Phe Asp Asp Leu Leu Ile Val Pro Gly His Asp Tyr Val Thr Leu Leu
 50 55 60

Thr Cys Thr Pro Tyr Met Ile Asn Thr His Arg Leu Leu Val Arg Gly
 65 70 75 80

His Arg

<210> 127
 <211> 82
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 127

Ile Thr His Ala Arg Gly Leu Pro Thr Ala Glu Leu Phe Ser Gln Leu
 1 5 10 15

Asp Lys Met Lys Lys Gly Asp Ile Phe Tyr Leu His Val Leu Asp Gln
 20 25 30

Val Leu Ala Tyr Gln Val Asp Gln Ile Val Thr Val Glu Pro Asn Asp
 35 40 45

eolf-seql

Phe Glu Val Leu Ile Gln His Gly Glu Asp Ala Tyr Ala Thr Leu Leu
50 55 60

Thr Cys Thr Pro Tyr Met Ile Asn Ser His Arg Leu Leu Val Arg Gly
65 70 75 80

Lys Arg

<210> 128
<211> 83
<212> PRT
<213> Enterococcus faecalis

<400> 128

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

Leu Pro Glu Leu Lys Lys Gly Asp Glu Phe Tyr Ile Glu Val Asn Gly
20 25 30

Lys Thr Leu Ala Tyr Gln Val Asp Gln Ile Lys Thr Val Glu Pro Thr
35 40 45

Asp Thr Lys Asp Leu His Ile Glu Ser Gly Gln Asp Leu Val Thr Leu
50 55 60

Leu Glu Cys Thr Pro Tyr Met Ile Asn Ser His Arg Leu Leu Val Arg
65 70 75 80

Gly His Arg

<210> 129
<211> 80
<212> PRT

eolf-seql

<213> Streptococcus equinus

<400> 129

Ile Ser Gly His Arg Gly Leu Pro Ser Ala Lys Leu Phe Thr Asn Ile
1 5 10 15

Asp Lys Leu Arg Ile Asn Asp Thr Phe Thr Thr Ser Leu Asn Arg Thr
20 25 30

Met Thr Tyr Gln Ile Asp Lys Ala Thr Val Leu Pro Asp Asp Val Ser
35 40 45

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

Thr Pro Tyr Gly Val Asn Thr His Arg Leu Leu Val Arg Gly His Arg
65 70 75 80

<210> 130

<211> 80

<212> PRT

<213> Streptococcus pyogenes

<400> 130

Ile Ser Ala Asn Arg Gly Leu Pro Ala Glu Met Phe Thr Asn Leu Asn
1 5 10 15

Leu Val Lys Lys Gly Asp Thr Phe Tyr Phe Arg Val Leu Asn Lys Val
20 25 30

Leu Ala Tyr Lys Val Asp Gln Ile Leu Thr Thr Val Glu Pro Asp Gln
35 40 45

Asn Ser Leu Ser Gln Val Met Gly Lys Asp Ala Thr Leu Val Thr Cys
50 55 60

Thr Pro Tyr Gly Val Asn Thr Lys Arg Leu Leu Val Arg Gly His Arg

eolf-seql

Lys Leu Lys Tyr Val Val Asp Gln Ile Lys Val Val Leu Pro Thr Glu
 35 40 45

Thr Glu Asp Leu Arg Pro Glu Gln Gly Lys Asp Tyr Ile Leu Leu Ile
 50 55 60

Thr Cys Thr Pro Tyr Gly Ile Asn Thr His Arg Leu Met Val Arg Gly
 65 70 75 80

His Gln

<210> 133
 <211> 80
 <212> PRT
 <213> Corynebacterium diphtheriae

<400> 133

Leu Ser Ala His Thr Gly Leu Gln Asn Ala Thr Leu Trp Asp Asn Leu
 1 5 10 15

Ile Gln Ile Lys Lys Gly Asp Pro Val Tyr Val Ala Ala Gly Glu Lys
 20 25 30

Leu Lys Tyr Glu Val Arg Asn Ile Glu Val Val Thr Pro Asp Lys Thr
 35 40 45

Ser Leu Leu Arg Arg Thr Ser Asn Lys Asp Gln Val Thr Leu Ile Thr
 50 55 60

Cys Thr Pro Tyr Gly Ile Asn Thr His Arg Leu Ile Ile Ala Glu Arg
 65 70 75 80

<210> 134
 <211> 81
 <212> PRT
 <213> Corynebacterium diphtheriae

eolf-seql

<400> 134

Leu Thr Ala His Ser Gly Glu Gln Lys Ser Thr Phe Phe Asp Asn Leu
1 5 10 15

Glu Lys Val Lys Lys Gly Asp Ala Ile Tyr Val Arg Asn Ile Gly Glu
20 25 30

Thr Leu Lys Tyr Gln Val Arg Asp Ile Glu Ile Ile Arg Pro Ala Glu
35 40 45

Glu Ile Asp Arg Ile Gln Phe Pro Asp Arg Asp Leu Ile Thr Leu Val
50 55 60

Glu Cys Pro Tyr Gly Ile Asn Thr His Arg Leu Leu Val Thr Ala Glu
65 70 75 80

Arg

<210> 135

<211> 74

<212> PRT

<213> Bacillus halodurans

<400> 135

Ile Ala Gly His Arg Gly Tyr Arg Gly Asn Arg His Phe Ser Arg Leu
1 5 10 15

Pro Asp Val Thr Ile Gly Asp Glu Val Phe Leu His Thr Lys Glu Thr
20 25 30

Phe Asp Ile Ser Ile Ile Glu Pro Thr Asp Val Asp Val Leu Asp Asp
35 40 45

Arg Asp Gly Lys His Glu Ile Thr Met Ile Thr Cys Thr Arg Ser Gly
50 55 60

eolf-seql

Lys Gln Arg Val Ala Val Arg Gly Glu Leu
65 70

<210> 136
<211> 80
<212> PRT
<213> Bacillus halodurans

<400> 136

Ile Ala Gly His Arg Gly Tyr Arg Gly Asn Arg His Phe Ser Arg Leu
1 5 10 15

Pro Asp Val Thr Ile Gly Asp Glu Val Phe Leu His Thr Lys Glu Glu
20 25 30

Thr Phe Val Tyr Lys Val Thr Asp Ile Ser Ile Ile Glu Pro Thr Asp
35 40 45

Val Asp Ile Leu Asp Asp Arg Asp Gly Lys His Glu Ile Thr Met Ile
50 55 60

Thr Cys Thr Arg Ser Gly Lys Gln Arg Val Ala Val Arg Gly Val Leu
65 70 75 80

<210> 137
<211> 85
<212> PRT
<213> Streptococcus mutans

<400> 137

Leu Ala Ser His His Val Pro Gly Met Thr Gly Ser Ser Gln Met Leu
1 5 10 15

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

eolf-seql

Asp Lys Asn Lys Val Tyr Thr Tyr Val Ile Ser Glu Lys Thr Val Thr
35 40 45

Pro Glu His Val Glu Val Ile Asp Asn Arg Pro Gly Gln Asn Glu Val
50 55 60

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

His Gly Thr Tyr Lys
85

<210> 138
<211> 88
<212> PRT
<213> Streptococcus pyogenes

<400> 138

Leu Ala Ser His His Ile Phe Pro Gly Ile Thr Gly Ser Ser Gln Thr
1 5 10 15

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

Leu Thr Asp Lys Asx Lys Ile Tyr Glu Tyr Ile Ile Lys Asp Val Pro
35 40 45

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

Lys Glu Val Leu Leu Val Arg Cys Thr Asp Ile Glu Ala Thr Glu Arg
65 70 75 80

Ile Ile Val Lys Gly Glu Leu Lys
85

<210> 139

eolf-seql

<211> 85

<212> PRT

<213> Streptococcus pneumoniae

<400> 139

Leu Ala Ser His His Ile Phe Gly Val Asp Asn Ala Asn Lys Met Leu
1 5 10 15

Phe Ser Pro Leu Asp Asn Ala Lys Asn Gly Met Lys Ile Tyr Leu Thr
20 25 30

Asp Lys Asn Lys Val Tyr Thr Tyr Glu Ile Arg Glu Val Lys Arg Val
35 40 45

Thr Pro Asp Arg Val Asp Glu Val Asp Asp Arg Asp Gly Val Asn Glu
50 55 60

Ile Thr Leu Val Thr Cys Glu Leu Ala Ala Thr Glu Arg Ile Ile Val
65 70 75 80

Lys Gly Asp Leu Lys
85

<210> 140

<211> 82

<212> PRT

<213> Enterococcus faecalis

<400> 140

Leu Ala Ser His Arg Thr Glu Asp Gly Val Ser Leu Phe Ser Pro Leu
1 5 10 15

Glu Arg Thr Lys Lys Asp Glu Leu Ile Tyr Ile Thr Asp Leu Ser Thr
20 25 30

Val Tyr Thr Tyr Lys Ile Thr Ser Val Glu Lys Ile Glu Pro Thr Arg
35 40 45

eolf-seql

Val Glu Leu Ile Asp Asp Val Pro Gly Gln Asn Met Ile Thr Leu Ile
50 55 60

Thr Cys Gly Asp Leu Gln Ala Thr Thr Arg Ile Ala Val Gln Gly Thr
65 70 75 80

Leu Ala

<210> 141
<211> 90
<212> PRT
<213> Bacillus halodurans

<400> 141

Asp His His Glu Gly Phe Tyr Tyr Asp Thr Leu Tyr Asn Arg Tyr Asp
1 5 10 15

Val Glu Val Phe Ser Ala Tyr Val Thr Thr Thr Asp Phe Tyr Tyr Ile
20 25 30

Glu Thr Glu Phe Pro Ser Lys Asp Asp Tyr Lys Ala Phe Leu Asn Glu
35 40 45

Leu Lys Lys Arg Ser Val Val Gln Thr Asn Val Glu Val Gly Glu Glu
50 55 60

Asp Gln Ile Ile Thr Leu Ser Thr Cys Asp Tyr Arg Leu Asp Arg Asp
65 70 75 80

Arg Gly Arg Leu Val Val His Gly Lys Leu
85 90

<210> 142
<211> 91
<212> PRT
<213> Bacillus anthracis

eolf-seql

<400> 142

Phe Met Ser His Arg Lys Leu Tyr Tyr Asp Thr Leu Phe Glu Gly Tyr
1 5 10 15

Asp Leu Glu Val Phe Ser Val Tyr Thr Thr Thr Thr Asp Phe Tyr Tyr
20 25 30

Ile Glu Thr Asp Phe Ser Ser Asp Thr Glu Tyr Thr Ser Phe Leu Glu
35 40 45

Lys Ile Gln Glu Lys Ser Leu Tyr Lys Thr Asp Thr Thr Val Thr Ala
50 55 60

Gly Asp Gln Ile Val Thr Leu Ser Thr Cys Asp Tyr Ala Leu Asp Pro
65 70 75 80

Glu Ala Gly Arg Leu Val Val His Ala Lys Leu
85 90

<210> 143

<211> 91

<212> PRT

<213> Staphylococcus aureus

<400> 143

Tyr Glu Lys His Lys Ile Ile Glu Pro Asp Asn Lys Tyr Gly Lys Tyr
1 5 10 15

Gln Leu Gln Val Tyr Phe Ser Ala Tyr Lys Thr Thr Thr Lys Asp Asn
20 25 30

Tyr Ile Arg Thr Asp Phe Glu Asn Asp Gln Asp Tyr Gln Gln Phe Leu
35 40 45

Asp Glu Thr Lys Arg Lys Ser Val Ile Asn Ser Asp Val Asn Val Thr
50 55 60

eolf-seql

Val Lys Asp Lys Ile Met Thr Leu Ser Thr Cys Glu Asp Ala Tyr Ser
65 70 75 80

Thr Thr Lys Arg Ile Val Val Val Ala Lys Ile
85 90

<210> 144
<211> 92
<212> PRT
<213> Streptococcus pyogenes

<400> 144

Phe Asn Lys His Lys Glu Pro Ser Ile Glu Thr Lys Thr Lys Gln Lys
1 5 10 15

Leu Lys Ile Asn Ile Phe Ala Cys Ile Gln Thr Asp Ala Phe Asp Ser
20 25 30

Leu Leu Phe Asn Pro Ile Asp Val Asp Ile Ser Ser Lys Asn Glu Phe
35 40 45

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

Thr Thr Asn Glu Ser Arg Phe Val Ala Leu Ser Thr Cys Glu Asp Met
65 70 75 80

Thr Thr Asp Gly Arg Ile Ile Val Ile Gly Gln Ile
85 90

<210> 145
<211> 91
<212> PRT
<213> Streptococcus pyogenes

<400> 145

eolf-seql

Phe Asn Lys His Asn Lys Ala Ile Ile Glu Thr Lys Glu Arg Lys Lys
1 5 10 15

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

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

Leu Val Asp Tyr Ile Ser Lys Arg Ser Lys Gln Phe Lys Pro Val Lys
50 55 60

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

Thr Asp Asn Arg Val Ile Val Val Gly Thr Ile
85 90

<210> 146

<211> 81

<212> PRT

<213> Streptococcus pneumoniae

<400> 146

Ile Ala Gly His Arg Ala Glu Pro Ser His Val Phe Phe Arg His Leu
1 5 10 15

Asp Gln Leu Lys Val Gly Asp Ala Leu Tyr Tyr Asp Asn Gly Gln Glu
20 25 30

Ile Val Glu Tyr Gln Met Met Asp Thr Glu Ile Ile Leu Pro Ser Glu
35 40 45

Trp Glu Lys Leu Glu Ser Val Ser Ser Lys Asn Ile Met Thr Leu Thr
50 55 60

Cys Asp Pro Ile Pro Thr Phe Asn Lys Arg Leu Leu Val Asn Phe Glu

eolf-seql

65 70 75 80

Arg

<210> 147
 <211> 77
 <212> PRT
 <213> Bacillus anthracis

<400> 147

Leu Ala Gly His Asn Met Ser Lys Lys Gly Val Leu Phe Ser Asp Ile
 1 5 10 15

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

Glu Tyr Ala Val Thr Gly Val Ser Glu Val Thr Phe Asp Lys Trp Glu
 35 40 45

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

Lys Asp Asn Ser Lys Arg Tyr Val Val Ala Gly Asp Leu
 65 70 75

<210> 148
 <211> 81
 <212> PRT
 <213> Bacillus subtilis

<400> 148

Leu Ala Gly His His Leu Lys Gln Lys Asn Leu Leu Phe Gly Pro Leu
 1 5 10 15

Glu Asn Ile Lys Thr Gly Ala Gln Ile Val Ile Thr Asp Phe Lys Lys
 20 25 30

eolf-seql

Asp Tyr Ile Tyr Ser Val Thr Ser Lys Asp Ile Ile Ser Glu Met Asp
35 40 45

Ala Asp Val Val Glu Glu Thr Asn Lys Lys Glu Ile Thr Leu Ile Thr
50 55 60

Cys Asp Lys Ala Val Lys Thr Glu Gly Arg Leu Val Val Lys Gly Glu
65 70 75 80

Leu

<210> 149
<211> 81
<212> PRT
<213> Enterococcus faecalis

<400> 149

Leu Ala Ser His Asn Ala Gly Tyr Glu Gly Leu Leu Phe Thr Ser Leu
1 5 10 15

Asn Lys Val Ser Val Gly Asp Leu Val Lys Leu Asn Asp Arg Gly His
20 25 30

Ser Phe Ile Tyr Lys Val Lys Glu Gln Lys His Val Asp Met Thr Asp
35 40 45

Thr Thr Met Leu Asn Leu Thr Arg Lys Pro Thr Leu Thr Leu Ile Thr
50 55 60

Cys Asp Gln Ala Thr Lys Thr Thr Gly Arg Ile Ile Val Ile Ala Glu
65 70 75 80

Leu

eolf-seql

<210> 150
 <211> 84
 <212> PRT
 <213> Staphylococcus aureus

<400> 150

Ile Ala Gly His Thr Phe Ile Asp Arg Pro Asn Tyr Gln Phe Thr Asn
 1 5 10 15

Leu Lys Ala Ala Lys Lys Gly Ser Met Val Tyr Phe Lys Val Gly Asn
 20 25 30

Glu Thr Arg Lys Tyr Lys Met Thr Ser Ile Arg Asp Val Lys Pro Thr
 35 40 45

Asp Val Gly Val Leu Asp Glu Gln Lys Gly Lys Asp Lys Gln Leu Thr
 50 55 60

Leu Ile Thr Cys Asp Asp Tyr Asn Glu Lys Thr Gly Val Trp Glu Lys
 65 70 75 80

Arg Lys Ile Phe

<210> 151
 <211> 79
 <212> PRT
 <213> Shewanella putrefaciens

<400> 151

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

Val Gly Arg Arg Leu Ala Leu Gln Thr Ala Ala Gly Lys Glu Ile Val
 20 25 30

Tyr Gln Val Val Ala Thr Lys Glu Ser Gln Thr Glu Leu Met Ala Pro
 35 40 45

eolf-seql

Ser Asp Asp Asn Arg Leu Thr Leu Ile Thr Cys Tyr Pro Pro Asp Ala
 50 55 60

Leu Gln Gly Val Ala Glu Leu Arg Phe Val Val Gln Ala Val Pro
 65 70 75

<210> 152
 <211> 91
 <212> PRT
 <213> Streptomyces coelicolor

<400> 152

Val Leu Leu Gly His Val Thr Val Gly Arg Tyr Gly Asp Gly Val Phe
 1 5 10 15

Arg His Leu Ala Gly Leu Arg Arg Gly Glu Arg Ile Glu Ala Arg Leu
 20 25 30

Glu Asn Gly Thr Thr Ala Glu Phe Thr Val Thr Ala Val Arg Thr Val
 35 40 45

Ala Lys Ala Asp Phe Pro Thr Asp Asp Val Tyr Gly Asp Val Ala Gly
 50 55 60

Pro Glu Leu Arg Leu Ile Thr Cys Gly Gly Pro Arg Asp Gly Gln Glu
 65 70 75 80

Tyr Arg Asp Asn Val Ile Val Phe Ala Glu Leu
 85 90

<210> 153
 <211> 90
 <212> PRT
 <213> Clostridium difficile

<400> 153

eolf-seq1

Ile Tyr Gly His Asn Met Lys Asn Lys Thr Met Phe Asn Asn Leu Asn
1 5 10 15

Lys Phe Lys Asp Ala Asp Phe Phe Lys Lys Asn Asn Lys Ile Lys Ile
20 25 30

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

Val Glu Ser Asp Tyr Asp Tyr Leu Lys Thr Asn Phe Asn Asn Glu Ser
50 55 60

Asp Tyr Gln Asn Tyr Asn Asp Ile Thr Ser Lys Ser Leu Tyr Lys Ser
65 70 75 80

Pro Ile Lys Val Asn Ser Asn Asp Lys Ile
85 90

<210> 154

<211> 86

<212> PRT

<213> Methanothermobacter thermautotrophicus

<400> 154

Ile Leu Gly His Arg Thr Thr Tyr Ser Gly Pro Phe Arg Lys Ile Gly
1 5 10 15

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

Ile Arg Tyr Ile Tyr Thr Val Thr Ser Asn Gly Asp Asp Ile Arg Trp
35 40 45

Asp Tyr Arg Thr Asn Pro Val Arg Phe Ser Gln Ser Gly Asp Ala Arg
50 55 60

Leu Met Leu Ile Thr Cys Tyr Pro Pro Gly Gln Lys Lys Ala Ala Trp

65	70	eolf-seql	80
		75	
Ile Thr His Cys Lys Leu			
85			