

## SEQUENCE LISTING

<110> GlaxoSmithKline Biologicals SA  
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 <130> VB66381P  
 <150> GB1711637.7  
 <151> 2017-07-19  
 <160> 66  
 <170> PatentIn version 3.5  
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 or "Gly" or "His" or "Ile" or "Leu" or "Lys" or "Met" or "Phe" or  
 "Ser" or "Thr" or "Trp" or "Tyr" or "Val"  
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 "Ser" or "Thr" or "Trp" or "Tyr" or "Val"  
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Asp Gln Asn Ala Thr  
1 5

<210> 3  
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or "Gly" or "His" or "Ile" or "Leu" or "Lys" or "Met" or "Phe" or  
"Ser" or "Thr" or "Trp" or "Tyr" or "Val"

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or "Gly" or "His" or "Ile" or "Leu" or "Lys" or "Met" or "Phe" or  
"Ser" or "Thr" or "Trp" or "Tyr" or "Val"

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<400> 3

Lys Xaa Xaa Asn Xaa Xaa Lys  
1 5

<210> 4  
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<400> 4

Lys Asp Gln Asn Ala Thr Lys  
1 5

<210> 5  
<211> 481  
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<213> Streptococcus pneumoniae

&lt;400&gt; 5

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

245

250

255

Thr Lys Lys Ile Leu Leu Thr Thr Thr Pro Arg Asp Ala Tyr Val Pro  
 260 265 270

Ile Ala Asp Gly Gly Asn Asn Gln Lys Asp Lys Leu Thr His Ala Gly  
 275 280 285

Ile Tyr Gly Val Asp Ser Ser Ile His Thr Leu Glu Asn Leu Tyr Gly  
 290 295 300

Val Asp Ile Asn Tyr Tyr Val Arg Leu Asn Phe Thr Ser Phe Leu Lys  
 305 310 315 320

Leu Ile Asp Leu Leu Gly Gly Ile Asp Val Tyr Asn Asp Gln Glu Phe  
 325 330 335

Thr Ala His Thr Asn Gly Lys Tyr Tyr Pro Ala Gly Asn Val His Leu  
 340 345 350

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

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

Ile Leu Gln Lys Leu Thr Ser Thr Glu Ala Leu Lys Asn Tyr Ser Thr  
 385 390 395 400

Ile Ile Asn Ser Leu Gln Asp Ser Ile Gln Thr Asn Met Pro Leu Glu  
 405 410 415

Thr Met Ile Asn Leu Val Asn Ala Gln Leu Glu Ser Gly Gly Asn Tyr  
 420 425 430

Lys Val Asn Ser Gln Asp Leu Lys Gly Thr Gly Arg Thr Asp Leu Pro  
 435 440 445

Ser Tyr Ala Met Pro Asp Ser Asn Leu Tyr Val Met Glu Ile Asp Asp  
 450 455 460

Ser Ser Leu Ala Val Val Lys Ala Ala Ile Gln Asp Val Met Glu Gly  
 465 470 475 480

Arg

<210> 6  
 <211> 243  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 6

Met Ile Asp Ile His Ser His Ile Val Phe Asp Val Asp Asp Gly Pro  
 1 5 10 15

Lys Ser Arg Glu Glu Ser Lys Ala Leu Leu Thr Glu Ser Tyr Arg Gln  
 20 25 30

Gly Val Arg Thr Ile Val Ser Thr Ser His Arg Arg Lys Gly Met Phe  
 35 40 45

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

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

Ile Tyr Tyr Thr Leu Asp Ala Leu Glu Lys Leu Glu Lys Lys Glu Ile  
 85 90 95

Pro Thr Leu Asn Asp Ser Arg Tyr Ala Leu Ile Glu Phe Ser Met Asn  
 100 105 110

Thr Pro Tyr Arg Asp Ile His Ser Ala Leu Ser Lys Ile Leu Met Leu  
 115 120 125

Gly Ile Thr Pro Val Ile Ala His Ile Glu Arg Tyr Asp Ala Leu Glu  
 130 135 140

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

Gln Ile Asn Ser Tyr His Val Ser Lys Pro Lys Phe Phe Gly Glu Lys  
 165 170 175

Tyr Lys Phe Met Lys Lys Arg Ala Arg Tyr Phe Leu Glu Arg Asp Leu  
 180 185 190

Val His Val Val Ala Ser Asp Met His Asn Leu Asp Ser Arg Pro Pro  
 195 200 205

Tyr Met Gln Gln Ala Tyr Asp Ile Ile Ala Lys Lys Tyr Gly Ala Lys  
 210 215 220

Lys Ala Lys Glu Leu Phe Val Asp Asn Pro Arg Lys Ile Ile Met Asp  
 225 230 235 240

Gln Leu Ile

<210> 7  
 <211> 230  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 7

Met Lys Glu Gln Asn Thr Leu Glu Ile Asp Val Leu Gln Leu Phe Arg  
 1 5 10 15

Ala Leu Trp Lys Arg Lys Leu Val Ile Leu Leu Val Ala Ile Ile Thr  
 20 25 30

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

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

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

Asp Tyr Arg Glu Ile Ile Leu Ser Gln Asp Val Leu Glu Glu Val Val  
 85 90 95

Ser Asp Leu Lys Leu Asp Leu Thr Pro Lys Gly Leu Ala Asn Lys Ile  
 100 105 110

Lys Val Thr Val Pro Val Asp Thr Arg Ile Val Ser Val Ser Val Asn  
 115 120 125

Asp Arg Val Pro Glu Glu Ala Ser Arg Ile Ala Asn Ser Leu Arg Glu  
 130 135 140

Val Ala Ala Gln Lys Ile Ile Ser Ile Thr Arg Val Ser Asp Val Thr  
 145 150 155 160

Thr Leu Glu Glu Ala Arg Pro Ala Ile Ser Pro Ser Ser Pro Asn Ile  
 165 170 175

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

Val Ile Val Leu Leu Leu Glu Leu Leu Asp Thr Arg Val Lys Arg Pro  
195 200 205

Glu Asp Ile Glu Asp Thr Leu Gln Met Thr Leu Leu Gly Val Val Pro  
210 215 220

Asn Leu Asn Lys Leu Lys  
225 230

<210> 8  
<211> 227  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 8

Met Pro Thr Leu Glu Ile Ala Gln Lys Lys Leu Glu Phe Ile Lys Lys  
1 5 10 15

Ala Glu Glu Tyr Tyr Asn Ala Leu Cys Thr Asn Ile Gln Leu Ser Gly  
20 25 30

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

Lys Thr Thr Thr Ser Val Asn Ile Ala Trp Ser Phe Ala Arg Ala Gly  
50 55 60

Tyr Lys Thr Leu Leu Ile Asp Gly Asp Thr Arg Asn Ser Val Ile Ser  
65 70 75 80

Gly Phe Phe Lys Ser Arg Glu Lys Ile Thr Gly Leu Thr Glu Phe Leu  
85 90 95

Ser Gly Thr Ala Asp Leu Ser His Gly Leu Cys Asp Thr Asn Ile Glu  
100 105 110

Asn Leu Phe Val Val Gln Ser Gly Ser Val Ser Pro Asn Pro Thr Ala  
115 120 125

Leu Leu Gln Ser Lys Asn Phe Asn Asp Met Ile Glu Thr Leu Arg Lys  
130 135 140

Tyr Phe Asp Tyr Ile Ile Val Asp Thr Ala Pro Ile Gly Ile Val Ile  
145 150 155 160

Asp Ala Ala Ile Ile Thr Gln Lys Cys Asp Ala Ser Ile Leu Val Thr  
165 170 175

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

Leu Lys Gln Thr Gly Lys Leu Phe Leu Gly Val Val Leu Asn Lys Leu  
195 200 205

Asp Ile Ser Val Asp Lys Tyr Gly Val Tyr Gly Phe Tyr Gly Asn Tyr  
210 215 220

Gly Lys Lys  
225

<210> 9  
<211> 455  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 9

Met Asp Glu Lys Gly Leu Lys Ile Phe Met Ala Val Leu Gln Ser Ile  
1 5 10 15

Ile Val Ile Leu Leu Val Tyr Phe Leu Ser Phe Val Arg Glu Thr Glu  
20 25 30

Leu Glu Arg Ser Ser Met Val Ile Leu Tyr Leu Leu His Phe Phe Val  
35 40 45

Phe Tyr Val Ser Ser Tyr Gly Asn Asn Phe Phe Lys Arg Gly Tyr Leu  
50 55 60

Val Glu Phe Asn Ser Thr Ile Arg Tyr Ile Phe Phe Phe Ala Ile Ala  
65 70 75 80

Ile Ser Val Leu Asn Phe Phe Ile Ala Glu Arg Phe Ser Ile Ser Arg  
85 90 95

Arg Gly Met Val Tyr Phe Leu Thr Leu Glu Gly Ile Ser Leu Tyr Leu  
100 105 110

Leu Asn Phe Leu Val Lys Lys Tyr Trp Lys His Val Phe Phe Asn Leu  
115 120 125

Lys Asn Ser Lys Lys Ile Leu Leu Leu Thr Val Thr Lys Asn Met Glu  
130 135 140

Lys Val Leu Asp Lys Leu Leu Glu Ser Asp Glu Leu Ser Trp Lys Leu  
145 150 155 160



Val	Ala	Val	Ser	Val	Leu	Asn	Lys	Ser	Asp	Phe	Gln	His	Asp	Lys	Ile	165	170	175
Pro	Val	Ile	Glu	Lys	Glu	Lys	Ile	Ile	Glu	Phe	Ala	Thr	His	Glu	Val	180	185	190
Val	Asp	Glu	Val	Phe	Val	Asn	Leu	Pro	Gly	Glu	Ser	Tyr	Asp	Ile	Gly	195	200	205
Glu	Ile	Ile	Ser	Arg	Phe	Glu	Thr	Met	Gly	Ile	Asp	Val	Thr	Val	Asn	210	215	220
Leu	Lys	Ala	Phe	Asp	Lys	Asn	Leu	Gly	Arg	Asn	Lys	Gln	Ile	His	Glu	225	230	235
Met	Val	Gly	Leu	Asn	Val	Val	Thr	Phe	Ser	Thr	Asn	Phe	Tyr	Lys	Thr	245	250	255
Ser	His	Val	Ile	Ser	Lys	Arg	Ile	Leu	Asp	Ile	Cys	Gly	Ala	Thr	Ile	260	265	270
Gly	Leu	Ile	Leu	Phe	Ala	Ile	Ala	Ser	Leu	Val	Leu	Val	Pro	Leu	Ile	275	280	285
Arg	Lys	Asp	Gly	Gly	Pro	Ala	Ile	Phe	Ala	Gln	Thr	Arg	Ile	Gly	Lys	290	295	300
Asn	Gly	Arg	His	Phe	Thr	Phe	Tyr	Lys	Phe	Arg	Ser	Met	Arg	Ile	Asp	305	310	315
Ala	Glu	Ala	Ile	Lys	Glu	Gln	Leu	Met	Asp	Gln	Asn	Thr	Met	Gln	Gly	325	330	335
Gly	Met	Phe	Lys	Ile	Asp	Asn	Asp	Pro	Arg	Val	Thr	Lys	Ile	Gly	Arg	340	345	350
Phe	Ile	Arg	Lys	Thr	Ser	Leu	Asp	Glu	Leu	Pro	Gln	Phe	Trp	Asn	Val	355	360	365
Phe	Ile	Gly	Asp	Met	Ser	Leu	Val	Gly	Thr	Arg	Pro	Pro	Thr	Val	Asp	370	375	380
Glu	Tyr	Asp	Gln	Tyr	Thr	Pro	Glu	Gln	Lys	Arg	Arg	Leu	Ser	Phe	Lys	385	390	395
Pro	Gly	Ile	Thr	Gly	Leu	Trp	Gln	Val	Ser	Gly	Arg	Ser	Lys	Ile	Thr	405	410	415

Asp Phe Asp Asp Val Val Lys Leu Asp Val Ser Tyr Ile Asp Asn Trp  
420 425 430

Thr Ile Trp Lys Asp Ile Glu Ile Leu Leu Lys Thr Val Lys Val Val  
435 440 445

Phe Met Arg Asp Gly Ala Lys  
450 455

<210> 10  
<211> 392  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 10

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

Tyr Gly Gly Phe Glu Thr Phe Val Glu Lys Leu Thr Ala Phe Gln Gln  
20 25 30

Asp Lys Ala Ile Gln Tyr Tyr Val Ala Cys Met Arg Glu Asn Ser Ala  
35 40 45

Lys Ser Gly Thr Thr Glu Asp Val Phe Glu His Asn Gly Ala Ile Cys  
50 55 60

Tyr Asn Val Asp Val Pro Asn Ile Gly Pro Ala Arg Ala Ile Val Tyr  
65 70 75 80

Asp Ile Ala Ala Ile Asn Arg Ala Ile Glu Ile Ala Lys Glu Asn Lys  
85 90 95

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

Ile His Gly Ile Lys Lys Lys Ile Gln Ala Ile Gly Gly Thr Leu Leu  
115 120 125

Val Asn Pro Asp Gly His Glu Trp Leu Arg Ala Lys Trp Ser Thr Pro  
130 135 140

Val Arg Arg Tyr Trp Lys Ile Ser Glu Gly Leu Met Val Lys His Ala  
145 150 155 160

Asp Leu Leu Val Cys Asp Ser Lys Asn Ile Glu Gln Tyr Ile Gln Glu  
165 170 175

Asp Tyr Lys Gln Phe Gln Pro Lys Thr Thr Tyr Ile Ala Tyr Gly Thr  
180 185 190

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

Trp Phe Lys Glu Lys Asn Val Ser Glu Asn Glu Tyr Tyr Leu Val Val  
210 215 220

Gly Arg Phe Val Pro Glu Asn Asn Tyr Glu Ser Met Ile Leu Gly Phe  
225 230 235 240

Leu Ala Ser Asn Ser Lys Lys Asp Phe Val Leu Ile Thr Asn Val Glu  
245 250 255

Gln Asn Lys Phe Tyr Asn Gln Leu Leu Ala Lys Thr Gly Phe Asp Lys  
260 265 270

Asp Pro Arg Val Lys Phe Val Gly Thr Val Tyr Asn Gln Glu Leu Leu  
275 280 285

Lys Tyr Ile Arg Glu Asn Ala Phe Ala Tyr Phe His Gly His Glu Val  
290 295 300

Gly Gly Thr Asn Pro Ser Leu Leu Glu Ala Leu Ala Ser Thr Lys Leu  
305 310 315 320

Asn Leu Leu Leu Asp Val Gly Phe Asn Arg Glu Val Ala Glu Asp Gly  
325 330 335

Ala Asp Tyr Trp Glu Lys Asp Asn Leu His Lys Val Ile Glu Ala Ser  
340 345 350

Glu Gln Lys Thr Gln Glu Glu Ile Asn Glu Lys Asn Ile Leu Ser Thr  
355 360 365

Lys Gln Val Thr Glu Arg Phe Ser Trp Asp Leu Ile Val Asn Glu Tyr  
370 375 380

Glu Lys Leu Phe Thr Arg Lys Asn  
385 390

<210> 11  
<211> 468  
<212> PRT  
<213> Streptococcus pneumoniae  
  
<400> 11

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

Tyr Leu Phe Ala Ala Phe Met Leu Ala Trp Tyr Lys Asn Lys Lys Leu  
260 265 270

Leu Gln Val Leu Leu Leu Ala Ser Phe Val Leu Ser Val Ser Lys Ala  
275 280 285

Ala Phe Leu Ser Met Leu Val Tyr Ile Ile Ile Tyr Thr Trp Val Val  
290 295 300

Asp Lys Asn Lys Ile Leu Ser Ile Phe Gly Ile Ile Ile Ser Thr Val  
305 310 315 320

Leu Gly Leu Tyr Phe Tyr Asn Phe Ser Gln Val Ser Ser Tyr Gly Ser  
325 330 335

Ile Asn Ala His Ile Asp Gly Phe Phe Ser Ala Leu Ser Thr Pro Leu  
340 345 350

His Tyr Pro Phe Gly Met Gly Val Gly Ser Val Gly Val Leu Ala Ser  
355 360 365

Lys Leu Gly Ser Gln Thr Ala Leu Ser Ser Glu Val Leu Glu Thr Gly  
370 375 380

Ile Gly Met Ile Ile Ala Gln Leu Gly Phe Val Gly Val Ile Ile Tyr  
385 390 395 400

Leu Ile Phe Phe Val Lys Leu Ser Val Ile Gly Lys Asn Ile Asn Asn  
405 410 415

Lys Arg Asp Lys Ile Leu Trp Phe Thr Leu Ile Tyr Ser Phe Leu Ala  
420 425 430

Asn Ala Phe Phe Asn Glu Val Ala Leu Ser Pro Asn Ser Cys Thr Leu  
435 440 445

Tyr Phe Leu Ile Leu Gly Leu Leu Tyr Asn Lys Asn Lys Ile Arg Ser  
450 455 460

Thr Glu Phe Ser  
465

<210> 12  
<211> 323  
<212> PRT  
<213> Streptococcus pneumoniae

&lt;400&gt; 12

Met Glu Lys Leu Val Ser Ile Ile Leu Pro Val Tyr Asn Val Glu Gln  
 1 5 10 15

Tyr Ile Lys Asn Cys Leu Glu Ser Ile Gln Gln Gln Thr Tyr Pro Asn  
 20 25 30

Leu Glu Val Ile Ile Val Asn Asp Gly Ser Thr Asp Lys Ser Val Glu  
 35 40 45

Tyr Cys Glu Gln Ile Cys Lys Ile Asp Ser Arg Phe Ser Ile Thr His  
 50 55 60

Lys Glu Asn Gly Gly Leu Ser Asp Ala Arg Asn Val Gly Ile Asp Lys  
 65 70 75 80

Ala Lys Gly Asp Tyr Leu Ile Phe Val Asp Ser Asp Asp Phe Val Ser  
 85 90 95

Gln Asp Met Val Ser Tyr Leu Val Ser Cys Met Glu Asn Asn Glu Ala  
 100 105 110

Asp Ile Ala Ile Cys Asp Pro Val His Tyr Tyr Ser Asp Arg Gln Asn  
 115 120 125

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

Thr Thr Glu Ala Leu Cys Glu Met Phe Tyr Gln Lys Ser Phe Leu Val  
 145 150 155 160

Ser Ala Trp Ala Lys Ile Phe Lys Arg Glu Leu Phe Asp Asp Ile Arg  
 165 170 175

Phe Pro Val Gly Lys Leu Phe Glu Asp Ser Ala Ile Met Tyr Leu Leu  
 180 185 190

Leu Glu Lys Cys Glu Thr Ile Ala Tyr Ser Asp Ala Lys Leu Tyr Ala  
 195 200 205

Tyr Val His Arg Asp Asn Ser Ile Thr Thr Lys Lys Phe Ser Asp Arg  
 210 215 220

Asp Leu Asp Ile Leu Glu Ile Thr Asn Thr Ile Ile Asn His Tyr Gly  
 225 230 235 240

Asp Asn Leu Arg Val Tyr Thr Ala Ala Val Ser Tyr Lys Val Ser Ala

245

250

255

Cys Phe Arg Ile Leu Leu Asn Ser Pro Ser Glu Glu Lys Tyr Lys Lys  
 260 265 270

Val Gln Lys Glu Cys Leu Ser Tyr Ile Leu Gln Asn Trp Arg Asn Ile  
 275 280 285

Leu Phe Asn Asn Asn Val Arg Leu Lys Asn Lys Leu Ala Leu Ile Ser  
 290 295 300

Ile Thr Ile Phe Asn Pro Phe Val Lys Leu Ile Tyr Ser Lys Val Asn  
 305 310 315 320

Arg Trp Glu

<210> 13  
 <211> 410  
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 <213> Streptococcus pneumoniae

<400> 13

Met Asn Lys Tyr Glu Glu Arg Tyr Gln Glu Asn Leu Ser Lys Asn Asp  
 1 5 10 15

Phe Tyr Lys Leu Ile Asn Lys Ser Tyr Leu Ser Asp Lys Glu Leu Gln  
 20 25 30

Val Gln Gln Val Lys Ala Gly Ile Val Leu Pro Pro Lys Ala Phe Glu  
 35 40 45

Thr Lys Leu Ser Asn Lys Leu Gly Leu Gln Lys Ser Leu His Gly Lys  
 50 55 60

Gly Gly Val Val Asp Ser Asn Gly Asn Tyr Ile Glu Leu Ser Ala Gln  
 65 70 75 80

Lys Ala Val Gly Met Arg Asn Arg Val Tyr Gly Pro Tyr Lys Ile Asn  
 85 90 95

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

Phe Ile Lys Gln Trp Gly His Phe Leu Leu Asp Val Val Gly Arg Leu  
 115 120 125

Trp Tyr Pro Leu Leu Gln Asp Asn Asp Thr Lys Leu Val Tyr Thr Cys

130		135		140
Tyr Ala Gly Thr Glu Thr Lys Ile Glu Gly Asn Tyr Leu Glu Phe Leu				
145		150		155
				160
Lys Leu Leu Gly Ile Asp Gln Ser Arg Leu Ile Met Ile Asn Cys Pro				
		165		170
				175
Thr Gln Phe Ser Glu Val Ile Ile Pro Glu Ser Ser Ile Leu Pro Gly				
		180		185
				190
Gly Tyr Tyr Thr Lys Glu Tyr Lys Gln Leu Phe Ser Ser Val Val Glu				
		195		200
				205
Asn Ile Lys Leu Asp Lys Tyr Asp Val Asn Ala Lys Met Ile Tyr Cys				
		210		215
				220
Ser Arg Ser Lys Leu Gly Ile Ala Lys Ser Lys Glu Phe Gly Glu Asp				
		225		230
				235
				240
Gly Ile Glu Gly Ile Phe Lys Gln Asn Gly Tyr Thr Ser Val Tyr Met				
		245		250
				255
Glu Thr Met Ser Leu Glu Glu Gln Ile Lys Thr Leu Leu Ser Ala Lys				
		260		265
				270
Thr Ile Val Leu Thr Ser Gly Ser Leu Ala His Asn Leu Leu Phe Val				
		275		280
				285
Asn Lys Asp Ile Asp Val Phe Ile Leu Asn Lys Thr Tyr Arg Val Asn				
		290		295
				300
Leu His Gln Phe Leu Ile Asn Glu Ile Ser Asp Ala Thr Val Arg Phe				
		305		310
				315
				320
Val Asp Ile Tyr Arg Ser Pro Leu Pro Ile Leu Tyr Gly Tyr Gly Pro				
		325		330
				335
Phe Leu Met Asp Leu Thr Lys Pro Leu Ala Asn Phe Leu Asp Asp Asn				
		340		345
				350
Glu Phe Val Tyr Glu Lys Gly Thr Val Leu Ser Lys Lys Asp Tyr Phe				
		355		360
				365
Lys Tyr Tyr Leu Lys Trp Leu Trp Ser Tyr Arg Phe Phe Leu Phe Arg				
		370		375
				380



Leu Asn Gly Ile Lys Glu Gly Asn Ser Glu Phe Glu Lys Ser Phe Lys  
 385 390 395 400

Ile Ile Arg Arg Tyr Tyr Lys Thr Gly Arg  
 405 410

<210> 14  
 <211> 461  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 14

Met Ser Lys Tyr Lys Glu Leu Ala Lys Asn Thr Gly Ile Phe Ala Leu  
 1 5 10 15

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

Thr Arg Val Leu Thr Thr Thr Glu Tyr Gly Phe Tyr Asp Leu Val Tyr  
 35 40 45

Thr Thr Ile Gln Leu Phe Val Pro Ile Leu Thr Leu Asn Ile Ser Glu  
 50 55 60

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

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

Leu Leu Leu Leu Val Asn Asn Leu Phe Ser Leu Ser Asp Leu Ile Ser  
 100 105 110

Gln Tyr Ser Ile Tyr Ile Phe Val Ile Phe Val Phe Tyr Thr Leu Asn  
 115 120 125

Asn Phe Leu Ile Gln Phe Ser Lys Gly Ile Asp Lys Ile Gly Val Thr  
 130 135 140

Ala Ile Ser Gly Val Ile Ser Thr Ala Val Met Leu Ala Met Asn Val  
 145 150 155 160

Ile Leu Leu Val Val Phe Asp Trp Gly Leu Leu Gly Phe Phe Ile Ala  
 165 170 175

Asn Val Cys Gly Tyr Val Ile Pro Cys Ile Tyr Ile Val Ser Arg Leu  
 180 185 190

Arg	Leu	Trp	Glu	Leu	Phe	Glu	Ile	Lys	Ile	Asp	Lys	Lys	Leu	Gln	Trp
	195						200					205			
Glu	Met	Val	Tyr	Tyr	Ala	Leu	Pro	Leu	Val	Leu	Asn	Ile	Leu	Ser	Trp
	210					215					220				
Trp	Val	Asn	Asn	Thr	Ser	Asp	Arg	Tyr	Ile	Val	Thr	Ala	Ile	Val	Gly
225					230					235					240
Ile	Gln	Ala	Ser	Ala	Ile	Ile	Ser	Val	Ala	Tyr	Lys	Ile	Pro	Gln	Ile
				245					250					255	
Leu	Ser	Thr	Ile	Ser	Ala	Ile	Phe	Ile	Gln	Ser	Trp	Gln	Ile	Ser	Ala
			260					265					270		
Ile	Lys	Ile	Gln	Glu	Asp	Lys	Ser	Gly	Thr	Thr	Phe	Val	Ser	Asn	Met
	275						280					285			
Leu	Leu	Tyr	Tyr	Asn	Ala	Leu	Leu	Leu	Ile	Ile	Ala	Ser	Gly	Ile	Ile
	290					295					300				
Leu	Phe	Val	Lys	Pro	Ile	Ser	Asn	Ile	Leu	Phe	Gly	Ile	Ser	Phe	Tyr
305					310					315					320
Ser	Ala	Trp	Glu	Leu	Val	Pro	Phe	Leu	Ile	Ile	Ser	Ser	Leu	Phe	Asn
				325					330					335	
Ala	Ile	Ser	Gly	Cys	Ile	Gly	Ala	Ile	Met	Gly	Ala	Lys	Met	Asp	Thr
			340					345					350		
His	Asn	Ile	Ala	Lys	Ser	Ala	Leu	Val	Gly	Met	Ile	Ala	Asn	Ile	Ile
	355						360					365			
Leu	Asn	Ile	Val	Leu	Thr	Phe	Leu	Met	Gly	Pro	Gln	Gly	Ile	Thr	Ile
	370					375					380				
Ser	Thr	Leu	Ile	Ala	Ser	Phe	Leu	Ile	Phe	Tyr	Met	Arg	Lys	Asp	Ser
385					390					395					400
Val	Lys	Glu	Ile	Asn	Ser	Glu	Thr	Tyr	Arg	Ala	Ile	Tyr	Leu	Ser	Trp
				405					410					415	
Ile	Leu	Leu	Val	Val	Glu	Ala	Cys	Leu	Leu	Ile	Tyr	Met	Asp	Phe	Ile
			420					425					430		
Ile	Gly	Ala	Leu	Ile	Ala	Met	Val	Ile	Asn	Leu	Phe	Leu	Leu	Lys	Asp
	435						440					445			

Val Ile Lys Pro Leu Tyr Leu Lys Ile Phe Lys Arg Asn  
 450 455 460

<210> 15  
 <211> 382  
 <212> PRT  
 <213> Streptococcus pneumoniae  
 <400> 15

Met Ile Val Leu Gln Tyr Phe Lys Ile Leu Ala Arg Phe Val Phe Met  
 1 5 10 15

Phe Leu Ile Ser Ala Val Leu Leu Pro Phe Lys Ile Lys Pro Asn Lys  
 20 25 30

Ile Val Phe Ile Asn Phe Asn Gly Lys Gly Tyr Gly Asp Asn Pro Lys  
 35 40 45

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

Trp Leu Ala Arg Asp Asn Glu Gly Phe Pro Asp Gly Val Arg Val Val  
 65 70 75 80

Lys Tyr Gly Thr Phe Gln Ala Phe Tyr Glu Gln Ala Ser Ser Lys Val  
 85 90 95

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

Gln Ile Tyr Ile Gln Thr Trp His Gly Ala Ser Ser Phe Lys Leu Ile  
 115 120 125

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

Asp Ala Arg Val Thr Asp Ile Met Ile Ser Asp Ser Arg Lys Gln Thr  
 145 150 155 160

Glu Glu Phe Gln Lys Tyr Phe Trp Tyr Ser Gly Glu Ile Phe Glu Val  
 165 170 175

Gly Met Pro Arg Asn Asp Ala Leu Phe His Tyr Lys Glu Asp Tyr Asp  
 180 185 190

Lys Leu Asn Asn Ile Arg Lys Glu Leu Ser Ile His Ser Asp Asp Tyr  
 195 200 205

Val Ile Leu Tyr Ala Pro Thr Phe Arg Asp Asp Gly Asp Ala Ser Tyr  
210 215 220

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

Lys Lys Lys Cys Lys Phe Leu Ile Arg Leu His Pro Asn His Ser His  
245 250 255

Leu Cys Asn Asn Ile Ser Phe Asn Lys Asn Ile Ile Asn Ala Thr Phe  
260 265 270

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

Asp Tyr Ser Ser Ser Ile Phe Asp Phe Met Leu Leu Asn Lys Pro Tyr  
290 295 300

Val Arg Tyr Val Asn Asp Leu Glu Lys Tyr Ala Glu Leu Arg Gly Val  
305 310 315 320

Ser Asp Thr Tyr Tyr Glu Leu Pro Asp Ser Ile Ile Lys Thr Ala Glu  
325 330 335

Glu Leu Tyr Asp Leu Leu Pro Lys Lys Ile Glu Asn Phe Asp Tyr Asp  
340 345 350

Ser Ile Lys Lys Tyr Arg Asn Glu Ile Leu Cys Pro Ile Phe Asn Gly  
355 360 365

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

<210> 16

<211> 342

<212> PRT

<213> Streptococcus pneumoniae

<400> 16

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

Ser Ala Thr Leu Ser Gln Asn Ser Ile Ser Gly Lys Ile Leu Tyr Cys  
20 25 30

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

Ile Glu Glu Ile Gly Arg Val Lys Glu Glu Ser Cys Asn Tyr Asn Thr  
50 55 60

Ile Ala Tyr Ala Met Asn Ile Ala Glu Arg Ala Ile Ala Thr Asp Ile  
65 70 75 80

Asp Cys Ile Val Gly Met Gly Gly Gly Arg Val Leu Asp Val Cys Lys  
85 90 95

Tyr Ala Ser Phe Ile Ser Lys Arg Pro Tyr Leu Ser Ile Pro Thr Thr  
100 105 110

Ala Ala Asn Asp Gly Ile Ala Ser Pro Val Ala Val Leu Lys Arg Gln  
115 120 125

Asp Asp Arg Pro Lys Ser Leu Gly Ala Ala Ile Pro Ser Met Thr Leu  
130 135 140

Ile	Asp	Ile	Asp	Val	Ile	Ala	Ser	Gly	Pro	Ile	Gln	Asn	Ile	Lys	Ala
145					150					155					160

Gly Ile Gly Asp Thr Ile Ser Asn Tyr Thr Ala Leu Lys Asp Trp Glu  
165 170 175

Leu Ala Val Glu Arg Gly Lys Asp Glu Met His Gly Phe Ala Tyr Leu  
180 185 190

Met Ser Gln Asn Ser Leu Asp Ala Leu Met Lys Thr Lys Tyr Asn Ser  
195 200 205

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

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

Glu His Leu Phe Ser His Ala Leu Asp Tyr Tyr Gly Ser Thr Arg Asn  
245 250 255

Leu His Gly Ile Gln Val Ala Leu Gly Thr Val Ala Val Leu Lys Leu  
260 265 270

Ile Glu Asn Ser Val Asp Thr Val Val Asp Tyr Leu Gln Arg Phe Glu  
275 280 285

Val	His	Ile	Asn	Pro	Lys	Leu	Leu	Gly	Ile	Asp	Glu	Glu	Leu	Phe	Ile
	290					295					300				

Tyr Cys Met Gln His Ala Thr Lys Met Arg Ser Asn Arg Tyr Thr Tyr  
305 310 315 320

Leu His Glu Val Asp Leu Ser Thr Asp Arg Leu Lys Gln Ile Tyr Lys  
325 330 335

Glu Leu Ile Ser Glu Leu  
340

<210> 17  
<211> 234  
<212> PRT  
<213> Streptococcus pneumoniae  
  
<400> 17

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

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

Ile Leu Met Lys Gln Ile Glu Asn Leu Tyr Gln Asn Asn Ile Thr Asp  
35 40 45

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

Thr Glu Lys Tyr Pro Glu Ile Asn Ile Ile Asp Asn Val Asp Phe Lys  
65 70 75 80

Thr Thr Asn Asn Met Tyr Ser Ala Tyr Leu Gly Lys Ala Ala Met Gly  
85 90 95

Asp Ser Asp Phe Leu Met Met Asn Ala Asp Val Phe Tyr Asp Ala Ser  
100 105 110

Val Ile Lys Ser Leu Leu Leu His Lys Ala Pro Asn Ala Ile Val Thr  
115 120 125

Asp Leu Gly Ile Tyr Ile Glu Glu Ser Met Lys Val Val Glu Lys Asn  
130 135 140

Gly Arg Leu Val Glu Ile Ser Lys Gln Ile Ser Pro Glu Glu Thr Leu  
145 150 155 160

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

Phe Phe Glu Lys Cys Lys Glu Phe Ile Glu Asp Lys Arg Glu Leu Gln  
180 185 190

Met Trp Ser Glu Val Ala Leu Asn Ala Ile Leu Ser Glu Val Glu Phe  
195 200 205

Val Ala Cys Pro Leu Glu Gly Arg Trp Leu Glu Ile Asp Asn His Glu  
210 215 220

Asp Leu Val Ala Ala Glu Lys Leu Phe Ala  
225 230

<210> 18  
<211> 277  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 18

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

Leu Gln Asn Lys Lys Leu Phe Leu Phe Asp Met Asp Gly Thr Ile Tyr  
20 25 30

Glu Glu Asp Arg Leu Phe Glu Gly Thr Leu Glu Leu Leu Asp Tyr Ile  
35 40 45

His Asn Ile Gly Gly Glu Tyr Ile Phe Ile Thr Asn Asn Ser Ser Lys  
50 55 60

Ser Val Val Asp Tyr Val Glu Lys Val Asn Arg Leu Gly Ile Lys Ala  
65 70 75 80

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

Lys Glu Asn Tyr Pro Lys Ser Lys Val Tyr Cys Gln Gly Thr Lys Ser  
100 105 110

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

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

Ser Asp Lys Ile Arg Asn Thr Cys Glu Ile Leu Ser Thr Lys Asp Val  
145 150 155 160

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

Phe Ile Pro Asp Cys Gly Ser Ile Cys Asp Met Ile Ser Lys Ser Val  
180 185 190

Asp Arg Lys Pro Val Tyr Ile Gly Lys Pro Glu Pro Thr Met Val Asp  
195 200 205

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

Gly Asp Arg Leu Tyr Thr Asp Ile Met Thr Gly Ile Asn Ala Gly Val  
225 230 235 240

Thr Ser Val Cys Val Leu Thr Gly Glu Ala Thr Val Asn Asp Ile Gln  
245 250 255

Gln Asp Ser Ile Lys Pro Thr Tyr Thr Phe Lys Asn Val Lys Glu Met  
260 265 270

Trp Lys Gly Ile Val  
275

<210> 19  
<211> 289  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 19

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

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

Met Ile Tyr Tyr Pro Leu Ser Thr Leu Met Leu Ala Gly Ile Arg Asp  
35 40 45

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

Leu Gln Asp Gly Ser Glu Phe Gly Ile Lys Leu Ser Tyr Ala Glu Gln  
65 70 75 80

Pro Ser Pro Asp Gly Leu Ala Gln Ala Phe Ile Ile Gly Glu Glu Phe  
85 90 95



Ile Gly Asp Asp Ser Val Ala Leu Ile Leu Gly Asp Asn Ile Tyr His  
 100 105 110

Gly Pro Gly Leu Ser Thr Met Leu Gln Lys Ala Ala Lys Lys Glu Lys  
 115 120 125

Gly Ala Thr Val Phe Gly Tyr His Val Lys Asp Pro Glu Arg Phe Gly  
 130 135 140

Val Val Glu Phe Asp Glu Asn Met Asn Ala Ile Ser Ile Glu Glu Lys  
 145 150 155 160

Pro Glu Tyr Pro Arg Ser Asn Tyr Ala Val Thr Gly Leu Tyr Phe Tyr  
 165 170 175

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

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

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

Gly Thr His Glu Ser Leu Leu Glu Ala Ser Gln Tyr Ile Glu Thr Val  
 225 230 235 240

Gln Arg Met Gln Asn Val Gln Val Ala Asn Leu Glu Glu Ile Ala Tyr  
 245 250 255

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

Leu Lys Lys Asn Glu Tyr Gly Gln Tyr Leu Leu Arg Leu Ile Gly Glu  
 275 280 285

Ala

<210> 20  
 <211> 197  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 20

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

Ala Ile Pro Gly Met Leu Glu Phe Asp Ile Pro Val His Gly Asp Asn  
20 25 30

Arg Gly Trp Phe Lys Glu Asn Phe Gln Lys Glu Lys Met Leu Pro Leu  
35 40 45

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

Ser Phe Ser Arg Lys Asn Val Leu Arg Gly Leu His Ala Glu Pro Trp  
65 70 75 80

Asp Lys Tyr Ile Ser Val Ala Asp Gly Gly Lys Val Leu Gly Ser Trp  
85 90 95

Val Asp Leu Arg Glu Gly Glu Thr Phe Gly Asn Thr Tyr Gln Thr Val  
100 105 110

Ile Asp Ala Ser Lys Gly Ile Phe Val Pro Arg Gly Val Ala Asn Gly  
115 120 125

Phe Gln Val Leu Ser Asp Thr Val Ser Tyr Ser Tyr Leu Val Asn Asp  
130 135 140

Tyr Trp Ala Leu Glu Leu Lys Pro Lys Tyr Ala Phe Val Asn Tyr Ala  
145 150 155 160

Asp Pro Ser Leu Gly Ile Glu Trp Glu Asn Ile Ala Glu Ala Glu Val  
165 170 175

Ser Glu Ala Asp Lys Asn His Pro Leu Leu Lys Asp Val Lys Pro Leu  
180 185 190

Lys Lys Glu Asp Leu  
195

<210> 21  
<211> 349  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 21

Met Thr Glu Tyr Lys Asn Ile Ile Val Thr Gly Gly Ala Gly Phe Ile  
1 5 10 15

Gly Ser Asn Phe Val His Tyr Val Tyr Glu Asn Phe Pro Asp Val His  
20 25 30

Val Thr Val Leu Asp Lys Leu Thr Tyr Ala Gly Asn Arg Ala Asn Ile  
35 40 45

Glu Glu Ile Leu Gly Asn Arg Val Glu Leu Val Val Gly Asp Ile Ala  
50 55 60

Asp Ala Glu Leu Val Asp Lys Leu Ala Ala Gln Ala Asp Ala Ile Val  
65 70 75 80

His Tyr Ala Ala Glu Ser His Asn Asp Asn Ser Leu Asn Asp Pro Ser  
85 90 95

Pro Phe Ile His Thr Asn Phe Ile Gly Thr Tyr Thr Leu Leu Glu Ala  
100 105 110

Ala Arg Lys Tyr Asp Ile Arg Phe His His Val Ser Thr Asp Glu Val  
115 120 125

Tyr Gly Asp Leu Pro Leu Arg Glu Asp Leu Pro Gly His Gly Glu Gly  
130 135 140

Pro	Gly	Glu	Lys	Phe	Thr	Ala	Glu	Thr	Lys	Tyr	Asn	Pro	Ser	Ser	Pro
145					150					155					160

Tyr Ser Ser Thr Lys Ala Ala Ser Asp Leu Ile Val Lys Ala Trp Val  
165 170 175

Arg Ser Phe Gly Val Lys Ala Thr Ile Ser Asn Cys Ser Asn Asn Tyr  
180 185 190

Gly Pro Tyr Gln His Ile Glu Lys Phe Ile Pro Arg Gln Ile Thr Asn  
195 200 205

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

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Arg	Asp	Trp	Ile	His	Thr	Asn	Asp	His	Ser	Ser	Gly	Val	Trp	Thr	Ile
225					230					235					240

Leu Thr Lys Gly Gln Ile Gly Glu Thr Tyr Leu Ile Gly Ala Asp Gly  
245 250 255

Glu Lys Asn Asn Lys Glu Val Leu Glu Leu Ile Leu Lys Glu Met Gly  
260 265 270

Gln Ala Val Asp Ala Tyr Asp His Val Thr Asp Arg Ala Gly His Asp

275

280

285

Leu Arg Tyr Ala Ile Asp Ala Ser Lys Leu Arg Asp Glu Leu Gly Trp  
 290 295 300

Lys Pro Glu Phe Thr Asn Phe Glu Ala Gly Leu Lys Ala Thr Ile Lys  
 305 310 315 320

Trp Tyr Thr Asp Asn Gln Glu Trp Trp Lys Ala Glu Lys Glu Ala Val  
 325 330 335

Glu Ala Asn Tyr Ala Lys Thr Gln Glu Ile Ile Thr Val  
 340 345

<210> 22

<211> 283

<212> PRT

<213> Streptococcus pneumoniae

<400> 22

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

Tyr Leu Leu Asp Glu Arg Asn Glu Glu Tyr Val Ala Val Asp Val Ala  
 20 25 30

Glu Met Asp Ile Thr Asp Ala Glu Met Val Glu Lys Val Phe Glu Glu  
 35 40 45

Val Lys Pro Thr Leu Val Tyr His Cys Ala Ala Tyr Thr Ala Val Asp  
 50 55 60

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

Gly Thr Lys Asn Val Ala Lys Ala Ser Glu Lys His Gly Ala Thr Leu  
 85 90 95

Val Tyr Ile Ser Thr Asp Tyr Val Phe Asp Gly Lys Lys Pro Val Gly  
 100 105 110

Gln Glu Trp Glu Val Asp Asp Arg Pro Asp Pro Gln Thr Glu Tyr Gly  
 115 120 125

Arg Thr Lys Arg Met Gly Glu Glu Leu Val Glu Lys His Val Ser Asn  
 130 135 140

Phe Tyr Ile Ile Arg Thr Ala Trp Val Phe Gly Asn Tyr Gly Lys Asn

145	150										155				160		
Phe	Val	Phe	Thr	Met	Gln	Asn	Leu	Ala	Lys	Thr	His	Lys	Thr	Leu	Thr		
				165					170					175			
Val	Val	Asn	Asp	Gln	Tyr	Gly	Arg	Pro	Thr	Trp	Thr	Arg	Thr	Leu	Ala		
				180					185					190			
Glu	Phe	Met	Thr	Tyr	Leu	Ala	Glu	Asn	Arg	Lys	Glu	Phe	Gly	Tyr	Tyr		
				195					200					205			
His	Leu	Ser	Asn	Asp	Ala	Thr	Glu	Asp	Thr	Thr	Trp	Tyr	Asp	Phe	Ala		
				210					215					220			
Val	Glu	Ile	Leu	Lys	Gly	Thr	Asp	Val	Glu	Val	Lys	Pro	Val	Asp	Ser		
225					230					235					240		
Ser	Gln	Phe	Pro	Ala	Lys	Ala	Lys	Arg	Pro	Leu	Asn	Ser	Thr	Met	Ser		
				245					250					255			
Leu	Ala	Lys	Ala	Lys	Ala	Thr	Gly	Phe	Val	Ile	Pro	Thr	Trp	Gln	Asp		
				260					265					270			
Ala	Leu	Gln	Glu	Phe	Tyr	Lys	Gln	Glu	Val	Arg							
				275					280								
<210>		23															
<211>		484															
<212>		PRT															
<213>		Streptococcus pneumoniae															
<400>		23															
Met	Leu	Ile	Met	Ser	Arg	Arg	Phe	Lys	Lys	Ser	Gly	Ser	Gln	Lys	Val		
1					5					10					15		
Lys	Arg	Ser	Val	Asn	Ile	Val	Leu	Leu	Thr	Ile	Tyr	Leu	Leu	Leu	Val		
				20					25					30			
Cys	Phe	Leu	Leu	Phe	Leu	Ile	Phe	Lys	Tyr	Asn	Ile	Leu	Ala	Phe	Arg		
				35					40					45			
Tyr	Phe	Asn	Leu	Val	Val	Thr	Ala	Leu	Val	Leu	Leu	Val	Ala	Leu	Val		
				50					55					60			
Gly	Leu	Leu	Leu	Ile	Ile	Tyr	Lys	Lys	Ala	Glu	Lys	Phe	Thr	Ile	Phe		
65					70					75					80		
Leu	Leu	Val	Phe	Ser	Ile	Leu	Val	Ser	Ser	Val	Ser	Leu	Phe	Ala	Val		

85

90

95

Gln Gln Phe Val Gly Leu Thr Asn Arg Leu Asn Ala Thr Ser Asn Tyr  
 100 105 110

Ser Glu Tyr Ser Ile Ser Val Ala Val Leu Ala Asp Ser Asp Ile Glu  
 115 120 125

Asn Val Thr Gln Leu Thr Ser Val Thr Ala Pro Thr Gly Thr Asp Asn  
 130 135 140

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

Asp Leu Thr Val Asn Gln Ser Ser Ser Tyr Leu Ala Ala Tyr Lys Ser  
 165 170 175

Leu Ile Ala Gly Glu Thr Lys Ala Ile Val Leu Asn Ser Val Phe Glu  
 180 185 190

Asn Ile Ile Glu Ser Glu Tyr Pro Asp Tyr Ala Ser Lys Ile Lys Lys  
 195 200 205

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

Lys Asn Gln Ser Phe Asn Ile Tyr Val Ser Gly Ile Asp Thr Tyr Gly  
 225 230 235 240

Pro Ile Ser Ser Val Ser Arg Ser Asp Val Asn Ile Leu Met Thr Val  
 245 250 255

Asn Arg Asp Thr Lys Lys Ile Leu Leu Thr Thr Thr Pro Arg Asp Ala  
 260 265 270

Tyr Val Pro Ile Ala Asp Gly Gly Asn Asn Gln Lys Asp Lys Leu Thr  
 275 280 285

His Ala Gly Ile Tyr Gly Val Asp Ser Ser Ile His Thr Leu Glu Asn  
 290 295 300

Leu Tyr Gly Val Asp Ile His Tyr Tyr Val Arg Leu Asn Phe Thr Ser  
 305 310 315 320

Phe Leu Lys Leu Ile Asp Leu Leu Gly Gly Val Asp Val Tyr Asn Asp  
 325 330 335

Gln Asp Phe Thr Ser Leu His Gly Lys Phe His Phe Pro Val Gly Asn  
340 345 350

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

Ser Leu Ala Asp Gly Asp His Asp Arg Gly Arg Asn Gln Gln Lys Val  
370 375 380

Ile Ala Ala Ile Leu Gln Lys Leu Thr Ser Ser Glu Ala Leu Lys Asn  
385 390 395 400

Tyr Ser Met Ile Ile Asp Ser Leu Gln Asp Ser Ile Gln Thr Asn Met  
405 410 415

Pro Leu Glu Thr Met Ile Asn Leu Val Asn Ala Gln Leu Glu Ser Gly  
420 425 430

Gly Thr Tyr Lys Val Asn Ser Gln Asp Leu Lys Gly Arg Gly Arg Thr  
435 440 445

Asp Leu Pro Ser Tyr Ala Met Pro Asp Ser Asn Leu Tyr Met Met Glu  
450 455 460

Ile Asn Asp Ser Ser Leu Ala Ser Val Lys Thr Ala Ile Gln Asp Val  
465 470 475 480

Leu Glu Gly Arg

<210> 24  
<211> 259  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 24

Met His Leu Ser Lys Leu Leu Phe Arg Met Cys Trp Arg Ala Asp Glu  
1 5 10 15

Met Ile Asp Ile His Ser His Ile Val Phe Asp Val Asp Asp Gly Pro  
20 25 30

Lys Ser Arg Glu Glu Ser Lys Ala Leu Leu Thr Glu Ala Tyr Arg Gln  
35 40 45

Gly Val Arg Thr Ile Val Ser Thr Ser His Arg Arg Lys Gly Met Phe  
50 55 60

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

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

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

Pro Thr Leu Asn Asn Ser Arg Tyr Ala Leu Ile Glu Phe Ser Met Asn  
115 120 125

Thr Pro Tyr Arg Asp Ile His Ser Ala Leu Ile Lys Ile Leu Met Leu  
130 135 140

Gly Ile Thr Pro Val Ile Ala His Ile Glu Arg Tyr Asp Ala Leu Glu  
145 150 155 160

Asn Asn Glu Lys Arg Val Arg Glu Leu Ile Asn Met Gly Cys Tyr Thr  
165 170 175

Gln Val Asn Ser Ser His Val Leu Lys Ser Lys Leu Phe Gly Glu Pro  
180 185 190

Tyr Lys Phe Met Lys Lys Arg Ala Gln Tyr Phe Leu Glu Arg Asp Leu  
195 200 205

Val His Val Ile Ala Ser Asp Met His Asn Val Asp Ser Arg Pro Pro  
210 215 220

His Met Ala Glu Ala Tyr Asp Leu Val Ser Gln Lys Tyr Gly Glu Thr  
225 230 235 240

Lys Ala Gln Asp Leu Phe Ile Asp Asn Pro Arg Lys Ile Val Met Asp  
245 250 255

Gln Leu Ile

<210> 25  
<211> 230  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 25

Met Lys Glu Gln Asn Thr Ile Glu Ile Asp Val Phe Gln Leu Leu Lys  
1 5 10 15



Thr Leu Trp Lys His Lys Leu Ile Ile Leu Leu Val Ala Leu Val Thr  
20 25 30

Gly Ala Gly Ala Phe Ala Tyr Ser Ile Phe Ile Val Lys Pro Glu Tyr  
35 40 45

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

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

Asp Tyr His Glu Ile Ile Leu Ser Gln Asp Val Leu Glu Lys Val Ala  
85 90 95

Thr Asn Leu Lys Leu Asp Ile Pro Val Lys Thr Leu Thr Ser Lys Val  
100 105 110

Gln Val Thr Val Pro Ala Asp Thr Arg Ile Val Ser Ile Ser Val Lys  
115 120 125

Asp Lys Gln Pro Glu Glu Ala Ser Arg Ile Ala Asn Ser Ile Arg Glu  
130 135 140

Val Ala Ala Glu Lys Ile Ile Ala Val Thr Arg Val Ser Asp Val Thr  
145 150 155 160

Thr Leu Glu Glu Ala Arg Pro Ala Thr Thr Pro Ser Ser Pro Asn Val  
165 170 175

Arg Arg Asn Thr Leu Val Gly Phe Leu Gly Ala Ala Ala Val Thr Val  
180 185 190

Ile Thr Val Leu Leu Ile Glu Leu Phe Asp Thr Arg Val Lys Arg Pro  
195 200 205

Glu Glu Val Glu Asp Val Leu Gln Met Pro Leu Leu Gly Val Val Pro  
210 215 220

Asp Phe Asn Lys Met Lys  
225 230

<210> 26  
<211> 229  
<212> PRT  
<213> Streptococcus pneumoniae  
  
<400> 26

Met Pro Thr Leu Glu Ile Ser Gln Ala Lys Leu Glu Leu Ala Lys Lys  
 1 5 10 15

Thr Glu Glu Tyr Tyr Asn Ala Leu Cys Thr Asn Pro Gln Leu Ser Gly  
 20 25 30

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

Lys Thr Thr Thr Ser Thr Asn Ile Ala Trp Ala Phe Ala His Ala Gly  
 50 55 60

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

Gly Val Phe Lys Ser Arg Glu Arg Ile Thr Gly Leu Thr Glu Phe Leu  
 85 90 95

Ser Gly Thr Thr Asp Leu Ser Gln Gly Leu Cys Asp Thr Asn Val Glu  
 100 105 110

Asn Leu Phe Val Ile Gln Ala Gly Ser Val Ser Pro Asn Pro Ile Ala  
 115 120 125

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

Tyr Phe Asp Tyr Ile Val Val Asp Thr Ala Pro Ile Gly Ile Val Ile  
 145 150 155 160

Asp Ala Ala Ile Ile Met Gln Lys Cys Asp Ala Ser Ile Leu Val Thr  
 165 170 175

Lys Ala Gly Glu Thr Lys Arg Arg Glu Leu Gln Lys Ala Lys Glu Gln  
 180 185 190

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

Asp Thr Ser Val Asp Lys Tyr Gly Phe Tyr Gly Ser Tyr Gly Ser Tyr  
 210 215 220

Arg Lys Gln Lys Lys  
 225

<210> 27  
 <211> 453  
 <212> PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 27

Met Asn Glu Lys Leu Ala Lys Ser Ser Val Ala Ile Val Gln Ser Phe  
 1 5 10 15

Leu Val Ile Leu Leu Thr Tyr Leu Leu Ser Ala Val Arg Glu Thr Glu  
 20 25 30

Ile Val Ser Thr Thr Ala Ile Val Leu Tyr Ile Leu His Tyr Phe Val  
 35 40 45

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

Ile Glu Leu Val Gln Thr Leu Lys Tyr Ile Leu Phe Phe Ala Leu Ala  
 65 70 75 80

Ile Ser Ile Ser Asn Phe Phe Leu Glu Asp Arg Phe Ser Ile Ser Arg  
 85 90 95

Arg Gly Met Ile Tyr Phe Leu Leu Leu His Val Phe Leu Val Tyr Met  
 100 105 110

Leu Asn Leu Phe Ile Lys Trp Tyr Trp Lys Arg Ala Tyr Pro Asn Phe  
 115 120 125

Lys Gly Ser Lys Lys Val Phe Leu Leu Thr Ala Thr Ser His Val Glu  
 130 135 140

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

Val Ala Val Ser Val Leu Asp Lys Pro Asp Phe Gln His Asp Asp Leu  
 165 170 175

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

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

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

Leu Asn Ala Phe Asp Trp Ala Arg Asn Lys Gln Ile Cys Glu Met Ala  
 225 230 235 240

Gly Leu Asn Val Val Thr Phe Ser Thr Thr Phe Tyr Lys Thr Ser His  
245 250 255

Val Ile Ala Lys Arg Val Ile Asp Ile Ile Gly Ser Leu Val Gly Leu  
260 265 270

Ile Leu Cys Gly Leu Val Ser Ile Val Leu Val Pro Leu Ile Arg Lys  
275 280 285

Asp Gly Gly Ser Ala Ile Phe Ala Gln Thr Arg Ile Gly Lys Asn Gly  
290 295 300

Arg His Phe Thr Phe Tyr Lys Phe Arg Ser Met Cys Val Asp Ala Glu  
305 310 315 320

Asp Lys Lys Arg Glu Leu Met Glu Gln Asn Thr Met Gln Gly Gly Met  
325 330 335

Phe Lys Val Asp Asp Asp Pro Arg Ile Thr Lys Ile Gly His Phe Ile  
340 345 350

Arg Lys Thr Ser Leu Asp Glu Leu Pro Gln Phe Tyr Asn Val Leu Lys  
355 360 365

Gly Asp Met Ser Leu Val Gly Thr Arg Pro Pro Thr Val Asp Glu Tyr  
370 375 380

Glu His Tyr Thr Pro Glu Gln Lys Arg Arg Leu Ser Phe Lys Pro Gly  
385 390 395 400

Ile Thr Gly Leu Trp Gln Val Ser Gly Arg Ser Glu Ile Lys Asn Phe  
405 410 415

Asp Glu Val Val Lys Leu Asp Val Val Tyr Ile Asp Gly Trp Thr Ile  
420 425 430

Trp Lys Asp Ile Glu Ile Leu Leu Lys Thr Val Lys Val Val Leu Met  
435 440 445

Lys Asp Gly Ala Lys  
450

<210> 28  
<211> 407  
<212> PRT  
<213> Streptococcus pneumoniae  
  
<400> 28

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

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

Asn Lys Phe Tyr Asp Gln Leu Leu Gln Glu Thr Gly Phe Asp Lys Asp  
275 280 285

Pro Arg Val Lys Phe Val Gly Thr Val Tyr Asp Gln Glu Leu Leu Lys  
290 295 300

Tyr Ile Arg Glu Asn Ala Phe Ala Tyr Phe His Gly His Glu Val Gly  
305 310 315 320

Gly Thr Asn Pro Ser Leu Leu Glu Ala Leu Ala Ser Thr Lys Leu Asn  
325 330 335

Leu Leu Leu Asp Val Gly Phe Asn Arg Glu Val Gly Glu Asp Gly Ala  
340 345 350

Ile Tyr Trp Arg Lys Asp Asn Leu His Lys Val Ile Glu Glu Ser Glu  
355 360 365

Gln Lys Thr Ile Glu Glu Ile Lys Glu Ile Asp Ile Leu Ser Thr Glu  
370 375 380

Gln Val Glu Lys Arg Phe Thr Trp Asp Phe Ile Val Asn Glu Tyr Glu  
385 390 395 400

Asn Leu Phe Leu Leu Gly Lys  
405

<210> 29  
<211> 395  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 29

Met Thr Ile Lys Ile Asn Tyr Met Phe Phe Val Cys Leu Ser Phe Phe  
1 5 10 15

Gly Ile Val Leu Ser Ser Ser Gln Val Ile Val Asn Leu Gly Leu Ser  
20 25 30

Ser Ile Val Gln Tyr Ile Ala Tyr Phe Leu Leu Leu Leu Cys Ile Phe  
35 40 45

Phe Thr Leu Ile Lys Asn Ser Pro Asp Val Ile Ala Asn Arg Ile Ala  
50 55 60

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





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

Trp Glu

<210> 31  
 <211> 412  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 31

Met Asn Lys Tyr Glu Glu Arg Tyr Gln Glu Asp Leu Ser Lys Asn Asp
1 5 10 15

Phe Glu Lys Leu Ile Asn Arg Arg Tyr Leu Ser Asp Lys Glu Leu Gln

20

25

30

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

Met Lys Leu Ser Asn Lys Leu Gly Leu Gln Lys Ala Leu His Gly Lys  
 50 55 60

Gly Gly Val Val Asp Ser Lys Gly Asn Tyr Val Glu Leu Ser Glu Gln  
 65 70 75 80

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

His Lys Asn Leu Ala Ile Arg Asn Glu Lys Val Ile Tyr Leu Asn Tyr  
 100 105 110

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

Trp Tyr Pro Leu Leu Lys Asp Thr Asp Thr Lys Leu Asp Tyr Thr Cys  
 130 135 140

Tyr Ala Gly Thr Glu Thr Lys Leu Glu Gly Asn Tyr Leu Glu Phe Leu  
 145 150 155 160

Glu Leu Leu Gly Ile Asp Lys Ser Arg Leu Ile Leu Ile Asn Arg Pro  
 165 170 175

Thr Gln Phe Ser Glu Ile Ile Ile Pro Glu Ser Ser Ile Leu Pro Gly  
 180 185 190

Glu Tyr Tyr Thr Lys Glu Tyr Lys Met Leu Phe Asn Ser Leu Val Ala  
 195 200 205

Asn Val Lys Leu Asp Asn Asn Leu Glu Ser Lys Lys Ile Tyr Cys Ser  
 210 215 220

Arg Ala Arg Leu Asp Leu Ala Lys Gly Lys Glu Phe Gly Glu Asn Gly  
 225 230 235 240

Ile Glu Lys Val Phe Leu Lys Asn Gly Tyr Thr Pro Val Tyr Met Glu  
 245 250 255

Thr Met Ser Leu Lys Glu Gln Ile Arg Thr Leu Leu Ser Ala Thr Thr  
 260 265 270

Ile Val Leu Thr Ser Gly Ser Leu Ala His Asn Leu Leu Phe Ile Asn  
 275 280 285

Asn Lys Ile Asn Val Phe Ile Leu Asn Lys Thr Tyr Arg Val Asn Leu  
 290 295 300

His Gln Phe Leu Ile Asn Lys Ile Ser Glu Ala Ser Val Ser Phe Val  
 305 310 315 320

Asp Ile Tyr Arg Ser Pro Leu Pro Ile Leu Tyr Gly Tyr Gly Pro Phe  
 325 330 335

Leu Met Asp Ile Thr Lys Pro Leu Val Asn Phe Phe Glu Asp Ser Gly  
 340 345 350

Phe Thr Tyr Asp Ser Gly Thr Ile Leu Asp Lys Thr Asp Tyr Phe Lys  
 355 360 365

Phe Tyr Leu Lys Trp Leu Trp Ser Tyr Lys Phe Phe Leu Phe Arg Leu  
 370 375 380

Asn His Ile Lys Glu Gly Asn Ser Glu Phe Glu Lys Ser Phe Lys Ile  
 385 390 395 400

Ile Arg Arg Tyr Tyr Lys Met Gly Arg Gln Tyr Glu  
 405 410

<210> 32

<211> 462

<212> PRT

<213> Streptococcus pneumoniae

<400> 32

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

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

Thr Lys Val Leu Thr Thr Thr Glu Tyr Gly Phe Tyr Asp Leu Val Tyr  
 35 40 45

Thr Thr Ile Gln Leu Leu Val Pro Ile Leu Thr Leu Asn Ile Ser Glu  
 50 55 60

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

Phe	Ser	Ile	Ala	Ile	Leu	Asp	Ile	Phe	Leu	Gly	Ser	Ile	Ile	Phe	Cys	
				85					90					95		
Leu	Leu	Leu	Leu	Val	Asn	Gln	Ile	Phe	Ser	Leu	Ser	Glu	Leu	Ile	Ser	
			100					105					110			
Gln	Tyr	Ser	Ile	Tyr	Ile	Met	Ala	Ile	Phe	Ala	Phe	Tyr	Thr	Leu	Asn	
		115					120					125				
Asn	Phe	Leu	Ile	Gln	Tyr	Ser	Lys	Gly	Ile	Asp	Lys	Ile	Gly	Val	Thr	
	130					135					140					
Ala	Ile	Ser	Gly	Val	Ile	Ser	Ala	Ala	Val	Met	Leu	Ser	Met	Asn	Ile	
145					150					155					160	
Leu	Leu	Leu	Val	Val	Leu	Asn	Trp	Gly	Leu	Leu	Gly	Phe	Phe	Ile	Ala	
			165						170					175		
Asn	Ile	Cys	Gly	Tyr	Val	Ile	Pro	Cys	Val	Tyr	Ile	Ile	Val	Lys	Leu	
			180					185					190			
Lys	Leu	Trp	Asp	Leu	Phe	Glu	Leu	Lys	Ile	Asp	Arg	Ser	Leu	Gln	Trp	
		195					200					205				
Glu	Met	Ile	Tyr	Tyr	Thr	Leu	Pro	Leu	Ile	Leu	Asn	Thr	Leu	Ser	Trp	
	210					215					220					
Trp	Val	Asn	Asn	Thr	Ser	Asp	Arg	Tyr	Ile	Ile	Thr	Val	Ile	Ile	Gly	
225					230					235					240	
Ile	Gln	Ala	Ser	Ala	Ile	Ile	Ser	Val	Ala	Tyr	Lys	Ile	Pro	Gln	Ile	
				245					250					255		
Phe	Ser	Thr	Ile	Ser	Ala	Ile	Phe	Ile	Gln	Ser	Trp	Gln	Ile	Ser	Ala	
			260					265					270			
Ile	Lys	Ile	Gln	Glu	Glu	Lys	Glu	Gly	Asn	Thr	Phe	Ile	Ser	Lys	Met	
		275					280					285				
Leu	Leu	Tyr	Tyr	Asn	Ala	Leu	Leu	Leu	Ile	Ile	Ala	Ser	Gly	Ile	Ile	
	290					295					300					
Leu	Phe	Val	Lys	Pro	Ile	Ser	Asn	Ile	Leu	Phe	Gly	Ala	Ser	Phe	Tyr	
305					310					315					320	
Ser	Ala	Trp	Thr	Leu	Val	Pro	Phe	Leu	Ile	Ile	Ser	Ser	Leu	Phe	Asn	
				325					330					335		

Ala Ile Ser Gly Tyr Ile Gly Ala Ile Met Gly Ala Lys Met Asp Thr  
340 345 350

Lys Asn Ile Ala Lys Ser Ala Leu Val Gly Met Ile Ala Asn Val Phe  
355 360 365

Leu Asn Ile Val Leu Thr Phe Leu Met Gly Leu Gln Gly Ile Thr Ile  
370 375 380

Ser Thr Met Ile Ala Ser Phe Leu Ile Phe Tyr Met Arg Lys Asp Ser  
385 390 395 400

Val Glu Glu Ile Ala Pro Glu Thr Tyr Arg Ala Ile Tyr Leu Ser Trp  
405 410 415

Phe Leu Leu Val Val Glu Ala Ser Leu Leu Val Tyr Ile Asp Phe Ile  
420 425 430

Ile Gly Ala Thr Leu Val Thr Leu Ile Asn Leu Phe Leu Leu Lys Asp  
435 440 445

Thr Leu Lys Pro Leu Cys Leu Lys Leu Leu Lys Gly Phe Lys  
450 455 460

<210> 33  
<211> 384  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 33

Met Lys Met Asn Ile Leu Gln Tyr Ile Lys Ile Leu Ala Arg Thr Ile  
1 5 10 15

Phe Met Leu Leu Ile Ser Thr Val Leu Leu Pro Val Arg Leu Lys Asn  
20 25 30

Asn Lys Ile Leu Phe Ile Asn Phe Asn Gly Lys Gly Tyr Gly Asp Asn  
35 40 45

Pro Lys Ser Ile Cys Glu Tyr Leu Arg Thr Thr Tyr Pro Asp Leu Asp  
50 55 60

Leu Val Trp Leu Ala Arg Asp Asn Glu Gly Phe Pro Asp Gly Val Arg  
65 70 75 80

Val Val Lys Tyr Gly Thr Phe Gln Ala Phe Tyr Glu Gln Ala Ser Ser  
85 90 95

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

Arg Gly Gln Ile Tyr Ile Gln Thr Trp His Gly Ala Ser Ser Phe Lys  
 115 120 125

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

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

Gln Thr Glu Glu Phe Gln Lys Tyr Phe Trp Tyr Ser Gly Glu Ile Phe  
 165 170 175

Glu Val Gly Met Pro Arg Asn Asp Ala Leu Phe His Tyr Lys Glu Asp  
 180 185 190

Tyr Asp Lys Leu Asn Asn Ile Arg Lys Glu Leu Ser Ile His Ser Asp  
 195 200 205

Asp Tyr Val Ile Leu Tyr Ala Pro Thr Phe Arg Asp Asp Gly Asp Ala  
 210 215 220

Ser Tyr Leu Asp Ile Asn Phe Glu Arg Leu Leu Gln Cys Val Glu His  
 225 230 235 240

Gly Ile Lys Lys Lys Cys Lys Phe Leu Ile Arg Leu His Pro Asn His  
 245 250 255

Ser His Leu Cys Asn Asn Ile Ser Phe Asn Lys Asn Ile Ile Asn Ala  
 260 265 270

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

Val Thr Asp Tyr Ser Ser Ser Ile Phe Asp Phe Met Leu Leu Asn Lys  
 290 295 300

Pro Tyr Val Arg Tyr Val Asn Asp Leu Glu Lys Tyr Ala Glu Leu Arg  
 305 310 315 320

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

Ala Glu Glu Leu Tyr Asp Leu Leu Pro Lys Lys Ile Glu Asn Phe Asp  
 340 345 350

Tyr Asp Ser Ile Lys Lys Tyr Arg Asn Glu Ile Leu Cys Pro Ile Phe  
355 360 365

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

<210> 34  
<211> 342  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 34

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

Ser Ala Thr Leu Ser Gln Asn Ser Ile Ser Gly Lys Ile Leu Tyr Cys  
20 25 30

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

Ile Glu Glu Ile Gly Arg Val Lys Glu Glu Ser Cys Asn Tyr Asn Thr  
50 55 60

Ile Ala Tyr Ala Met Asn Ile Ala Glu Arg Ala Ile Ala Thr Asp Ile  
65 70 75 80

Asp Cys Ile Val Gly Met Gly Gly Gly Arg Val Leu Asp Val Cys Lys  
85 90 95

Tyr Ala Ser Phe Ile Ser Lys Arg Pro Tyr Leu Ser Ile Pro Thr Thr  
100 105 110

Ala Ala Asn Asp Gly Ile Ala Ser Pro Val Ala Val Leu Lys Arg Gln  
115 120 125

Asp Asp Arg Pro Lys Ser Leu Gly Ala Ala Ile Pro Ser Met Thr Leu  
130 135 140

Ile Asp Ile Asp Val Ile Ala Ser Gly Pro Ile Gln Asn Ile Lys Ala  
145 150 155 160

Gly Ile Gly Asp Thr Ile Ser Asn Tyr Thr Ala Leu Lys Asp Trp Glu  
165 170 175

Leu Ala Val Glu Arg Gly Lys Asp Glu Met His Gly Phe Ala Tyr Leu  
180 185 190

Met Ser Gln Asn Ser Leu Asp Ala Leu Met Lys Thr Lys Tyr Asn Ser  
195 200 205

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

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

Glu His Leu Phe Ser His Ala Leu Asp Tyr Tyr Gly Ser Thr Arg Asn  
245 250 255

Leu His Gly Ile Gln Val Ala Leu Gly Thr Val Ala Val Leu Lys Leu  
260 265 270

Ile Glu Asn Ser Val Asp Thr Val Val Asp Tyr Leu Gln Arg Phe Glu  
275 280 285

Val His Ile Asn Pro Lys Leu Leu Gly Ile Asp Glu Glu Leu Phe Ile  
290 295 300

Tyr Cys Met Gln His Ala Thr Lys Met Arg Ser Asn Arg Tyr Thr Tyr  
305 310 315 320

Leu His Glu Val Asp Leu Ser Thr Asp Arg Leu Lys Gln Ile Tyr Lys  
325 330 335

Glu Leu Ile Ser Glu Leu  
340

<210> 35  
<211> 234  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 35

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

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

Ile Leu Met Lys Gln Ile Glu Asn Leu Tyr Gln Asn Asn Ile Thr Asp  
35 40 45

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



Thr Glu Lys Tyr Pro Glu Ile Asn Ile Ile Asp Asn Val Asp Phe Lys  
65 70 75 80

Thr Thr Asn Asn Met Tyr Ser Ala Tyr Leu Gly Lys Ala Ala Met Gly  
85 90 95

Asp Ser Asp Phe Leu Met Met Asn Ala Asp Val Phe Tyr Asp Ala Ser  
100 105 110

Val Ile Lys Ser Leu Leu Leu His Lys Ala Pro Asn Ala Ile Val Thr  
115 120 125

Asp Leu Gly Ile Tyr Ile Glu Glu Ser Met Lys Val Val Glu Lys Asn  
130 135 140

Gly Arg Leu Val Glu Ile Ser Lys Gln Ile Ser Pro Glu Glu Thr Leu  
145 150 155 160

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

Phe Phe Glu Lys Cys Lys Glu Phe Ile Glu Asp Lys Arg Glu Leu Gln  
180 185 190

Met Trp Ser Glu Val Ala Leu Asn Ala Ile Leu Ser Glu Val Glu Phe  
195 200 205

Val Ala Cys Pro Leu Glu Gly Arg Trp Leu Glu Ile Asp Asn His Glu  
210 215 220

Asp Leu Val Ala Ala Glu Lys Leu Phe Ala  
225 230

<210> 36  
<211> 283  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 36

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

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

Met Asp Gly Thr Ile Tyr Glu Glu Asp Arg Leu Phe Glu Gly Thr Leu  
35 40 45

Glu Leu Leu Asp Tyr Ile His Asn Ile Gly Gly Glu Tyr Ile Phe Ile  
50 55 60

Thr Asn Asn Ser Ser Lys Ser Val Val Asp Tyr Val Glu Lys Val Asn  
65 70 75 80

Arg Leu Gly Ile Lys Ala Glu Arg Asp Asn Phe Phe Thr Ser Ala Gln  
85 90 95

Ala Thr Ile Val Tyr Ile Lys Glu Asn Tyr Pro Lys Ser Lys Val Tyr  
100 105 110

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

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

Phe Asp Thr Glu Leu Thr Ser Asp Lys Ile Arg Asn Thr Cys Glu Ile  
145 150 155 160

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

Cys Pro Val Ser Phe Gly Phe Ile Pro Asp Cys Gly Ser Ile Cys Asp  
180 185 190

Met Ile Ser Lys Ser Val Asp Arg Lys Pro Val Tyr Ile Gly Lys Pro  
195 200 205

Glu Pro Thr Met Val Asp Ile Val Arg Lys Lys Leu Asn Tyr Ser Leu  
210 215 220

Phe Glu Thr Val Val Ile Gly Asp Arg Leu Tyr Thr Asp Ile Met Thr  
225 230 235 240

Gly Ile Asn Ala Gly Val Thr Ser Val Cys Val Leu Thr Gly Glu Ala  
245 250 255

Thr Val Asn Asp Ile Gln Gln Asp Ser Ile Lys Pro Thr Tyr Thr Phe  
260 265 270

Lys Asn Val Lys Glu Met Trp Lys Gly Ile Val  
275 280

&lt;211&gt; 289

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 37

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

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

Met Ile Tyr Tyr Pro Leu Ser Thr Leu Met Leu Ala Gly Ile Arg Asp  
 35 40 45

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

Leu Gln Asp Gly Ser Glu Phe Gly Ile Lys Leu Ser Tyr Ala Glu Gln  
 65 70 75 80

Pro Ser Pro Asp Gly Leu Ala Gln Ala Phe Ile Ile Gly Glu Glu Phe  
 85 90 95

Ile Gly Asp Asp Ser Val Ala Leu Ile Leu Gly Asp Asn Ile Tyr His  
 100 105 110

Gly Pro Gly Leu Ser Thr Met Leu Gln Lys Ala Ala Lys Lys Glu Lys  
 115 120 125

Gly Ala Thr Val Phe Gly Tyr His Val Lys Asp Pro Glu Arg Phe Gly  
 130 135 140

Val Val Glu Phe Asp Glu Asn Met Asn Ala Ile Ser Ile Glu Glu Lys  
 145 150 155 160

Pro Glu Tyr Pro Arg Ser Asn Tyr Ala Val Thr Gly Leu Tyr Phe Tyr  
 165 170 175

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

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

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

Gly Thr His Glu Ser Leu Leu Glu Ala Ser Gln Tyr Ile Glu Thr Val

225                      230                      235                      240

Gln Arg Met Gln Asn Val Gln Val Ala Asn Leu Glu Glu Ile Ala Tyr  
245 250 255

Arg Met Gly Tyr Ile Ser Arg Glu Asp Val Leu Ala Leu Ala Gln Pro  
260 265 270

Leu Lys Lys Asn Glu Tyr Gly Gln Tyr Leu Leu Arg Leu Ile Gly Glu  
275 280 285

Ala

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<210> 38
<211> 197
<212> PRT
<213> Streptococcus pneumoniae

<400> 38
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Met Thr Asp Asn Phe Phe Gly Lys Thr Leu Ala Ala Arg Lys Val Glu  
1 5 10 15

Ala Ile Pro Gly Met Leu Glu Phe Asp Ile Pro Val His Gly Asp Asn  
20 25 30

Arg Gly Trp Phe Lys Glu Asn Phe Gln Lys Glu Lys Met Leu Pro Leu  
35 40 45

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

Ser Phe Ser Arg Lys Asn Val Leu Arg Gly Leu His Ala Glu Pro Trp  
65 70 75 80

Asp Lys Tyr Ile Ser Val Ala Asp Gly Gly Lys Val Leu Gly Ser Trp  
85 90 95

Val Asp Leu Arg Glu Gly Glu Thr Phe Gly Asn Thr Tyr Gln Thr Val  
100 105 110

Ile Asp Ala Ser Lys Gly Ile Phe Val Pro Arg Gly Val Ala Asn Gly  
115 120 125

Phe Gln Val Leu Ser Asp Thr Val Ser Tyr Ser Tyr Leu Val Asn Asp  
130 135 140

Tyr Trp Ala Leu Glu Leu Lys Pro Lys Tyr Ala Phe Val Asn Tyr Ala

145								150								155								160
Asp	Pro	Ser	Leu	Gly	Ile	Glu	Trp	Glu	Asn	Ile	Ala	Glu	Ala	Glu	Val									
				165					170					175										
Ser	Glu	Ala	Asp	Lys	Asn	His	Pro	Leu	Leu	Lys	Asp	Val	Lys	Pro	Leu									
			180				185				190													
Lys	Lys	Glu	Asp	Leu																				
		195																						

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<210> 39
<211> 349
<212> PRT
<213> Streptococcus pneumoniae (
<400> 39
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Met Thr Glu Tyr Lys Asn Ile Ile Val Thr Gly Gly Ala Gly Phe Ile  
1 5 10 15

Gly Ser Asn Phe Val His Tyr Val Tyr Glu Asn Phe Pro Gly Val His  
20 25 30

Val Thr Val Leu Asp Lys Leu Thr Tyr Ala Gly Asn Arg Ala Asn Ile  
35 40 45

Glu Glu Ile Leu Gly Asn Arg Val Glu Leu Val Val Gly Asp Ile Ala  
50 55 60

Asp Ala Glu Leu Val Asp Lys Leu Ala Ala Gln Ala Asp Ala Ile Val  
65 70 75 80

His Tyr Ala Ala Glu Ser His Asn Asp Asn Ser Leu Asn Asp Pro Ser  
85 90 95

Pro Phe Ile His Thr Asn Phe Ile Gly Thr Tyr Thr Leu Leu Glu Ala  
100 105 110

Ala Arg Lys Tyr Asp Ile Arg Phe His His Val Ser Thr Asp Glu Val  
115 120 125

Tyr Gly Asp Leu Pro Leu Arg Glu Asp Leu Pro Gly His Gly Glu Gly  
130 135 140

Pro	Gly	Glu	Lys	Phe	Thr	Ala	Glu	Thr	Lys	Tyr	Asn	Pro	Ser	Ser	Pro
145					150					155					160

Tyr Ser Ser Thr Lys Ala Ala Ser Asp Leu Ile Val Lys Ala Trp Val

165

170

175

Arg Ser Phe Gly Val Lys Ala Thr Ile Ser Asn Cys Ser Asn Asn Tyr  
 180 185 190

Gly Pro Tyr Gln His Ile Glu Lys Phe Ile Pro Arg Gln Ile Thr Asn  
 195 200 205

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

Arg Asp Trp Ile His Thr Asn Asp His Ser Ser Gly Val Trp Thr Ile  
 225 230 235 240

Leu Thr Lys Gly Gln Ile Gly Glu Thr Tyr Leu Ile Gly Ala Asp Gly  
 245 250 255

Glu Lys Asn Asn Lys Glu Val Leu Glu Leu Ile Leu Lys Glu Met Gly  
 260 265 270

Gln Ala Thr Asp Ala Tyr Asp His Val Thr Asp Arg Ala Gly His Asp  
 275 280 285

Leu Arg Tyr Ala Ile Asp Ala Ser Lys Leu Arg Asp Glu Leu Gly Trp  
 290 295 300

Lys Pro Glu Phe Thr Asn Phe Glu Ala Gly Leu Lys Ala Thr Ile Lys  
 305 310 315 320

Trp Tyr Thr Asp Asn Gln Glu Trp Trp Lys Ala Glu Lys Glu Ala Val  
 325 330 335

Glu Ala Asn Tyr Ala Lys Thr Gln Glu Ile Ile Thr Val  
 340 345

<210> 40

<211> 283

<212> PRT

<213> Streptococcus pneumoniae

<400> 40

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

Tyr Leu Leu Asp Glu Arg Asn Glu Glu Tyr Val Ala Val Asp Val Ala  
 20 25 30

Glu Met Asp Ile Thr Asn Glu Glu Met Val Glu Lys Val Phe Glu Glu

35

40

45

Val Lys Pro Thr Leu Val Tyr His Cys Ala Ala Tyr Thr Ala Val Asp  
50 55 60

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

Gly Thr Lys Asn Val Ala Lys Ala Ser Glu Lys His Gly Ala Thr Leu  
85 90 95

Val Tyr Ile Ser Thr Asp Tyr Val Phe Asp Gly Lys Lys Pro Val Gly  
100 105 110

Gln Glu Trp Glu Val Asp Asp Arg Pro Asp Pro Gln Thr Glu Tyr Gly  
115 120 125

Arg Thr Lys Arg Met Gly Glu Glu Leu Val Glu Lys His Val Ser Asn  
130 135 140

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

Phe Val Phe Thr Met Gln Asn Leu Ala Lys Thr His Lys Thr Leu Thr  
165 170 175

Val Val Asn Asp Gln Tyr Gly Arg Pro Thr Trp Thr Arg Thr Leu Ala  
180 185 190

Glu Phe Met Thr Tyr Leu Ala Glu Asn Arg Lys Glu Phe Gly Tyr Tyr  
195 200 205

His Leu Ser Asn Asp Ala Thr Glu Asp Thr Thr Trp Tyr Asp Phe Ala  
210 215 220

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

Ser Gln Phe Pro Ala Lys Ala Lys Arg Pro Leu Asn Ser Thr Met Ser  
245 250 255

Leu Ala Lys Ala Lys Ala Thr Gly Phe Val Ile Pro Thr Trp Gln Asp  
260 265 270

Ala Leu Gln Glu Phe Tyr Lys Gln Glu Val Arg  
275 280

<210> 41  
 <211> 481  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 41

Met Ser Arg Arg Phe Lys Lys Ser Arg Ser Gln Lys Val Lys Arg Ser  
 1 5 10 15

Val Asn Ile Val Leu Leu Thr Ile Tyr Leu Leu Leu Val Cys Phe Leu  
 20 25 30

Leu Phe Leu Ile Phe Lys Tyr Asn Ile Leu Ala Phe Arg Tyr Leu Asn  
 35 40 45

Leu Val Val Thr Ala Leu Val Leu Leu Val Ala Leu Val Gly Leu Leu  
 50 55 60

Leu Ile Ile Tyr Lys Lys Ala Glu Lys Phe Thr Ile Phe Leu Leu Val  
 65 70 75 80

Phe Ser Ile Leu Val Ser Ser Val Ser Leu Phe Ala Val Gln Gln Phe  
 85 90 95

Val Gly Leu Thr Asn Arg Leu Asn Ala Thr Ser Asn Tyr Ser Glu Tyr  
 100 105 110

Ser Ile Ser Val Ala Val Leu Ala Asp Ser Asp Ile Glu Asn Val Thr  
 115 120 125

Gln Leu Thr Ser Val Thr Ala Pro Thr Gly Thr Asp Asn Glu Asn Ile  
 130 135 140

Gln Lys Leu Leu Ala Asp Ile Lys Ser Ser Gln Asn Thr Asp Leu Thr  
 145 150 155 160

Val Asp Gln Ser Ser Ser Tyr Leu Ala Ala Tyr Lys Ser Leu Ile Ala  
 165 170 175

Gly Glu Thr Lys Ala Ile Val Leu Asn Ser Val Phe Glu Asn Ile Ile  
 180 185 190

Glu Ser Glu Tyr Pro Asp Tyr Ala Ser Lys Ile Lys Lys Ile Tyr Thr  
 195 200 205

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



Ser Phe Asn Ile Tyr Val Ser Gly Ile Asp Thr Tyr Gly Pro Ile Ser  
 225 230 235 240

Ser Val Ser Arg Ser Asp Val Asn Ile Leu Met Thr Val Asn Arg Asp  
 245 250 255

Thr Lys Lys Ile Leu Leu Thr Thr Thr Pro Arg Asp Ala Tyr Val Pro  
 260 265 270

Ile Ala Asp Gly Gly Asn Asn Gln Lys Asp Lys Leu Thr His Ala Gly  
 275 280 285

Ile Tyr Gly Val Asp Ser Ser Ile His Thr Leu Glu Asn Leu Tyr Gly  
 290 295 300

Val Asp Ile Asn Tyr Tyr Val Arg Leu Asn Phe Thr Ser Phe Leu Lys  
 305 310 315 320

Met Ile Asp Leu Leu Gly Gly Val Asp Val His Asn Asp Gln Glu Phe  
 325 330 335

Ser Ala Leu His Gly Lys Phe His Phe Pro Val Gly Asn Val His Leu  
 340 345 350

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

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

Ile Leu Gln Lys Leu Thr Ser Thr Glu Ala Leu Lys Asn Tyr Ser Thr  
 385 390 395 400

Ile Ile Asp Ser Leu Gln Asp Ser Ile Gln Thr Asn Met Pro Leu Glu  
 405 410 415

Thr Met Ile Asn Leu Val Asn Ala Gln Leu Glu Ser Gly Gly Asn Tyr  
 420 425 430

Lys Val Asn Ser Gln Asp Leu Lys Gly Thr Gly Arg Thr Asp Leu Pro  
 435 440 445

Ser Tyr Ala Met Pro Asp Ser Asn Leu Tyr Val Met Glu Ile Asp Asp  
 450 455 460

Ser Ser Leu Ala Val Val Lys Ala Ala Ile Gln Asp Val Met Glu Gly  
 465 470 475 480

Arg

<210> 42  
 <211> 243  
 <212> PRT  
 <213> Streptococcus pneumoniae  
 <400> 42

Met Ile Asp Ile His Ser His Ile Val Phe Asp Val Asp Asp Gly Pro  
 1 5 10 15

Lys Ser Arg Glu Glu Ser Lys Ala Leu Leu Thr Glu Ser Tyr Arg Gln  
 20 25 30

Gly Val Arg Thr Ile Val Ser Thr Ser His Arg Arg Lys Gly Met Phe  
 35 40 45

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

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

Ile Tyr Tyr Thr Leu Asp Ala Leu Glu Lys Leu Glu Lys Lys Glu Ile  
 85 90 95

Pro Thr Leu Asn Asp Ser Arg Tyr Ala Leu Ile Glu Phe Ser Met Asn  
 100 105 110

Thr Pro Tyr Arg Asp Ile His Ser Ala Leu Ser Lys Ile Leu Met Leu  
 115 120 125

Gly Ile Thr Pro Val Ile Ala His Ile Glu Arg Tyr Asp Ala Leu Glu  
 130 135 140

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

Gln Val Asn Ser Ser His Val Leu Lys Pro Lys Leu Phe Gly Glu Arg  
 165 170 175

Tyr Lys Phe Met Lys Lys Arg Ala Gln Tyr Phe Leu Glu Gln Asp Leu  
 180 185 190

Val His Val Ile Ala Ser Asp Met His Asn Leu Asp Gly Arg Pro Pro  
 195 200 205

His Met Ala Glu Ala Tyr Asp Leu Val Thr Gln Lys Tyr Gly Glu Ala  
210 215 220

Lys Ala Gln Glu Leu Phe Ile Asp Asn Pro Arg Lys Ile Val Met Asp  
225 230 235 240

Gln Leu Ile

<210> 43  
<211> 231  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 43

Met Met Lys Glu Gln Asn Thr Ile Glu Ile Asp Val Phe Gln Leu Phe  
1 5 10 15

Lys Thr Leu Trp Lys Arg Lys Leu Met Ile Leu Ile Val Ala Leu Val  
20 25 30

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

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

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

Lys Asp Tyr Arg Glu Ile Ile Leu Ser Gln Asp Ala Leu Glu Lys Val  
85 90 95

Ala Thr Asn Leu Lys Leu Asp Met Pro Ala Lys Thr Leu Ala Ser Lys  
100 105 110

Val Gln Val Ala Val Pro Ala Asp Thr Arg Ile Val Ser Ile Ser Val  
115 120 125

Lys Asp Lys Gln Pro Glu Glu Ala Ser Arg Ile Ala Asn Ser Leu Arg  
130 135 140

Glu Val Ala Ala Glu Lys Ile Val Ala Val Thr Arg Val Ser Asp Val  
145 150 155 160

Thr Thr Leu Glu Glu Ala Arg Pro Ala Thr Thr Pro Ser Ser Pro Asn  
165 170 175

Val Arg Arg Asn Ser Leu Phe Gly Phe Leu Gly Gly Ala Val Val Thr  
180 185 190

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

Pro Glu Asp Val Glu Asp Val Leu Lys Ile Pro Leu Leu Gly Leu Val  
210 215 220

Pro Asp Phe Asp Lys Ile Lys  
225 230

<210> 44  
<211> 229  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 44

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

Ala Glu Glu Tyr Tyr Asn Ala Leu Cys Thr Asn Leu Gln Leu Ser Gly  
20 25 30

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

Lys Ser Thr Thr Ser Ala Asn Ile Ala Trp Ala Phe Ala Arg Ala Gly  
50 55 60

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

Gly Val Phe Lys Ala Arg Asn Lys Ile Thr Gly Leu Thr Glu Phe Leu  
85 90 95

Ser Gly Thr Thr Asp Leu Ser Gln Gly Leu Cys Asp Thr Asn Ile Glu  
100 105 110

Asn Leu Phe Val Ile Gln Ala Gly Ser Val Ser Pro Asn Pro Thr Ala  
115 120 125

Leu Leu Gln Ser Lys Asn Phe Thr Thr Met Leu Glu Thr Leu Arg Lys  
130 135 140

Tyr Phe Asp Tyr Ile Ile Val Asp Thr Ala Pro Val Gly Val Val Ile  
145 150 155 160

Asp Ala Ala Ile Ile Thr Arg Asn Cys Asp Ala Ser Ile Leu Val Thr  
165 170 175

Glu Ala Gly Glu Ile Asn Arg Arg Asp Ile Gln Lys Ala Lys Glu Gln  
180 185 190

Leu Glu His Thr Gly Lys Pro Phe Leu Gly Ile Val Leu Asn Lys Phe  
195 200 205

Asp Thr Ser Val Asp Lys Tyr Gly Ser Tyr Gly Asn Tyr Gly Asn Tyr  
210 215 220

Gly Lys Asn Lys Lys  
225

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<210> 45
<211> 455
<212> PRT
<213> Streptococcus pneumoniae
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<400> 45

Met Asn Glu Lys Ile Leu Arg Ser Ser Leu Ala Ile Ile Gln Ser Phe  
1 5 10 15

Leu Val Ile Leu Leu Thr Tyr Leu Leu Ser Ala Val Arg Glu Thr Glu  
20 25 30

Ile Val Ser Thr Thr Ala Ile Ala Leu Cys Ile Leu His Tyr Phe Val  
35 40 45

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

Ile Glu Leu Val Gln Thr Leu Lys Tyr Ile Leu Phe Phe Ala Leu Ala  
65 70 75 80

Ile Gly Ile Ser Asn Phe Phe Leu Glu Asp Arg Phe Ser Ile Ser Arg  
85 90 95

Arg Gly Met Ile Tyr Phe Leu Thr Leu His Ala Leu Leu Val Tyr Val  
100 105 110

Leu Asn Leu Phe Ile Lys Trp Tyr Trp Lys Arg Ala Tyr Pro Asn Phe  
115 120 125

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

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

Val Ala Val Ser Val Leu Asp Lys Pro Asp Phe Gln His Asp Cys Leu  
 165 170 175

Lys Val Val Ala Glu Gly Gly Ile Val Asn Phe Ala Thr His Glu Val  
 180 185 190

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

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

Leu Asn Ala Phe Asp Arg Ser Leu Ala Arg Asn Lys Gln Ile Arg Glu  
 225 230 235 240

Met Ala Gly Leu Asn Val Val Thr Phe Ser Thr Thr Phe Tyr Lys Thr  
 245 250 255

Ser His Val Ile Ala Lys Arg Ile Ile Asp Ile Val Gly Ala Leu Val  
 260 265 270

Gly Leu Ile Leu Cys Gly Leu Val Ser Ile Val Leu Val Pro Leu Ile  
 275 280 285

Arg Lys Asp Gly Gly Ser Ala Ile Phe Ala Gln Thr Arg Ile Gly Lys  
 290 295 300

Asn Gly Arg Gln Phe Thr Phe Tyr Lys Phe Arg Ser Met Cys Val Asp  
 305 310 315 320

Ala Glu Ala Lys Lys Arg Glu Leu Met Glu Gln Asn Thr Met Gln Gly  
 325 330 335

Gly Met Phe Lys Val Asp Asp Asp Pro Arg Ile Thr Lys Ile Gly Cys  
 340 345 350

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

Leu Lys Gly Asp Met Ser Leu Val Gly Thr Arg Pro Pro Thr Val Asp  
 370 375 380

Glu Tyr Glu His Tyr Thr Pro Glu Gln Lys Arg Arg Leu Ser Phe Lys  
 385 390 395 400

Pro Gly Ile Thr Gly Leu Trp Gln Val Ser Gly Arg Ser Glu Ile Lys  
405 410 415

Asn Phe Asp Glu Val Val Lys Leu Asp Val Ala Tyr Ile Asp Gly Trp  
420 425 430

Thr Ile Trp Lys Asp Ile Glu Ile Leu Leu Lys Thr Val Lys Val Val  
435 440 445

Phe Met Arg Asp Gly Ala Lys  
450 455

<210> 46  
<211> 392  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 46

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

Tyr Gly Gly Phe Glu Thr Phe Val Glu Lys Leu Thr Ala Phe Gln Gln  
20 25 30

Asp Lys Ala Ile Gln Tyr Tyr Val Ala Cys Met Arg Glu Asn Ser Ala  
35 40 45

Lys Ser Gly Thr Thr Glu Asp Val Phe Glu His Asn Gly Ala Ile Cys  
50 55 60

Tyr Asn Val Asp Val Pro Asn Phe Gly Pro Ala Arg Ala Ile Ala Tyr  
65 70 75 80

Asp Ile Ala Ala Ile Asn Arg Ala Ile Glu Ile Ala Lys Glu Asn Lys  
85 90 95

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

Ile His Gly Ile Lys Lys Lys Ile Gln Glu Ile Gly Gly Thr Leu Leu  
115 120 125

Val Asn Pro Asp Gly His Glu Trp Leu Arg Ala Lys Trp Ser Ala Pro  
130 135 140

Val Arg Arg Tyr Trp Lys Ile Ser Glu Gly Leu Met Val Lys His Ala  
145 150 155 160

Asp Leu Leu Val Cys Asp Ser Lys Asn Ile Glu Lys Tyr Ile Gln Glu  
 165 170 175

Asp Tyr Lys Gln Tyr Gln Pro Lys Thr Thr Tyr Ile Ala Tyr Gly Thr  
 180 185 190

Asp Thr Thr Arg Ser Val Leu Lys Ser Ser Asp Glu Lys Val Arg Ser  
 195 200 205

Trp Phe Lys Glu Lys Asn Val Ser Glu Asn Glu Tyr Tyr Leu Val Val  
 210 215 220

Gly Arg Phe Val Pro Glu Asn Asn Tyr Glu Ser Met Ile Arg Gly Phe  
 225 230 235 240

Leu Ala Ser Asn Ser Lys Lys Asp Phe Val Leu Ile Thr Asn Val Glu  
 245 250 255

Gln Asn Lys Phe Tyr Asn Gln Leu Leu Ala Lys Thr Gly Phe Asp Lys  
 260 265 270

Asp Pro Arg Val Lys Phe Val Gly Thr Val Tyr Glu Gln Glu Leu Leu  
 275 280 285

Lys Tyr Ile Arg Glu Asn Ala Phe Ala Tyr Phe His Gly His Glu Val  
 290 295 300

Gly Gly Thr Asn Pro Ser Leu Leu Glu Ala Leu Ala Ser Thr Lys Leu  
 305 310 315 320

Asn Leu Leu Leu Asp Val Gly Phe Asn Arg Glu Val Ala Glu Asp Gly  
 325 330 335

Ala Ile Tyr Trp Lys Lys Asp Asn Leu His Glu Ile Ile Glu Thr Ser  
 340 345 350

Glu Gln Lys Thr Gln Lys Glu Ile Asp Glu Lys Asp Ile Leu Ser Ile  
 355 360 365

Lys Gln Val Thr Glu Arg Phe Ser Trp Glu Leu Ile Val Asn Glu Tyr  
 370 375 380

Glu Lys Leu Phe Leu Cys Glu Lys  
 385 390



&lt;211&gt; 397

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 47

Met Thr Ile Lys Ile Asn Asn Leu Phe Phe Val Cys Leu Ser Phe Phe  
1 5 10 15

Gly Ile Val Leu Ser Ser Ser Gln Val Ile Val Asn Leu Gly Leu Ser  
20 25 30

Ser Ile Ile Gln Tyr Ile Ser Tyr Phe Met Leu Met Leu Cys Val Phe  
35 40 45

Leu Thr Leu Ile Lys Asn Thr Leu Asn Val Phe Ala Asn Arg Ile Ile  
50 55 60

Tyr Phe Leu Ile Ile Ser Phe Leu Phe Ile Ile Gly Ile Asn Leu Gln  
65 70 75 80

Asn Leu Pro Leu Ser Arg Lys Ile Tyr Leu Ser Phe Ser Met Leu Ile  
85 90 95

Ile Ser Ser Leu Ser Thr Leu Pro Ile Lys Leu Ile Asn Asn Leu Ser  
100 105 110

Asp Leu Arg Arg Ile Ser Tyr Tyr Leu Leu His Ser Ile Phe Leu Ser  
115 120 125

Val Phe Leu Gly Leu Val Phe Lys Ile Ser Leu Val Thr Val Ala Val  
130 135 140

Glu Gly Ile Gly Phe Ser Tyr Gly Phe Asn Gly Gly Leu Thr His Lys  
145 150 155 160

Asn Phe Tyr Ala Ile Thr Ile Leu Val Ser Tyr Ile Leu Leu Tyr Val  
165 170 175

Ser Arg Lys Tyr Asp Ala Lys His Gln Ile Asp Ser Phe Val Leu Trp  
180 185 190

Leu Asp Leu Phe Leu Leu Leu Ile Ser Asn Thr Arg Thr Val Tyr Ile  
195 200 205

Ile Leu Val Val Phe Trp Ile Ile Ile Asn Arg Asn Phe Ile Asn Asn  
210 215 220

Ile Lys Lys Glu His Arg Leu Val Val Thr Ala Thr Thr Ile Val Ile

225						230						235						240
Ser	Leu	Leu	Ala	Leu	Thr	Phe	Phe	Phe	Lys	His	Ile	Ile	Asn	Asn	Ser			
				245					250					255				
Glu	Ser	Tyr	Ser	His	Arg	Val	Leu	Gly	Val	Val	Asn	Phe	Phe	Lys	Tyr			
				260					265					270				
Tyr	Glu	Ser	Asp	Arg	Phe	His	Leu	Phe	Phe	Gly	Asp	Ala	Glu	Leu	Ala			
				275					280					285				
Phe	Gly	Asn	Thr	Thr	Lys	Gly	Tyr	Gly	His	Asn	Ile	Arg	Ser	Val	Leu			
				290					295					300				
Gly	Trp	Asp	Gly	Thr	Val	Glu	Met	Pro	Leu	Leu	Ser	Val	Met	Ile	Lys			
				305					310					315				
Asn	Gly	Tyr	Val	Gly	Leu	Val	Gly	Tyr	Ile	Ile	Val	Leu	Phe	Lys	Phe			
				325					330					335				
Ile	Ser	Ser	Ile	Ile	Ser	Val	Lys	Asn	Ser	Thr	Lys	Lys	Asn	Ile	Gly			
				340					345					350				
Leu	Ser	Ile	Phe	Ile	Pro	Leu	Leu	Leu	Ser	Ala	Thr	Val	Glu	Asn	Tyr			
				355					360					365				
Ile	Val	Asn	Ile	Ser	Phe	Val	Phe	Met	Pro	Val	Cys	Phe	Cys	Ile	Leu			
				370					375					380				
Cys	Ser	Ile	Lys	Asn	Ile	Lys	Leu	Val	Asn	Asn	Arg	Lys						
				385					390					395				
<210>	48																	
<211>	323																	
<212>	PRT																	
<213>	Streptococcus pneumoniae																	
<400>	48																	
Met	Glu	Lys	Leu	Val	Ser	Ile	Ile	Leu	Pro	Val	Tyr	Asn	Val	Glu	Gln			
1					5					10					15			
Tyr	Ile	Lys	Asn	Cys	Leu	Glu	Ser	Ile	Gln	Gln	Gln	Thr	Tyr	Ser	Asn			
				20					25					30				
Leu	Glu	Val	Ile	Ile	Val	Asn	Asp	Gly	Ser	Thr	Asp	Lys	Ser	Val	Glu			
				35					40					45				
Tyr	Cys	Glu	Gln	Ile	Cys	Lys	Ile	Asp	Ser	Arg	Phe	Ser	Ile	Thr	Hi			

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

Ile Thr Ile Phe Asn Pro Phe Val Lys Phe Ile Tyr Ser Lys Val Asn  
 305 310 315 320

Arg Trp Glu

<210> 49  
 <211> 410  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 49

Met Asn Lys Tyr Glu Glu Arg Tyr Gln Glu Asn Leu Ser Lys Asn Asp  
 1 5 10 15

Phe Tyr Lys Leu Ile Asn Lys Ser Tyr Leu Ser Asp Lys Glu Leu Gln  
 20 25 30

Val Gln Gln Val Lys Ala Gly Ile Val Leu Pro Pro Lys Ala Phe Glu  
 35 40 45

Thr Lys Leu Ser Asn Lys Leu Gly Leu Gln Lys Ser Leu His Gly Lys  
 50 55 60

Gly Gly Val Val Asp Ser Asn Gly Asn Tyr Ile Glu Leu Ser Ala Gln  
 65 70 75 80

Lys Ala Val Gly Met Arg Asn Arg Val Tyr Gly Pro Tyr Lys Ile Asn  
 85 90 95

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

Phe Ile Lys Gln Trp Gly His Phe Leu Leu Asp Val Val Gly Arg Leu  
 115 120 125

Trp Tyr Pro Leu Leu Gln Asp Asn Asp Thr Lys Leu Val Tyr Thr Cys  
 130 135 140

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

Lys Leu Leu Gly Ile Asp Gln Ser Arg Leu Ile Met Ile Asn Cys Pro  
 165 170 175

Thr Gln Phe Ser Glu Val Ile Ile Pro Glu Ser Ser Ile Leu Pro Gly  
 180 185 190

Gly Tyr Tyr Thr Lys Glu Tyr Lys Gln Leu Phe Ser Ser Val Val Glu  
195 200 205

Asn Ile Lys Leu Asp Lys Tyr Asp Val Asn Ala Lys Met Ile Tyr Cys  
210 215 220

Ser Arg Ser Lys Leu Gly Ile Ala Lys Ser Lys Glu Phe Gly Glu Asp  
225 230 235 240

Gly Ile Glu Gly Ile Phe Lys Gln Asn Gly Tyr Thr Ser Val Tyr Met  
245 250 255

Glu Thr Met Ser Leu Glu Glu Gln Ile Lys Thr Leu Leu Ser Ala Lys  
260 265 270

Thr Ile Val Leu Thr Ser Gly Ser Leu Ala His Asn Leu Leu Phe Val  
275 280 285

Asn Lys Asp Ile Asp Val Phe Ile Leu Asn Lys Thr Tyr Arg Val Asn  
290 295 300

Leu His Gln Phe Leu Ile Asn Glu Ile Ser Asp Ala Thr Val Arg Phe  
305 310 315 320

Val Asp Ile Tyr Arg Ser Pro Leu Pro Ile Leu Tyr Gly Tyr Gly Pro  
325 330 335

Phe Leu Met Asp Leu Thr Lys Pro Leu Ala Asn Phe Leu Asp Asp Asn  
340 345 350

Glu Phe Val Tyr Glu Lys Gly Thr Val Leu Ser Lys Lys Asp Tyr Phe  
355 360 365

Lys Tyr Tyr Leu Lys Trp Leu Trp Ser Tyr Arg Phe Phe Leu Phe Arg  
370 375 380

Leu Asn Gly Ile Lys Glu Gly Asn Ser Glu Phe Glu Lys Ser Phe Lys  
385 390 395 400

Ile Ile Arg Arg Tyr Tyr Lys Thr Gly Arg  
405 410

<210> 50  
<211> 461  
<212> PRT  
<213> Streptococcus pneumoniae  
  
<400> 50

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

Leu Ser Thr Ile Ser Ala Ile Phe Ile Gln Ser Trp Gln Ile Ser Ala  
260 265 270

Ile Lys Ile Gln Glu Asp Lys Ser Asp Thr Thr Phe Val Ser Asn Met  
275 280 285

Leu Leu Tyr Tyr Asn Ala Leu Leu Leu Ile Ile Ala Ser Gly Ile Ile  
290 295 300

Leu Phe Val Lys Pro Ile Ser Asn Ile Leu Phe Gly Ile Ser Phe Tyr  
305 310 315 320

Ser Ala Trp Glu Leu Val Pro Phe Leu Ile Ile Ser Ser Leu Phe Asn  
325 330 335

Ala Ile Ser Gly Cys Ile Gly Ala Ile Met Gly Ala Lys Met Asp Thr  
340 345 350

His Asn Ile Ala Lys Ser Ala Leu Val Gly Met Ile Ala Asn Ile Ile  
355 360 365

Leu Asn Ile Val Leu Thr Phe Leu Met Gly Pro Gln Gly Ile Thr Ile  
370 375 380

Ser Thr Leu Ile Ala Ser Phe Leu Ile Phe Tyr Met Arg Lys Asp Ser  
385 390 395 400

Val Lys Glu Ile Asn Ser Glu Thr Tyr Arg Ala Ile Tyr Leu Ser Trp  
405 410 415

Ile Leu Leu Val Val Glu Ala Cys Leu Leu Ile Tyr Met Asp Phe Ile  
420 425 430

Ile Gly Ala Leu Ile Ala Met Val Ile Asn Leu Phe Leu Leu Lys Asp  
435 440 445

Val Ile Lys Pro Leu Tyr Leu Lys Ile Phe Lys Arg Asn  
450 455 460

<210> 51  
<211> 382  
<212> PRT  
<213> Streptococcus pneumoniae  
  
<400> 51

Met Ile Val Leu Gln Tyr Phe Lys Ile Leu Ala Arg Phe Val Phe Met  
1 5 10 15

Phe Leu Ile Ser Ala Val Leu Leu Pro Phe Lys Ile Lys Pro Asn Lys  
 20 25 30

Ile Val Phe Ile Asn Phe Asn Gly Lys Gly Tyr Gly Asp Asn Pro Lys  
 35 40 45

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

Trp Leu Ala Arg Asp Asn Glu Gly Phe Pro Asp Gly Val Arg Val Val  
 65 70 75 80

Lys Tyr Gly Thr Phe Gln Ala Phe Tyr Glu Gln Ala Ser Ser Lys Val  
 85 90 95

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

Gln Ile Tyr Ile Gln Thr Trp His Gly Ala Ser Ser Phe Lys Leu Ile  
 115 120 125

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

Asp Ala Arg Val Thr Asp Ile Met Ile Ser Asp Ser Arg Lys Gln Thr  
 145 150 155 160

Glu Glu Phe Gln Lys Tyr Phe Trp Tyr Ser Gly Glu Ile Phe Glu Val  
 165 170 175

Gly Met Pro Arg Asn Asp Ala Leu Phe His Tyr Lys Glu Asp Tyr Asp  
 180 185 190

Lys Leu Asn Asn Ile Arg Lys Glu Leu Ser Ile His Ser Asp Asp Tyr  
 195 200 205

Val Ile Leu Tyr Ala Pro Thr Phe Arg Asp Asp Gly Asp Ala Ser Tyr  
 210 215 220

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

Lys Lys Lys Cys Lys Phe Leu Ile Arg Leu His Pro Asn His Ser His  
 245 250 255

Leu Cys Asn Asn Ile Ser Phe Asn Lys Asn Ile Ile Asn Ala Thr Phe  
 260 265 270



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

Asp Tyr Ser Ser Ser Ile Phe Asp Phe Met Leu Leu Asn Lys Pro Tyr  
290 295 300

Val Arg Tyr Val Asn Asp Leu Glu Lys Tyr Ala Glu Leu Arg Gly Val  
305 310 315 320

Ser Asp Thr Tyr Tyr Glu Leu Pro Asp Ser Ile Ile Lys Thr Ala Glu  
325 330 335

Glu Leu Tyr Asp Leu Leu Pro Lys Lys Ile Glu Asn Phe Asp Tyr Asp  
340 345 350

Ser Ile Lys Lys Tyr Arg Asn Glu Ile Leu Cys Pro Ile Phe Asn Gly  
355 360 365

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

<210> 52  
<211> 342  
<212> PRT  
<213> Streptococcus pneumoniae

<400> 52

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

Ser Ala Thr Leu Ser Gln Asn Ser Ile Ser Gly Lys Ile Leu Tyr Cys  
20 25 30

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

Ile Glu Glu Ile Gly Arg Val Lys Glu Glu Ser Cys Asn Tyr Asn Thr  
50 55 60

Ile Ala Tyr Ala Met Asn Ile Ala Glu Arg Ala Ile Ala Thr Asp Ile  
65 70 75 80

Asp Cys Ile Val Gly Met Gly Gly Gly Arg Val Leu Asp Val Cys Lys  
85 90 95

Tyr Ala Ser Phe Ile Ser Lys Arg Pro Tyr Leu Ser Ile Pro Thr Thr  
100 105 110

Ala Ala Asn Asp Gly Ile Ala Ser Pro Val Ala Val Leu Lys Arg Gln  
 115 120 125

Asp Asp Arg Pro Lys Ser Leu Gly Ala Ala Ile Pro Ser Met Thr Leu  
 130 135 140

Ile Asp Ile Asp Val Ile Ala Ser Gly Pro Ile Gln Asn Ile Lys Ala  
 145 150 155 160

Gly Ile Gly Asp Thr Ile Ser Asn Tyr Thr Ala Leu Lys Asp Trp Glu  
 165 170 175

Leu Ala Val Glu Arg Gly Lys Asp Glu Met His Gly Phe Ala Tyr Leu  
 180 185 190

Met Ser Gln Asn Ser Leu Asp Ala Leu Met Lys Thr Lys Tyr Asn Ser  
 195 200 205

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

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

Glu His Leu Phe Ser His Ala Leu Asp Tyr Tyr Gly Ser Thr Arg Asn  
 245 250 255

Leu His Gly Ile Gln Val Ala Leu Gly Thr Val Ala Val Leu Lys Leu  
 260 265 270

Ile Glu Asn Ser Val Asp Thr Val Val Asp Tyr Leu Gln Arg Phe Glu  
 275 280 285

Val His Ile Asn Pro Lys Leu Leu Gly Ile Asp Glu Glu Leu Phe Ile  
 290 295 300

Tyr Cys Met Gln His Ala Thr Lys Met Arg Ser Asn Arg Tyr Thr Tyr  
 305 310 315 320

Leu His Glu Val Asp Leu Ser Thr Asp Arg Leu Lys Gln Ile Tyr Lys  
 325 330 335

Glu Leu Ile Ser Glu Leu  
 340

<210> 53

&lt;211&gt; 234

&lt;212&gt; PRT

&lt;213&gt; Streptococcus pneumoniae

&lt;400&gt; 53

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

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

Ile Leu Met Lys Gln Ile Glu Asn Leu Tyr Gln Asn Asn Ile Thr Asp  
35 40 45

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

Thr Glu Lys Tyr Pro Glu Ile Asn Ile Ile Asp Asn Val Asp Phe Lys  
65 70 75 80

Thr Thr Asn Asn Met Tyr Ser Ala Tyr Leu Gly Lys Ala Ala Met Gly  
85 90 95

Asp Ser Asp Phe Leu Met Met Asn Ala Asp Val Phe Tyr Asp Ala Ser  
100 105 110

Val Ile Lys Ser Leu Leu Leu His Lys Ala Pro Asn Ala Ile Val Thr  
115 120 125

Asp Leu Gly Ile Tyr Ile Glu Glu Ser Met Lys Val Val Glu Lys Asn  
130 135 140

Gly Arg Leu Val Glu Ile Ser Lys Gln Ile Ser Pro Glu Glu Thr Leu  
145 150 155 160

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

Phe Phe Glu Lys Cys Lys Glu Phe Ile Glu Asp Lys Arg Glu Leu Gln  
180 185 190

Met Trp Ser Glu Val Ala Leu Asn Ala Ile Leu Ser Glu Val Glu Phe  
195 200 205

Val Ala Cys Pro Leu Glu Gly Arg Trp Leu Glu Ile Asp Asn His Glu  
210 215 220

Asp Leu Val Ala Ala Glu Lys Leu Phe Ala

225

230

<210> 54  
 <211> 277  
 <212> PRT  
 <213> Streptococcus pneumoniae

&lt;400&gt; 54

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

Leu Gln Asn Lys Lys Leu Phe Leu Phe Asp Met Asp Gly Thr Ile Tyr  
 20 25 30

Glu Glu Asp Arg Leu Phe Glu Gly Thr Leu Glu Leu Leu Asp Tyr Ile  
 35 40 45

His Asn Ile Gly Gly Glu Tyr Ile Phe Ile Thr Asn Asn Ser Ser Lys  
 50 55 60

Ser Val Val Asp Tyr Val Glu Lys Val Asn Arg Leu Gly Ile Lys Ala  
 65 70 75 80

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

Lys Glu Asn Tyr Pro Lys Ser Lys Val Tyr Cys Gln Gly Thr Lys Ser  
 100 105 110

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

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

Ser Asp Lys Ile Arg Asn Thr Cys Glu Ile Leu Ser Thr Lys Asp Val  
 145 150 155 160

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

Phe Ile Pro Asp Cys Gly Ser Ile Cys Asp Met Ile Ser Lys Ser Val  
 180 185 190

Asp Arg Lys Pro Val Tyr Ile Gly Lys Pro Glu Pro Thr Met Val Asp  
 195 200 205

Ile Val Arg Lys Lys Leu Asn Tyr Ser Leu Phe Glu Thr Val Val Ile

210                                      215                                      220  
 Gly Asp Arg Leu Tyr Thr Asp Ile Met Thr Gly Ile Asn Ala Gly Val  
 225                                      230                                      235                                      240  
 Thr Ser Val Cys Val Leu Thr Gly Glu Ala Thr Val Asn Asp Ile Gln  
                                     245                                      250                                      255  
 Gln Asp Ser Ile Lys Pro Thr Tyr Thr Phe Lys Asn Val Lys Glu Met  
                                     260                                      265                                      270  
 Trp Lys Gly Ile Val  
                                     275  
  
 <210> 55  
 <211> 289  
 <212> PRT  
 <213> Streptococcus pneumoniae  
  
 <400> 55  
 Met Lys Gly Ile Ile Leu Ala Gly Gly Ser Gly Thr Arg Leu Tyr Pro  
 1                                      5                                      10                                      15  
 Leu Thr Arg Ala Ala Ser Lys Gln Leu Met Pro Val Tyr Asp Lys Pro  
                                     20                                      25                                      30  
 Met Ile Tyr Tyr Pro Leu Ser Thr Leu Met Leu Ala Gly Ile Arg Asp  
                                     35                                      40                                      45  
 Ile Leu Ile Ile Ser Thr Pro Gln Asp Leu Pro Arg Phe Lys Glu Leu  
                                     50                                      55                                      60  
 Leu Gln Asp Gly Ser Glu Phe Gly Ile Lys Leu Ser Tyr Ala Glu Gln  
 65                                      70                                      75                                      80  
 Pro Ser Pro Asp Gly Leu Ala Gln Ala Phe Ile Ile Gly Glu Glu Phe  
                                     85                                      90                                      95  
 Ile Gly Asp Asp Ser Val Ala Leu Ile Leu Gly Asp Asn Ile Tyr His  
                                     100                                      105                                      110  
 Gly Pro Gly Leu Ser Thr Met Leu Gln Lys Ala Ala Lys Lys Glu Lys  
                                     115                                      120                                      125  
 Gly Ala Thr Val Phe Gly Tyr His Val Lys Asp Pro Glu Arg Phe Gly  
                                     130                                      135                                      140  
 Val Val Glu Phe Asp Glu Asn Met Asn Ala Ile Ser Ile Glu Glu Lys

Ser Phe Ser Arg Lys Asn Val Leu Arg Gly Leu His Ala Glu Pro Trp

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

<210> 57  
 <211> 349  
 <212> PRT  
 <213> Streptococcus pneumoniae  
 <400> 57

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

85

90

95

Pro Phe Ile His Thr Asn Phe Ile Gly Thr Tyr Thr Leu Leu Glu Ala  
 100 105 110

Ala Arg Lys Tyr Asp Ile Arg Phe His His Val Ser Thr Asp Glu Val  
 115 120 125

Tyr Gly Asp Leu Pro Leu Arg Glu Asp Leu Pro Gly His Gly Glu Gly  
 130 135 140

Pro Gly Glu Lys Phe Thr Ala Glu Thr Lys Tyr Asn Pro Ser Ser Pro  
 145 150 155 160

Tyr Ser Ser Thr Lys Ala Ala Ser Asp Leu Ile Val Lys Ala Trp Val  
 165 170 175

Arg Ser Phe Gly Val Lys Ala Thr Ile Ser Asn Cys Ser Asn Asn Tyr  
 180 185 190

Gly Pro Tyr Gln His Ile Glu Lys Phe Ile Pro Arg Gln Ile Thr Asn  
 195 200 205

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

Arg Asp Trp Ile His Thr Asn Asp His Ser Ser Gly Val Trp Thr Ile  
 225 230 235 240

Leu Thr Lys Gly Gln Ile Gly Glu Thr Tyr Leu Ile Gly Ala Asp Gly  
 245 250 255

Glu Lys Asn Asn Lys Glu Val Leu Glu Leu Ile Leu Lys Glu Met Gly  
 260 265 270

Gln Ala Val Asp Ala Tyr Asp His Val Thr Asp Arg Ala Gly His Asp  
 275 280 285

Leu Arg Tyr Ala Ile Asp Ala Ser Lys Leu Arg Asp Glu Leu Gly Trp  
 290 295 300

Lys Pro Glu Phe Thr Asn Phe Glu Ala Gly Leu Lys Ala Thr Ile Lys  
 305 310 315 320

Trp Tyr Thr Asp Asn Gln Glu Trp Trp Lys Ala Glu Lys Glu Ala Val  
 325 330 335



Glu Ala Asn Tyr Ala Lys Thr Gln Glu Ile Ile Thr Val  
 340 345

<210> 58  
 <211> 283  
 <212> PRT  
 <213> Streptococcus pneumoniae

<400> 58

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

Tyr Leu Leu Asp Glu Arg Asn Glu Glu Tyr Val Ala Val Asp Val Ala  
 20 25 30

Glu Met Asp Ile Thr Asp Ala Glu Met Val Glu Lys Val Phe Glu Glu  
 35 40 45

Val Lys Pro Thr Leu Val Tyr His Cys Ala Ala Tyr Thr Ala Val Asp  
 50 55 60

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

Gly Thr Lys Asn Val Ala Lys Ala Ser Glu Lys His Gly Ala Thr Leu  
 85 90 95

Val Tyr Ile Ser Thr Asp Tyr Val Phe Asp Gly Lys Lys Pro Val Gly  
 100 105 110

Gln Glu Trp Glu Val Asp Asp Arg Pro Asp Pro Gln Thr Glu Tyr Gly  
 115 120 125

Arg Thr Lys Arg Met Gly Glu Glu Leu Val Glu Lys His Val Ser Asn  
 130 135 140

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

Phe Val Phe Thr Met Gln Asn Leu Ala Lys Thr His Lys Thr Leu Thr  
 165 170 175

Val Val Asn Asp Gln Tyr Gly Arg Pro Thr Trp Thr Arg Thr Leu Ala  
 180 185 190

Glu Phe Met Thr Tyr Leu Ala Glu Asn Arg Lys Glu Phe Gly Tyr Tyr  
 195 200 205

His Leu Ser Asn Asp Ala Thr Glu Asp Thr Thr Trp Tyr Asp Phe Ala  
 210 215 220

Val Glu Ile Leu Lys Gly Thr Asp Val Glu Val Lys Pro Val Asp Ser  
 225 230 235 240

Ser Gln Phe Pro Ala Lys Ala Lys Arg Pro Leu Asn Ser Thr Met Ser  
 245 250 255

Leu Ala Lys Ala Lys Ala Thr Gly Phe Val Ile Pro Thr Trp Gln Asp  
 260 265 270

Ala Leu Gln Glu Phe Tyr Lys Gln Glu Val Arg  
 275 280

<210> 59  
 <211> 358  
 <212> PRT  
 <213> E. coli

<400> 59

Met Glu Glu Asn Asn Met Lys Thr Val Ala Val Val Gly Thr Val Gly  
 1 5 10 15

Val Pro Ala Cys Tyr Gly Gly Phe Glu Ser Leu Val Gln Asn Leu Ile  
 20 25 30

Asp Tyr Gln Ser Asp Gly Ile Gln Tyr Gln Ile Phe Cys Ser Ser Lys  
 35 40 45

Lys Tyr Asp Lys Lys Phe Lys Asn Tyr Lys Asn Ala Glu Leu Ile Tyr  
 50 55 60

Leu Pro Ile Asn Ala Asn Gly Val Ser Ser Ile Ile Tyr Asp Ile Met  
 65 70 75 80

Cys Leu Ile Ile Cys Leu Phe Lys Arg Pro Asp Val Val Leu Ile Leu  
 85 90 95

Gly Val Ser Gly Cys Leu Phe Leu Pro Ile Tyr Lys Leu Phe Ser Lys  
 100 105 110

Ser Lys Ile Ile Val Asn Ile Asp Gly Leu Glu Trp Arg Arg Asn Lys  
 115 120 125

Trp Gly Thr Phe Ala Lys Lys Phe Leu Lys Ile Ser Glu Ala Ile Ser  
 130 135 140

Ile Arg Ile Ala Asp Ile Ile Ile Ser Asp Asn Gln Ala Ile Ala Asp  
 145 150 155 160

Tyr Val Glu Asn Lys Tyr Lys Lys Lys Ser Val Val Ile Ala Tyr Gly  
 165 170 175

Gly Asp His Ala Thr Asn Leu Ser Thr Pro Ile Asp Asn Asp Gln Lys  
 180 185 190

Lys Glu Gly Tyr Tyr Leu Gly Leu Cys Arg Ile Glu Pro Glu Asn Asn  
 195 200 205

Ile Glu Met Ile Leu Asn Ala Phe Ile Asn Thr Asp Lys Lys Ile Lys  
 210 215 220

Phe Met Gly Asn Trp Asp Asn Ser Glu Tyr Gly Arg Gln Leu Lys Lys  
 225 230 235 240

Tyr Tyr Ser Asn Tyr Pro Asn Ile Thr Leu Leu Glu Pro Asn Tyr Asn  
 245 250 255

Ile Glu Glu Leu Tyr Lys Leu Arg Lys Asn Cys Leu Ala Tyr Ile His  
 260 265 270

Gly His Ser Ala Gly Gly Thr Asn Pro Ser Leu Val Glu Ala Met His  
 275 280 285

Phe Asn Ile Pro Ile Phe Ala Phe Asp Cys Asp Phe Asn Arg Tyr Thr  
 290 295 300

Thr Asn Asn Leu Ala His Tyr Phe Asn Asp Ser Glu Gln Leu Ser Leu  
 305 310 315 320

Leu Ala Glu Ser Leu Ser Phe Gly Asn Leu Lys Cys Arg Val Leu Asp  
 325 330 335

Leu Lys Asn Tyr Ala Glu Asp Met Tyr Asn Trp Arg His Ile Ala Ala  
 340 345 350

Met Tyr Glu Ser Ile Tyr  
 355

<210> 60  
 <211> 360  
 <212> PRT  
 <213> E. coli

<400> 60

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

Ile Leu Phe Asn Phe Arg Ser Leu Cys Arg Gly Tyr Ile His Gly His  
260 265 270

Ser Ala Gly Gly Thr Asn Pro Ser Leu Val Glu Ala Met His Phe Gln  
275 280 285

Ile Pro Ile Ile Ala Phe Asp Cys Asp Phe Asn Arg Phe Thr Thr Asp  
290 295 300

Asn Tyr Ala Phe Tyr Phe Lys Asn Lys Asn Glu Leu Ser Phe Ile Val  
305 310 315 320

Asn Asp Ile Leu Asn Gly Asn Gln Asn Glu Gln Ala Glu Ile Cys Ala  
325 330 335

Lys Lys Met Lys Glu Ile Ala Thr Lys Lys Tyr Thr Trp Asp Thr Ile  
340 345 350

Ala Lys Met Tyr Glu Glu Leu Tyr  
355 360

<210> 61  
<211> 351  
<212> PRT  
<213> Cronobacter sakazakii

<400> 61

Met Lys Arg Ile Ala Val Val Gly Thr Val Gly Ile Pro Ala Cys Tyr  
1 5 10 15

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

Gly Tyr Gln Tyr Tyr Ile Phe Cys Ser Ser Lys Asn Tyr Pro Glu Lys  
35 40 45

Ser Asp Ser His Asn Asp Ala Gln Leu Ile Tyr Val Pro Leu Lys Ala  
50 55 60

Asn Gly Ile Gln Ser Ile Leu Tyr Asp Ile Val Ser Leu Trp Lys Cys  
65 70 75 80

Leu Phe Leu Lys Val Asp Thr Ile Leu Ile Leu Gly Val Ser Gly Cys  
85 90 95

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

Asn Ile Asp Gly Leu Glu Trp Lys Arg Glu Lys Trp Asn Tyr Pro Ile  
115 120 125

Lys Lys Phe Leu Lys Phe Ser Glu Leu Leu Ala Val Lys Tyr Ser His  
130 135 140

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

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

Arg Pro Ser Asn Asn Asn Asn Asn Ile Lys Ser Ser Tyr Ala Leu Gly  
180 185 190

Leu Cys Arg Ile Glu Pro Glu Asn Asn Val Glu Leu Ile Leu Lys Ala  
195 200 205

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

Ser Ser Tyr Gly Arg Met Leu Lys Lys Asn Tyr Ser Asn Tyr Ser Asn  
225 230 235 240

Ile Glu Leu Ile Glu Pro Ile Tyr Asp Ile Asp Lys Leu Tyr Ile Leu  
245 250 255

Arg Ser Gly Cys Asp Lys Tyr Ile His Gly His Ser Ala Gly Gly Thr  
260 265 270

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

Phe Asp Cys Glu Phe Asn Arg His Ser Thr Asp Asn Lys Ala Phe Tyr  
290 295 300

Phe Lys Asp Ala Gln His Leu Ala Asp Leu Val Lys Met Lys Asp Asn  
305 310 315 320

Thr Glu Leu Glu Lys Asn Ser Cys Asn Met Lys Val Leu Ala Gln Glu  
325 330 335

Asn Tyr Thr Trp Gln Lys Ile Thr Ala Ser Tyr Glu Ser Leu Tyr  
340 345 350

<210> 62  
<211> 664

&lt;212&gt; PRT

&lt;213&gt; Campylobacter jejuni

&lt;400&gt; 62

Ile	Ile	Ser	Asn	Asp	Gly	Tyr	Ala	Phe	Ala	Glu	Gly	Ala	Arg	Asp	Met
1				5					10					15	

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

Leu	Ser	Thr	Leu	Thr	Tyr	Trp	Leu	Tyr	Lys	Ile	Thr	Pro	Phe	Ser	Phe
		35					40					45			

Glu	Ser	Ile	Ile	Leu	Tyr	Met	Ser	Thr	Phe	Leu	Ser	Ser	Leu	Val	Val
	50					55					60				

Ile	Pro	Ile	Ile	Leu	Leu	Ala	Asn	Glu	Tyr	Lys	Arg	Pro	Leu	Met	Gly
65					70					75					80

Phe	Val	Ala	Ala	Leu	Leu	Ala	Ser	Ile	Ala	Asn	Ser	Tyr	Tyr	Asn	Arg
				85					90					95	

Thr	Met	Ser	Gly	Tyr	Tyr	Asp	Thr	Asp	Met	Leu	Val	Ile	Val	Leu	Pro
			100					105					110		

Met	Phe	Ile	Leu	Phe	Phe	Met	Val	Arg	Met	Ile	Leu	Lys	Lys	Asp	Phe
		115					120					125			

Phe	Ser	Leu	Ile	Ala	Leu	Pro	Leu	Phe	Ile	Gly	Ile	Tyr	Leu	Trp	Trp
		130				135						140			

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

Ile	Tyr	Thr	Leu	Ile	Phe	His	Arg	Lys	Glu	Lys	Ile	Phe	Tyr	Ile	Ala
			165						170					175	

Val	Ile	Leu	Ser	Ser	Leu	Thr	Leu	Ser	Asn	Ile	Ala	Trp	Phe	Tyr	Gln
		180						185					190		

Ser	Thr	Ile	Ile	Val	Ile	Leu	Phe	Ala	Leu	Phe	Ala	Leu	Glu	Gln	Lys
		195					200					205			

Arg	Leu	Asn	Phe	Val	Ile	Ile	Gly	Ile	Leu	Ala	Ser	Val	Thr	Leu	Ile
	210					215					220				

Phe	Leu	Ile	Leu	Ser	Gly	Gly	Val	Asp	Pro	Ile	Leu	Tyr	Gln	Leu	Lys
225					230					235					240

Phe Tyr Ile Phe Arg Ser Asp Glu Ser Ala Asn Leu Thr Gln Gly Phe  
                                   245                                  250                                  255

Met Tyr Phe Asn Val Asn Gln Thr Ile Gln Glu Val Glu Asn Val Asp  
                                   260                                  265                                  270

Leu Ser Glu Phe Met Arg Arg Ile Ser Gly Ser Glu Ile Val Phe Leu  
                                   275                                  280                                  285

Phe Ser Leu Phe Gly Phe Val Trp Leu Leu Arg Lys His Lys Ser Met  
                                   290                                  295                                  300

Ile Met Ala Leu Pro Ile Leu Val Leu Gly Phe Leu Ala Leu Lys Gly  
   305                                  310                                  315                                  320

Gly Leu Arg Phe Thr Ile Tyr Ser Val Pro Val Met Ala Leu Gly Phe  
                                   325                                  330                                  335

Gly Phe Leu Leu Ser Glu Phe Lys Ala Ile Leu Val Lys Lys Tyr Ser  
                                   340                                  345                                  350

Gln Leu Thr Ser Asn Val Cys Ile Val Phe Ala Thr Ile Leu Thr Leu  
                                   355                                  360                                  365

Ala Pro Val Phe Ile His Ile Tyr Asn Tyr Lys Ala Pro Thr Val Phe  
                                   370                                  375                                  380

Ser Gln Asn Glu Ala Ser Leu Leu Asn Gln Leu Lys Asn Ile Ala Asn  
   385                                  390                                  395                                  400

Arg Glu Asp Tyr Val Val Thr Trp Trp Asp Tyr Gly Tyr Pro Val Arg  
                                   405                                  410                                  415

Tyr Tyr Ser Asp Val Lys Thr Leu Val Asp Gly Gly Lys His Leu Gly  
                                   420                                  425                                  430

Lys Asp Asn Phe Phe Pro Ser Phe Ala Leu Ser Lys Asp Glu Gln Ala  
                                   435                                  440                                  445

Ala Ala Asn Met Ala Arg Leu Ser Val Glu Tyr Thr Glu Lys Ser Phe  
                                   450                                  455                                  460

Tyr Ala Pro Gln Asn Asp Ile Leu Lys Thr Asp Ile Leu Gln Ala Met  
   465                                  470                                  475                                  480

Met Lys Asp Tyr Asn Gln Ser Asn Val Asp Leu Phe Leu Ala Ser Leu



485

490

495

Ser Lys Pro Asp Phe Lys Ile Asp Thr Pro Lys Thr Arg Asp Ile Tyr  
 500 505 510

Leu Tyr Met Pro Ala Arg Met Ser Leu Ile Phe Ser Thr Val Ala Ser  
 515 520 525

Phe Ser Phe Ile Asn Leu Asp Thr Gly Val Leu Asp Lys Pro Phe Thr  
 530 535 540

Phe Ser Thr Ala Tyr Pro Leu Asp Val Lys Asn Gly Glu Ile Tyr Leu  
 545 550 555 560

Ser Asn Gly Val Val Leu Ser Asp Asp Phe Arg Ser Phe Lys Ile Gly  
 565 570 575

Asp Asn Val Val Ser Val Asn Ser Ile Val Glu Ile Asn Ser Ile Lys  
 580 585 590

Gln Gly Glu Tyr Lys Ile Thr Pro Ile Asp Asp Lys Ala Gln Phe Tyr  
 595 600 605

Ile Phe Tyr Leu Lys Asp Ser Ala Ile Pro Tyr Ala Gln Phe Ile Leu  
 610 615 620

Met Asp Lys Thr Met Phe Asn Ser Ala Tyr Val Gln Met Phe Phe Leu  
 625 630 635 640

Gly Asn Tyr Asp Lys Asn Leu Phe Asp Leu Val Ile Asn Ser Arg Asp  
 645 650 655

Ala Lys Val Phe Lys Leu Lys Ile  
 660

<210> 63

<211> 257

<212> PRT

<213> E. coli

<400> 63

Met Met Val Phe Gly Lys Leu Tyr Leu Ser Ser Leu Gly Tyr Ile Phe  
 1 5 10 15

Gly Ser Trp Glu Met Val Leu Gly Pro Phe Gly Tyr Phe Leu Thr Leu  
 20 25 30

Phe Ala Val Trp Ala Ala Ile Asn Ala Phe Asn Met Val Asp Gly Ile

35

40

45

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

Met Ile Leu Trp Phe Asp Gly Gln Thr Ser Leu Ala Ile Trp Cys Phe  
65 70 75 80

Ala Met Ile Ala Ala Ile Leu Pro Tyr Ile Met Leu Asn Leu Gly Ile  
85 90 95

Leu Gly Arg Arg Tyr Lys Val Phe Met Gly Asp Ala Gly Ser Thr Leu  
100 105 110

Ile Gly Phe Thr Val Ile Trp Ile Leu Leu Glu Thr Thr Gln Gly Lys  
115 120 125

Thr His Pro Ile Ser Pro Val Thr Ala Leu Trp Ile Ile Ala Ile Pro  
130 135 140

Leu Met Asp Met Val Ala Ile Met Tyr Arg Arg Leu Arg Lys Gly Met  
145 150 155 160

Ser Pro Phe Ser Pro Asp Arg Gln His Ile His His Leu Ile Met Arg  
165 170 175

Ala Gly Phe Thr Ser Arg Gln Ala Phe Val Leu Ile Thr Leu Ala Ala  
180 185 190

Ala Leu Leu Ala Ser Ile Gly Val Leu Ala Glu Tyr Ser His Phe Val  
195 200 205

Pro Glu Trp Val Met Leu Val Leu Phe Leu Leu Ala Phe Phe Leu Tyr  
210 215 220

Gly Tyr Cys Ile Lys Arg Ala Trp Lys Val Ala Arg Phe Ile Lys Arg  
225 230 235 240

Val Lys Arg Arg Leu Arg Arg Asn Arg Gly Gly Ser Pro Asn Leu Thr  
245 250 255

Lys

<210> 64  
<211> 207  
<212> PRT  
<213> E. coli

&lt;400&gt; 64

Met Ser Thr Ile Ile Met Asp Leu Cys Ser Tyr Thr Arg Leu Gly Leu  
 1 5 10 15

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

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

Ser Val Val Phe Ile Asn Glu Asp Cys Phe Ile His Asp Ala Ser Asn  
 50 55 60

Ser Gln Arg Ile Lys Leu Ile Ile Asn Gln His Pro Asn Thr Leu Phe  
 65 70 75 80

Ile Val Phe Met Ala Ile Ala Asn Val His Phe Asp Glu Tyr Leu Leu  
 85 90 95

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

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

Ser Phe Leu Asn Met Pro Thr Leu Ser Leu Ser Arg Thr Glu Ser Ser  
 130 135 140

Met Leu Arg Met Trp Met Ala Gly Gln Gly Thr Ile Gln Ile Ser Asp  
 145 150 155 160

Gln Met Asn Ile Lys Ala Lys Thr Val Ser Ser His Lys Gly Asn Ile  
 165 170 175

Lys Arg Lys Ile Lys Thr His Asn Lys Gln Val Ile Tyr His Val Val  
 180 185 190

Arg Leu Thr Asp Asn Val Thr Asn Gly Ile Phe Val Asn Met Arg  
 195 200 205

&lt;210&gt; 65

&lt;211&gt; 713

&lt;212&gt; PRT

&lt;213&gt; Campylobacter jejuni

&lt;400&gt; 65

Met Leu Lys Lys Glu Tyr Leu Lys Asn Pro Tyr Leu Val Leu Phe Ala

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

Lys Arg Leu Asn Phe Met Ile Ile Gly Ile Leu Gly Ser Ala Thr Leu  
 260 265 270

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

Lys Phe Tyr Ile Phe Arg Ser Asp Glu Ser Ala Asn Leu Thr Gln Gly  
 290 295 300

Phe Met Tyr Phe Asn Val Asn Gln Thr Ile Gln Glu Val Glu Asn Val  
 305 310 315 320

Asp Leu Ser Glu Phe Met Arg Arg Ile Ser Gly Ser Glu Ile Val Phe  
 325 330 335

Leu Phe Ser Leu Phe Gly Phe Val Trp Leu Leu Arg Lys His Lys Ser  
 340 345 350

Met Ile Met Ala Leu Pro Ile Leu Val Leu Gly Phe Leu Ala Leu Lys  
 355 360 365

Gly Gly Leu Arg Phe Thr Ile Tyr Ser Val Pro Val Met Ala Leu Gly  
 370 375 380

Phe Gly Phe Leu Leu Ser Glu Phe Lys Ala Ile Met Val Lys Lys Tyr  
 385 390 395 400

Ser Gln Leu Thr Ser Asn Val Cys Ile Val Phe Ala Thr Ile Leu Thr  
 405 410 415

Leu Ala Pro Val Phe Ile His Ile Tyr Asn Tyr Lys Ala Pro Thr Val  
 420 425 430

Phe Ser Gln Asn Glu Ala Ser Leu Leu Asn Gln Leu Lys Asn Ile Ala  
 435 440 445

Asn Arg Glu Asp Tyr Val Val Thr Trp Trp Asp Tyr Gly Tyr Pro Val  
 450 455 460

Arg Tyr Tyr Ser Asp Val Lys Thr Leu Val Asp Gly Gly Lys His Leu  
 465 470 475 480

Gly Lys Asp Asn Phe Phe Pro Ser Phe Ala Leu Ser Lys Asp Glu Gln  
 485 490 495

Ala Ala Ala Asn Met Ala Arg Leu Ser Val Glu Tyr Thr Glu Lys Ser  
 500 505 510

Phe Tyr Ala Pro Gln Asn Asp Ile Leu Lys Thr Asp Ile Leu Gln Ala  
515 520 525

Met Met Lys Asp Tyr Asn Gln Ser Asn Val Asp Leu Phe Leu Ala Ser  
530 535 540

Leu Ser Lys Pro Asp Phe Lys Ile Asp Thr Pro Lys Thr Arg Asp Ile  
545 550 555 560

Tyr Leu Tyr Met Pro Ala Arg Met Ser Leu Ile Phe Ser Thr Val Ala  
565 570 575

Ser Phe Ser Phe Ile Asn Leu Asp Thr Gly Val Leu Asp Lys Pro Phe  
580 585 590

Thr Phe Ser Thr Ala Tyr Pro Leu Asp Val Lys Asn Gly Glu Ile Tyr  
595 600 605

Leu Ser Asn Gly Val Val Leu Ser Asp Asp Phe Arg Ser Phe Lys Ile  
610 615 620

Gly Asp Asn Val Val Ser Val Asn Ser Ile Val Glu Ile Asn Ser Ile  
625 630 635 640

Lys Gln Gly Glu Tyr Lys Ile Thr Pro Ile Asp Asp Lys Ala Gln Phe  
645 650 655

Tyr Ile Phe Tyr Leu Lys Asp Ser Ala Ile Pro Tyr Ala Gln Phe Ile  
660 665 670

Leu Met Asp Lys Thr Met Phe Asn Ser Ala Tyr Val Gln Met Phe Phe  
675 680 685

Leu Gly Asn Tyr Asp Lys Asn Leu Phe Asp Leu Val Ile Asn Ser Arg  
690 695 700

Asp Ala Lys Val Phe Lys Leu Lys Ile  
705 710

<210> 66  
<211> 378  
<212> PRT  
<213> Salmonella typhimurium

<400> 66

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

Tyr Ser Leu Pro Pro Ala Asn Ser His Glu Ile Asp Leu Phe Ser Leu  
 20 25 30

Ile Glu Val Leu Trp Gln Ala Lys Arg Arg Ile Leu Ala Thr Val Phe  
 35 40 45

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

Trp Thr Ser Gln Ala Ile Val Thr Pro Ala Glu Ser Val Gln Trp Gln  
 65 70 75 80

Gly Leu Glu Arg Thr Leu Thr Ala Leu Arg Val Leu Asp Met Glu Val  
 85 90 95

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

Ser Pro Ser Leu Leu Glu Glu Tyr Leu Arg Ser Ser Pro Tyr Val Met  
 115 120 125

Asp Gln Leu Lys Gly Ala Gln Ile Asp Glu Gln Asp Leu His Arg Ala  
 130 135 140

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

Lys Lys Asn Glu Thr Ser Leu Phe Thr Ser Trp Thr Leu Ser Phe Thr  
 165 170 175

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

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

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

Arg Val Arg Leu Lys Asn Gln Leu Asp Ala Asn Ile Gln Arg Leu His  
 225 230 235 240

Tyr Ser Leu Glu Ile Ala Asn Ala Ala Gly Ile Lys Arg Pro Val Tyr  
 245 250 255

Ser Asn Gly Gln Ala Val Lys Asp Asp Pro Asp Phe Ser Ile Ser Leu  
 260 265 270

Gly Ala Asp Gly Ile Ser Arg Lys Leu Glu Ile Glu Lys Gly Val Thr  
275 280 285

Asp Val Ala Glu Ile Asp Gly Asp Leu Arg Asn Arg Gln Tyr His Val  
290 295 300

Glu Gln Leu Ala Ala Met Asn Val Ser Asp Val Lys Phe Thr Pro Phe  
305 310 315 320

Lys Tyr Gln Leu Ser Pro Ser Leu Pro Val Lys Lys Asp Gly Pro Gly  
325 330 335

Lys Ala Ile Ile Ile Ile Leu Ala Ala Leu Ile Gly Gly Met Met Ala  
340 345 350

Cys Gly Gly Val Leu Leu Arg His Ala Met Val Ser Arg Lys Met Glu  
355 360 365

Asn Ala Leu Ala Ile Asp Glu Arg Leu Val  
370 375