

SEQUENCE LISTING

<110> BENINATI, CONCETTA

FELICI, FRANCO

UNIVERSITA DEGLI STUDI DI SIENA

<120> ANTIGEN PROTEIN FRAGMENTS OF STREPTOCOCCUS PNEUMONIAE

<130> 07176MS

<140>

<141>

<160> 44

<170> PatentIn Ver. 3.3

<210> 1

<211> 199

<212> PRT

<213> Streptococcus pneumoniae

<400> 1

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Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr	Thr	Ile	Glu	Ser	Leu	Ile
		35					40					45			

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

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

Val	Tyr	Lys	Asn	Val	Gly	Leu	Met	Pro	Gly	Pro	Val	Asp	Ser	Pro	Ser
145					150					155					160

Leu	Asp	Ala	Ile	Glu	Ser	Ser	Ile	Asn	Gln	Thr	Lys	Ser	Asp	Asn	Leu
				165					170					175	

Tyr	Phe	Val	Ala	Asp	Val	Thr	Glu	Gly	Lys	Val	Tyr	Tyr	Ala	Asn	Asn
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Gln	Glu	Asp	His	Asp	Arg	Asn
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<211> 551
<212> PRT
<213> Streptococcus pneumoniae

<400> 2

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			20					25					30		
Glu	Asp	Glu	Ala	Val	Val	Arg	Thr	Pro	Ala	Asn	Glu	Pro	Ser	Ala	Glu
		35					40					45			
Glu	Leu	Met	Ala	Asp	Ser	Leu	Ser	Thr	Val	Glu	Glu	Ile	Met	Arg	Lys
	50					55					60				
Ala	Pro	Thr	Val	Pro	Thr	His	Pro	Ser	Gln	Gly	Val	Pro	Ala	Ser	Pro
65					70					75					80
Ala	Asp	Glu	Ile	Gln	Arg	Glu	Thr	Pro	Gly	Val	Pro	Ser	His	Pro	Ser
				85					90					95	
Gln	Asp	Val	Pro	Ser	Ser	Pro	Ala	Glu	Glu	Ser	Gly	Ser	Arg	Pro	Gly
		100						105					110		
Pro	Gly	Pro	Val	Arg	Pro	Lys	Lys	Leu	Glu	Arg	Glu	Tyr	Asn	Glu	Thr
	115						120					125			
Pro	Thr	Arg	Val	Ala	Val	Ser	Tyr	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu
	130					135					140				
Gln	Ala	Gly	Pro	Glu	Thr	Pro	Thr	Pro	Ala	Thr	Glu	Thr	Val	Asp	Ile
145					150					155					160
Ile	Arg	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Ala
				165					170					175	
Lys	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser
		180						185					190		
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr
	195					200						205			
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys
	210					215					220				
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly
225					230					235					240
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser
				245					250					255	
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr
			260					265					270		
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln
		275					280					285			

Lys Gly Gly Thr Asp Glu Pro Gln Glu Pro Val Leu Ala Thr Leu Thr
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 Ile Pro Glu Gly Tyr Thr Leu Asp Gln Ile Ala Gln Thr Val Gly Gln
 305 310 315 320
 Leu Gln Gly Asp Phe Lys Glu Ser Leu Thr Ala Glu Ala Phe Leu Ala
 325 330 335
 Lys Val Gln Asp Glu Thr Phe Ile Ser Gln Ala Val Ala Lys Tyr Pro
 340 345 350
 Thr Leu Leu Glu Ser Leu Pro Val Lys Asp Ser Gly Ala Arg Tyr Arg
 355 360 365
 Leu Glu Gly Tyr Leu Phe Pro Ala Thr Tyr Ser Ile Lys Glu Ser Thr
 370 375 380
 Thr Ile Glu Ser Leu Ile Asp Glu Met Leu Ala Ala Met Asp Lys Asn
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 Leu Ser Leu Tyr Tyr Ser Thr Ile Lys Ser Lys Asn Leu Thr Val Asn
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 Glu Leu Leu Thr Ile Ala Ser Leu Val Glu Lys Glu Gly Ala Lys Thr
 420 425 430
 Glu Asp Arg Lys Leu Ile Ala Gly Val Phe Tyr Asn Arg Leu Asn Arg
 435 440 445
 Asp Met Pro Leu Gln Ser Asn Ile Ala Ile Leu Tyr Ala Gln Gly Lys
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 Leu Gly Gln Asn Ile Ser Leu Ala Glu Asp Val Ala Ile Asp Thr Asn
 465 470 475 480
 Ile Asp Ser Pro Tyr Asn Val Tyr Lys Asn Val Gly Leu Met Pro Gly
 485 490 495
 Pro Val Asp Ser Pro Ser Leu Asp Ala Ile Glu Ser Ser Ile Asn Gln
 500 505 510
 Thr Lys Ser Asp Asn Leu Tyr Phe Val Ala Asp Val Thr Glu Gly Lys
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<210> 3

<211> 108

<212> PRT

<213> Streptococcus pneumoniae

<400> 3

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 20 25 30
 Glu Asn Gln Ser Lys Tyr Gly Tyr Lys Ile Lys Thr Phe Ala Asp Gly
 35 40 45
 Ser Ser Met Asp Asp Ser Leu Asn Thr Gly Ala Ile Asp Ala Val Met
 50 55 60
 Asp Asp Glu Pro Val Leu Lys Tyr Ser Ile Ser Gln Gly Gln Lys Leu
 65 70 75 80
 Lys Thr Pro Ile Ser Gly Thr Pro Ile Gly Glu Thr Ala Phe Ala Val
 85 90 95
 Lys Lys Gly Ala Asn Pro Glu Leu Ile Glu Met Phe
 100 105

<210> 4
 <211> 721
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 4
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 Ala Tyr Ala Pro Phe Glu Phe Lys Asp Ser Asp Gln Thr Tyr Lys Gly
 35 40 45
 Ile Asp Val Asp Ile Ile Asn Lys Val Ala Glu Ile Lys Gly Trp Asn
 50 55 60
 Ile Gln Met Ser Tyr Pro Gly Phe Asp Ala Ala Val Asn Ala Val Gln
 65 70 75 80
 Ala Gly Gln Ala Asp Ala Ile Met Ala Gly Met Thr Lys Thr Lys Glu
 85 90 95
 Arg Glu Lys Val Phe Thr Met Ser Asp Thr Tyr Tyr Asp Thr Lys Val
 100 105 110
 Val Ile Ala Thr Thr Lys Ser His Lys Ile Ser Lys Tyr Asp Gln Leu
 115 120 125
 Thr Gly Lys Thr Val Gly Val Lys Asn Gly Thr Ala Ala Gln Arg Phe
 130 135 140
 Leu Glu Thr Ile Lys Asp Lys Tyr Gly Phe Thr Ile Lys Thr Phe Asp
 145 150 155 160
 Thr Gly Asp Leu Met Asn Asn Ser Leu Ser Ala Gly Ala Ile Asp Ala
 165 170 175
 Met Met Asp Asp Lys Pro Val Ile Glu Tyr Ala Ile Asn Gln Gly Gln
 180 185 190

Asp	Leu	His	Ile	Glu	Met	Asp	Gly	Glu	Ala	Val	Gly	Ser	Phe	Ala	Phe		
	195						200					205					
Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn		
	210					215					220						
Gln	Ala	Leu	Ser	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile		
225					230					235					240		
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr		
				245					250						255		
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala		
			260					265					270				
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln		
	275						280					285					
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln		
	290					295					300						
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser		
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Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val		
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Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr		
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Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr		
		355					360					365					
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser		
	370					375					380						
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys		
385					390					395					400		
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Asp	Asp	Ser	Leu	Asn	Thr	Gly	Ala		
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Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser		
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Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu		
		435					440					445					
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met		
	450					455					460						
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys		
465					470					475					480		
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser		
				485					490					495			
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys		
			500					505					510				

Gln Leu Leu Ser Gly Leu Gly Ile Thr Leu Ala Leu Ala Leu Ile Ser
 515 520 525
 Phe Ala Ile Ala Ile Val Ile Gly Ile Ile Phe Gly Met Phe Ser Val
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 Ser Pro Tyr Lys Ser Leu Arg Val Ile Ser Glu Ile Phe Val Asp Val
 545 550 555 560
 Ile Arg Gly Ile Pro Leu Met Ile Leu Ala Ala Phe Ile Phe Trp Gly
 565 570 575
 Ile Pro Asn Phe Ile Glu Ser Ile Thr Gly Gln Gln Ser Pro Ile Asn
 580 585 590
 Asp Phe Val Ala Gly Thr Ile Ala Leu Ser Leu Asn Ala Ala Ala Tyr
 595 600 605
 Ile Ala Glu Ile Val Arg Gly Gly Ile Gln Ala Val Pro Val Gly Gln
 610 615 620
 Met Glu Ala Ser Arg Ser Leu Gly Ile Ser Tyr Gly Lys Thr Met Arg
 625 630 635 640
 Lys Ile Ile Leu Pro Gln Val Thr Lys Leu Met Leu Pro Asn Phe Val
 645 650 655
 Asn Gln Phe Val Ile Ala Leu Lys Asp Thr Thr Ile Val Ser Ala Ile
 660 665 670
 Gly Leu Val Glu Leu Phe Gln Thr Gly Lys Ile Ile Ile Ala Arg Asn
 675 680 685
 Tyr Gln Ser Phe Lys Met Tyr Ala Ile Leu Ala Ile Phe Tyr Leu Val
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 705 710 715 720
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<210> 5

<211> 161

<212> PRT

<213> Streptococcus pneumoniae

<400> 5

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 35 40 45
 Leu Ile Phe Pro Glu Thr Val Leu Thr Thr Thr Val Asn Glu Ala Glu
 50 55 60

Glu	Val	Thr	Glu	Val	Glu	Ile	Gln	Thr	Pro	Gln	Ala	Asp	Ser	Ser	Glu
65					70					75					80
Glu	Val	Thr	Thr	Ala	Thr	Ala	Asp	Leu	Thr	Thr	Asn	Gln	Val	Thr	Val
				85					90					95	
Asp	Asp	Gln	Thr	Val	Gln	Val	Ala	Asp	Leu	Ser	Gln	Pro	Ile	Ala	Glu
			100					105					110		
Ala	Pro	Lys	Glu	Val	Ala	Ser	Ser	Ser	Glu	Val	Thr	Lys	Thr	Val	Ile
		115					120					125			
Ala	Ser	Glu	Glu	Val	Ala	Pro	Ser	Thr	Gly	Thr	Ser	Val	Pro	Glu	Glu
	130					135					140				
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Thr

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

<400> 6															
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			20					25					30		
Val	Glu	Gln	Ile	Gln	Asn	Asp	Leu	Thr	Lys	Thr	Asp	Asn	Lys	Thr	Ser
		35					40					45			
Tyr	Thr	Val	Gln	Tyr	Gly	Asp	Thr	Leu	Ser	Thr	Ile	Ala	Glu	Ala	Leu
	50					55					60				
Gly	Val	Asp	Val	Thr	Val	Leu	Ala	Asn	Leu	Asn	Lys	Ile	Thr	Asn	Met
65					70					75					80
Asp	Leu	Ile	Phe	Pro	Glu	Thr	Val	Leu	Thr	Thr	Thr	Val	Asn	Glu	Ala
			85						90					95	
Glu	Glu	Val	Thr	Glu	Val	Glu	Ile	Gln	Thr	Pro	Gln	Ala	Asp	Ser	Ser
			100					105					110		
Glu	Glu	Val	Thr	Thr	Ala	Thr	Ala	Asp	Leu	Thr	Thr	Asn	Gln	Val	Thr
		115					120					125			
Val	Asp	Asp	Gln	Thr	Val	Gln	Val	Ala	Asp	Leu	Ser	Gln	Pro	Ile	Ala
	130					135					140				
Glu	Ala	Pro	Lys	Glu	Val	Ala	Ser	Ser	Ser	Glu	Val	Thr	Lys	Thr	Val
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Ile	Ala	Ser	Glu	Glu	Val	Ala	Pro	Ser	Thr	Gly	Thr	Ser	Val	Pro	Glu
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<213> Streptococcus pneumoniae

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aaaatcaaaa cctttgctga tggttcttca atggatgaca gtttaaacac tggtgccatt 180
gatgccgtta tggatgatga acctgttctc aaatattcta tcagccaagg tcaaaaattg 240
aaaactccaa tctctggaac tccaatcggg gaaacagcct ttgccgttaa aaaaggagca 300
aatccagaac tgattgaaat gttc                                     324
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<210> 9

<211> 483

<212> DNA

<213> Streptococcus pneumoniae

<400> 9

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ctgaacaaaa tcactaatat ggacttgatt ttcccagaaa ctgttttgac aacgactgtc 180
aatgaagcag aagaagtaac agaagttgaa atccaaacac ctcaagcaga ctctagtga 240
gaagtgacaa ctgcgacagc agatttgacc actaatcaag tgaccgttga tgatcaaact 300
gttcagggtg cagaccttct tcaaccaatt gcagaagctc caaaagaagt agcatcaagt 360
tcagaagtta caaagacagt gattgcttct gaagaagtgg caccatctac gggcacttct 420
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acg                                     483
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<210> 10

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 10

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<210> 11

<211> 44

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 11

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<210> 12

<211> 44

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic

primer

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<210> 13
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<212> DNA
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<223> Description of Artificial Sequence: Synthetic
primer

<400> 13
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<210> 14
<211> 22
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primer

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<210> 15
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<212> DNA
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<220>
<223> Description of Artificial Sequence: Synthetic
primer

<400> 15
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<210> 16
<211> 551
<212> PRT
<213> Streptococcus pneumoniae

<400> 16
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20 25 30

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

Glu Leu Met Ala Asp Ser Leu Ser Thr Val Glu Glu Ile Met Arg Lys

50					55					60					
Ala	Pro	Thr	Val	Pro	Thr	His	Pro	Ser	Gln	Gly	Val	Pro	Ala	Ser	Pro
65					70					75					80
Ala	Asp	Glu	Ile	Gln	Arg	Glu	Thr	Pro	Gly	Val	Pro	Ser	His	Pro	Ser
				85					90					95	
Gln	Asp	Val	Pro	Ser	Ser	Pro	Ala	Glu	Glu	Ser	Gly	Ser	Arg	Pro	Gly
			100					105					110		
Pro	Gly	Pro	Val	Arg	Pro	Lys	Lys	Leu	Glu	Arg	Glu	Tyr	Asn	Glu	Thr
		115					120					125			
Pro	Thr	Arg	Val	Ala	Val	Ser	Tyr	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu
		130					135					140			
Gln	Ala	Gly	Pro	Glu	Thr	Pro	Thr	Pro	Ala	Thr	Glu	Thr	Val	Asp	Ile
145					150					155					160
Ile	Arg	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Ala
				165					170					175	
Lys	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser
			180					185					190		
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr
		195					200					205			
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys
		210					215					220			
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly
225					230					235					240
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser
				245					250					255	
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr
			260					265					270		
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln
		275					280					285			
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr
		290					295					300			
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Thr	Val	Gly	Gln
305					310					315					320
Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Ala	Phe	Leu	Ala
				325					330					335	
Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala	Lys	Tyr	Pro
			340					345					350		
Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala	Arg	Tyr	Arg
		355					360					365			
Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr
		370					375					380			

Thr Ile Glu Ser Leu Ile Asp Glu Met Leu Ala Ala Met Asp Lys Asn
 385 390 395 400
 Leu Ser Leu Tyr Tyr Ser Thr Ile Lys Ser Lys Asn Leu Thr Val Asn
 405 410 415
 Glu Leu Leu Thr Ile Ala Ser Leu Val Glu Lys Glu Gly Ala Lys Thr
 420 425 430
 Glu Asp Arg Lys Leu Ile Ala Gly Val Phe Tyr Asn Arg Leu Asn Arg
 435 440 445
 Asp Met Pro Leu Gln Ser Asn Ile Ala Ile Leu Tyr Ala Gln Gly Lys
 450 455 460
 Leu Gly Gln Asn Ile Ser Leu Ala Glu Asp Val Ala Ile Asp Thr Asn
 465 470 475 480
 Ile Asp Ser Pro Tyr Asn Val Tyr Lys Asn Val Gly Leu Met Pro Gly
 485 490 495
 Pro Val Asp Ser Pro Ser Leu Asp Ala Ile Glu Ser Ser Ile Asn Gln
 500 505 510
 Thr Lys Ser Asp Asn Leu Tyr Phe Val Ala Asp Val Thr Glu Gly Lys
 515 520 525
 Val Tyr Tyr Ala Asn Asn Gln Glu Asp His Asp Arg Asn Val Ala Glu
 530 535 540
 His Val Asn Ser Lys Leu Asn
 545 550

<210> 17

<211> 551

<212> PRT

<213> Streptococcus pneumoniae

<400> 17

Met Ser Glu Lys Ser Arg Glu Glu Glu Lys Leu Ser Phe Lys Glu Gln
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 35 40 45
 Glu Leu Met Ala Asp Ser Leu Ser Thr Val Glu Glu Ile Met Arg Lys
 50 55 60
 Ala Pro Thr Val Pro Thr His Pro Ser Gln Gly Val Pro Ala Ser Pro
 65 70 75 80
 Ala Asp Glu Ile Gln Arg Glu Thr Pro Gly Val Pro Ser His Pro Ser
 85 90 95
 Gln Asp Val Pro Ser Ser Pro Ala Glu Glu Ser Gly Ser Arg Pro Gly
 100 105 110

Pro	Gly	Pro	Val	Arg	Pro	Lys	Lys	Leu	Glu	Arg	Glu	Tyr	Asn	Glu	Thr	115	120	125
Pro	Thr	Arg	Val	Ala	Val	Ser	Tyr	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu	130	135	140
Gln	Ala	Gly	Pro	Glu	Thr	Pro	Thr	Pro	Ala	Thr	Glu	Thr	Val	Asp	Ile	145	150	155
Ile	Arg	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Ala	165	170	175
Lys	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser	180	185	190
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr	195	200	205
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys	210	215	220
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly	225	230	235
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser	245	250	255
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr	260	265	270
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln	275	280	285
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr	290	295	300
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Thr	Val	Gly	Gln	305	310	315
Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Ala	Phe	Leu	Ala	325	330	335
Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala	Lys	Tyr	Pro	340	345	350
Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala	Arg	Tyr	Arg	355	360	365
Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr	370	375	380
Thr	Ile	Glu	Ser	Leu	Ile	Asp	Glu	Met	Leu	Ala	Ala	Met	Asp	Lys	Asn	385	390	395
Leu	Ser	Leu	Tyr	Tyr	Ser	Thr	Ile	Lys	Ser	Lys	Asn	Leu	Thr	Val	Asn	405	410	415
Glu	Leu	Leu	Thr	Ile	Ala	Ser	Leu	Val	Glu	Lys	Glu	Gly	Ala	Lys	Thr	420	425	430

Ile	Arg	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Val	
				165					170					175		
Lys	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser	
				180				185					190			
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr	
		195					200					205				
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys	
	210					215					220					
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly	
225					230					235					240	
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser	
				245					250					255		
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr	
			260					265					270			
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln	
		275					280					285				
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr	
	290					295					300					
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Thr	Val	Gly	Gln	
305					310					315					320	
Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Ala	Phe	Leu	Ala	
				325					330					335		
Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala	Lys	Tyr	Pro	
			340					345					350			
Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala	Arg	Tyr	Arg	
		355					360					365				
Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr	
	370					375					380					
Thr	Ile	Glu	Ser	Leu	Ile	Asp	Glu	Met	Leu	Ala	Ala	Met	Asp	Lys	Asn	
385					390					395					400	
Leu	Ser	Pro	Tyr	Tyr	Ser	Thr	Ile	Lys	Ser	Lys	Asn	Leu	Thr	Val	Asn	
				405					410					415		
Glu	Leu	Leu	Thr	Ile	Ala	Ser	Leu	Val	Glu	Lys	Glu	Gly	Ala	Lys	Thr	
			420					425					430			
Glu	Asp	Arg	Lys	Leu	Ile	Ala	Gly	Val	Phe	Tyr	Asn	Arg	Leu	Asn	Arg	
		435					440					445				
Asp	Met	Pro	Leu	Gln	Ser	Asn	Ile	Ala	Ile	Leu	Tyr	Ala	Gln	Gly	Lys	
	450					455					460					
Leu	Gly	Gln	Asn	Ile	Ser	Leu	Ala	Glu	Asp	Val	Ala	Ile	Asp	Thr	Asn	
465					470					475					480	
Ile	Asp	Ser	Pro	Tyr	Asn	Val	Tyr	Lys	Asn	Val	Gly	Leu	Met	Pro	Gly	

				485					490					495			
Pro	Val	Asp	Ser	Pro	Ser	Leu	Asp	Ala	Ile	Glu	Ser	Ser	Ile	Asn	Gln		
			500					505					510				
Thr	Lys	Ser	Asp	Asn	Leu	Tyr	Phe	Val	Ala	Asp	Val	Thr	Glu	Gly	Lys		
		515					520					525					
Val	Tyr	Tyr	Ala	Asn	Asn	Gln	Glu	Asp	His	Asp	Arg	Asn	Val	Ala	Glu		
	530					535					540						
His	Val	Asn	Ser	Lys	Leu	Asn											
545					550												

<210> 19

<211> 551

<212> PRT

<213> Streptococcus pneumoniae

<400> 19

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

210					215					220					
Tyr 225	Val	Thr	Val	Gly	Ile 230	Pro	Glu	Gly	Ser	Asn 235	Val	Gln	Glu	Ile	Gly 240
Thr	Thr	Leu	Glu	Lys 245	Ala	Gly	Leu	Val	Lys 250	His	Gly	Leu	Ile	Phe	Ser 255
Phe	Tyr	Ala	Lys 260	Tyr	Lys	Asn	Tyr	Thr 265	Asp	Leu	Lys	Ala	Gly 270	Tyr	Tyr
Asn	Leu	Gln 275	Lys	Ser	Met	Ser	Thr 280	Glu	Asp	Leu	Leu	Lys 285	Glu	Leu	Gln
Lys	Gly 290	Gly	Thr	Asp	Glu	Pro 295	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr 300
Ile 305	Pro	Glu	Gly	Tyr	Thr 310	Leu	Asp	Gln	Ile	Ala 315	Gln	Thr	Val	Gly	Gln 320
Leu	Gln	Gly	Asp	Phe 325	Lys	Glu	Ser	Leu	Thr 330	Ala	Glu	Ala	Phe	Leu	Ala 335
Lys	Val	Gln	Asp 340	Glu	Thr	Phe	Ile	Ser 345	Gln	Ala	Val	Ala	Lys 350	Tyr	Pro
Thr	Leu	Leu 355	Glu	Ser	Leu	Pro	Val 360	Lys	Asp	Ser	Gly	Ala 365	Arg	Tyr	Arg
Leu 370	Glu	Gly	Tyr	Leu	Phe 375	Pro	Ala	Thr	Tyr	Ser	Ile 380	Lys	Glu	Ser	Thr
Thr 385	Ile	Glu	Ser	Leu	Ile 390	Asp	Glu	Met	Leu	Ala 395	Ala	Met	Asp	Lys	Asn 400
Leu	Ser	Pro	Tyr	Tyr 405	Ser	Thr	Ile	Lys	Ser 410	Lys	Asn	Leu	Thr	Val 415	Asn
Glu	Leu	Leu	Thr 420	Ile	Ala	Ser	Leu	Val 425	Glu	Lys	Glu	Gly	Ala 430	Lys	Thr
Glu	Asp	Arg 435	Lys	Leu	Ile	Ala	Gly 440	Val	Phe	Tyr	Asn	Arg 445	Leu	Asn	Arg
Asp 450	Met	Pro	Leu	Gln	Ser	Asn 455	Ile	Ala	Ile	Leu	Tyr 460	Ala	Gln	Gly	Lys
Leu 465	Gly	Gln	Asn	Ile 470	Ser	Leu	Ala	Glu	Asp	Val 475	Ala	Ile	Asp	Thr	Asn 480
Ile	Asp	Ser	Pro	Tyr 485	Asn	Val	Tyr	Lys	Asn 490	Val	Gly	Leu	Met	Pro	Gly 495
Pro	Val	Asp	Ser 500	Pro	Ser	Leu	Asp	Ala 505	Ile	Glu	Ser	Ser	Ile 510	Asn	Gln
Thr	Lys	Ser 515	Asp	Asn	Leu	Tyr	Phe 520	Val	Ala	Asp	Val	Thr 525	Glu	Gly	Lys
Val 530	Tyr	Tyr	Ala	Asn	Asn 535	Gln	Glu	Asp	His	Asp	Arg 540	Asn	Val	Ala	Glu

His Val Asn Ser Lys Leu Asn
545 550

<210> 20

<211> 551

<212> PRT

<213> Streptococcus pneumoniae

<400> 20

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

Ile Leu Arg Asp Leu Glu Lys Val Lys Gly Tyr Asp Glu Val Leu Lys
20 25 30

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

Glu Leu Met Ala Asp Ser Leu Ser Thr Val Glu Glu Ile Met Arg Lys
50 55 60

Ala Pro Thr Val Pro Thr His Pro Ser Gln Gly Val Pro Ala Ser Pro
65 70 75 80

Ala Asp Glu Ile Gln Arg Glu Thr Pro Gly Val Pro Ser His Pro Ser
85 90 95

Gln Asp Val Pro Ser Ser Pro Ala Glu Glu Ser Gly Ser Arg Pro Gly
100 105 110

Pro Gly Pro Val Arg Pro Lys Lys Leu Glu Arg Glu Tyr Asn Glu Thr
115 120 125

Pro Thr Arg Val Ala Val Ser Tyr Thr Thr Ala Glu Lys Lys Ala Glu
130 135 140

Gln Ala Gly Pro Glu Thr Pro Thr Pro Ala Thr Glu Thr Val Asp Ile
145 150 155 160

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

Lys Pro Lys Lys Glu Lys Lys Ser His Val Lys Ala Phe Val Ile Ser
180 185 190

Phe Leu Val Phe Leu Ala Leu Leu Ser Ala Gly Gly Tyr Phe Gly Tyr
195 200 205

Gln Tyr Val Leu Asp Ser Leu Leu Pro Ile Asp Ala Asn Ser Lys Lys
210 215 220

Tyr Val Thr Val Gly Ile Pro Glu Gly Ser Asn Val Gln Glu Ile Gly
225 230 235 240

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

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

<400> 21

Met	Ser	Glu	Lys	Ser	Arg	Glu	Glu	Glu	Lys	Leu	Ser	Phe	Lys	Glu	Gln
1				5					10					15	
Ile	Leu	Arg	Asp	Leu	Glu	Lys	Val	Lys	Gly	Tyr	Asp	Glu	Val	Leu	Lys
			20					25					30		
Glu	Asp	Glu	Ala	Val	Val	Arg	Thr	Pro	Ala	Asn	Glu	Pro	Ser	Thr	Glu
		35					40					45			
Glu	Leu	Met	Ala	Asp	Ser	Leu	Ser	Thr	Val	Glu	Glu	Ile	Met	Arg	Lys
	50					55					60				
Ala	Pro	Thr	Val	Pro	Thr	His	Pro	Ser	Gln	Gly	Val	Pro	Ala	Ser	Pro
65					70					75					80
Ala	Asp	Glu	Ile	Gln	Arg	Glu	Thr	Pro	Gly	Val	Pro	Ser	His	Pro	Ser
				85					90					95	
Gln	Asp	Val	Pro	Ser	Ser	Pro	Ala	Glu	Glu	Ser	Gly	Ser	Arg	Pro	Gly
			100					105					110		
Pro	Gly	Pro	Val	Arg	Pro	Lys	Lys	Leu	Glu	Arg	Glu	Tyr	Asn	Glu	Thr
		115					120					125			
Pro	Thr	Arg	Val	Ala	Val	Ser	Tyr	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu
	130					135					140				
Gln	Ala	Gly	Pro	Glu	Thr	Pro	Thr	Pro	Ala	Thr	Glu	Thr	Val	Asp	Ile
145					150					155					160
Ile	Arg	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Val
				165					170					175	
Lys	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser
			180					185					190		
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr
		195					200					205			
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys
	210					215					220				
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly
225					230					235					240
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser
				245					250					255	
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr
			260					265					270		
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln
		275					280					285			
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr
	290					295					300				
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Thr	Val	Gly	Gln
305					310					315					320

Leu Gln Gly Asp Phe Lys Glu Ser Leu Thr Ala Glu Ala Phe Leu Ala
 325 330 335
 Lys Val Gln Asp Glu Thr Phe Ile Ser Gln Ala Val Ala Lys Tyr Pro
 340 345 350
 Thr Leu Leu Glu Ser Leu Pro Val Lys Asp Ser Gly Ala Arg Tyr Arg
 355 360 365
 Leu Glu Gly Tyr Leu Phe Pro Ala Thr Tyr Ser Ile Lys Glu Ser Thr
 370 375 380
 Thr Ile Glu Ser Leu Ile Asp Glu Met Leu Ala Ala Met Asp Lys Asn
 385 390 395 400
 Leu Ser Pro Tyr Tyr Ser Thr Ile Lys Ser Lys Asn Leu Thr Ile Asn
 405 410 415
 Glu Leu Leu Thr Ile Ala Ser Leu Val Glu Lys Glu Gly Ala Lys Thr
 420 425 430
 Glu Asp Arg Lys Leu Ile Ala Gly Val Phe Tyr Asn Arg Leu Asn Arg
 435 440 445
 Asp Met Pro Leu Gln Ser Asn Ile Ala Ile Leu Tyr Ala Gln Gly Lys
 450 455 460
 Leu Gly Gln Asn Ile Ser Leu Ala Glu Asp Val Ala Ile Asp Thr Asp
 465 470 475 480
 Ile Asp Ser Pro Tyr Asn Val Tyr Lys Asn Val Gly Leu Met Pro Gly
 485 490 495
 Pro Val Asp Ser Pro Ser Leu Asp Ala Ile Glu Ser Ser Ile Asn Gln
 500 505 510
 Thr Lys Ser Asp Asn Leu Tyr Phe Val Ala Asp Val Thr Glu Gly Lys
 515 520 525
 Val Tyr Tyr Ala Asn Asn Gln Glu Asp His Asp Arg Asn Val Ala Glu
 530 535 540
 His Val Asn Ser Lys Leu Asn
 545 550

<210> 22

<211> 551

<212> PRT

<213> Streptococcus pneumoniae

<400> 22

Met Ser Glu Lys Ser Arg Glu Glu Glu Lys Leu Ser Phe Lys Glu Gln
 1 5 10 15
 Ile Leu Arg Asp Leu Glu Lys Val Lys Gly Tyr Asp Glu Val Leu Lys
 20 25 30
 Glu Asp Glu Ala Val Val Arg Thr Pro Ala Asn Glu Pro Ser Ala Glu
 35 40 45

Glu	Leu	Met	Ala	Asp	Ser	Leu	Ser	Thr	Val	Glu	Glu	Ile	Met	Arg	Lys	50	55	60	
Ala	Pro	Thr	Val	Pro	Thr	His	Pro	Ser	Gln	Gly	Val	Pro	Ala	Ser	Pro	65	70	75	80
Ala	Asp	Glu	Ile	Gln	Arg	Glu	Thr	Pro	Gly	Val	Pro	Ser	His	Pro	Ser	85	90	95	
Gln	Asp	Val	Pro	Ser	Ser	Pro	Ala	Glu	Glu	Ser	Gly	Ser	Arg	Pro	Gly	100	105	110	
Pro	Gly	Pro	Val	Arg	Pro	Lys	Lys	Leu	Glu	Arg	Glu	Tyr	Asn	Glu	Thr	115	120	125	
Pro	Thr	Arg	Val	Ala	Val	Ser	Tyr	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu	130	135	140	
Gln	Ala	Gly	Pro	Ala	Thr	Pro	Thr	Pro	Ala	Thr	Glu	Thr	Val	Asp	Ile	145	150	155	160
Ile	Ser	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Val	165	170	175	
Lys	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser	180	185	190	
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr	195	200	205	
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys	210	215	220	
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly	225	230	235	240
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser	245	250	255	
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr	260	265	270	
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln	275	280	285	
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr	290	295	300	
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Ala	Val	Gly	Gln	305	310	315	320
Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Thr	Phe	Leu	Ala	325	330	335	
Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala	Lys	Tyr	Pro	340	345	350	
Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala	Arg	Tyr	Arg	355	360	365	
Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr				

370		375		380
Thr Ile Glu Ser Leu Ile Asp Glu Met Leu Ala Ala Met Asp Lys Asn				
385		390		400
Leu Ser Pro Tyr Tyr Ser Thr Ile Lys Ser Lys Asn Leu Thr Val Asn				
	405		410	415
Glu Leu Leu Thr Ile Ala Ser Leu Val Glu Lys Glu Gly Ala Lys Thr				
	420		425	430
Glu Asp Arg Lys Leu Ile Ala Gly Val Phe Tyr Asn Arg Leu Asn Arg				
	435		440	445
Asp Met Pro Leu Gln Ser Asn Ile Ala Ile Leu Tyr Ala Gln Gly Lys				
	450		455	460
Leu Gly Gln Asn Ile Ser Leu Ala Glu Asp Val Ala Ile Asp Thr Asn				
	465		470	475
Ile Asp Ser Pro Tyr Asn Val Tyr Lys Asn Val Gly Leu Met Pro Gly				
	485		490	495
Pro Val Asp Ser Pro Ser Leu Asp Ala Ile Glu Ser Ser Ile Asn Gln				
	500		505	510
Thr Lys Ser Asp Asn Leu Tyr Phe Val Ala Asp Val Thr Glu Gly Lys				
	515		520	525
Val Tyr Tyr Ala Asn Asn Gln Glu Asp His Asp Arg Asn Val Ala Glu				
	530		535	540
His Val Asn Ser Lys Leu Asn				
545		550		

<210> 23

<211> 551

<212> PRT

<213> Streptococcus pneumoniae

<400> 23

Met Ser Glu Lys Ser Arg Glu Glu Glu Lys Leu Ser Phe Lys Glu Gln				
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				15
Ile Leu Arg Asp Leu Glu Lys Val Lys Gly Tyr Asp Glu Val Leu Lys				
	20		25	30
Glu Asp Glu Ala Val Val Arg Thr Pro Ala Asn Glu Pro Ser Ala Glu				
	35		40	45
Glu Leu Met Ala Asp Ser Leu Ser Thr Val Glu Glu Ile Met Arg Lys				
	50		55	60
Ala Pro Thr Val Ser Thr His Pro Ser Gln Gly Val Pro Ala Ser Pro				
	65		70	75
				80
Ala Asp Glu Ile Gln Arg Glu Thr Pro Gly Val Pro Ser His Pro Ser				
	85		90	95
Gln Asp Val Pro Ser Ser Pro Ala Glu Glu Ser Gly Ser Arg Pro Gly				

100					105					110					
Pro	Gly	Pro	Val	Arg	Pro	Lys	Lys	Leu	Glu	Arg	Glu	Tyr	Asn	Glu	Thr
		115					120					125			
Pro	Thr	Arg	Val	Ala	Val	Ser	Tyr	Thr	Thr	Ala	Glu	Lys	Lys	Ala	Glu
	130					135					140				
Gln	Ala	Gly	Pro	Glu	Thr	Pro	Thr	Pro	Ala	Thr	Glu	Thr	Val	Asp	Ile
145						150					155				160
Ile	Ser	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala	Lys	Pro	Val
				165					170					175	
Asn	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe	Val	Ile	Ser
			180					185					190		
Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr	Phe	Gly	Tyr
		195					200					205			
Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys
	210					215					220				
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly
225						230					235				240
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu	Ile	Phe	Ser
				245					250					255	
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr
			260					265					270		
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln
		275					280					285			
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr
	290					295					300				
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Ala	Val	Gly	Gln
305						310					315				320
Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Ala	Phe	Leu	Ala
				325					330					335	
Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala	Lys	Tyr	Pro
			340					345					350		
Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala	Arg	Tyr	Arg
		355					360					365			
Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr
	370					375					380				
Thr	Ile	Glu	Ser	Leu	Ile	Asp	Glu	Met	Leu	Ala	Ala	Met	Asp	Lys	Asn
385						390					395				400
Leu	Ser	Pro	Tyr	Tyr	Ser	Thr	Ile	Lys	Ser	Lys	Asn	Leu	Thr	Val	Asn
				405					410					415	
Glu	Leu	Leu	Thr	Ile	Ala	Ser	Leu	Val	Glu	Lys	Glu	Gly	Ala	Lys	Thr
			420					425					430		

Glu Asp Arg Lys Leu Ile Ala Gly Val Phe Tyr Asn Arg Leu Asn Arg
 435 440 445
 Asp Met Pro Leu Gln Ser Asn Ile Ala Ile Leu Tyr Ala Gln Gly Lys
 450 455 460
 Leu Gly Gln Asn Ile Ser Leu Ala Glu Asp Val Ala Ile Asp Thr Asn
 465 470 475 480
 Ile Asp Ser Pro Tyr Asn Val Tyr Lys Asn Val Gly Leu Met Pro Gly
 485 490 495
 Pro Val Asp Ser Pro Ser Leu Asp Ala Ile Glu Ser Ser Ile Asn Gln
 500 505 510
 Thr Lys Ser Asp Asn Leu Tyr Phe Val Ala Asp Val Thr Glu Gly Lys
 515 520 525
 Val Tyr Tyr Ala Asn Asn Gln Glu Asp His Asp Arg Asn Val Ala Glu
 530 535 540
 His Val Asn Ser Lys Leu Asn
 545 550

<210> 24

<211> 554

<212> PRT

<213> Streptococcus pneumoniae

<400> 24

Met Ser Glu Lys Ser Arg Glu Glu Glu Lys Leu Ser Phe Lys Glu Gln
 1 5 10 15
 Ile Leu Arg Asp Leu Glu Lys Val Lys Gly Tyr Asp Glu Val Leu Lys
 20 25 30
 Glu Asp Glu Ala Val Val Arg Thr Pro Ala Asn Glu Pro Ser Ala Glu
 35 40 45
 Glu Leu Met Thr Asp Ser Leu Ser Thr Val Glu Glu Ile Met Arg Lys
 50 55 60
 Ala Pro Thr Val Pro Thr His Pro Ser Gln Gly Val Pro Ala Ser Pro
 65 70 75 80
 Ala Asp Glu Ile Gln Arg Glu Thr Pro Gly Val Pro Ser His Pro Ser
 85 90 95
 His Pro Ser Gln Asp Val Pro Ser Ser Pro Ala Glu Glu Ser Gly Ser
 100 105 110
 Arg Pro Gly Pro Gly Pro Val Arg Pro Lys Lys Leu Glu Arg Glu Tyr
 115 120 125
 Asn Glu Thr Pro Thr Arg Val Ala Val Ser Tyr Thr Thr Ala Glu Lys
 130 135 140
 Lys Ala Glu Gln Ala Gly Pro Glu Thr Pro Thr Pro Ala Thr Glu Thr
 145 150 155 160

Val	Asp	Ile	Ile	Ser	Asp	Thr	Ser	Arg	Arg	Ser	Arg	Arg	Glu	Gly	Ala		
				165					170					175			
Lys	Pro	Val	Asn	Pro	Lys	Lys	Glu	Lys	Lys	Ser	His	Val	Lys	Ala	Phe		
			180					185					190				
Val	Ile	Ser	Phe	Leu	Val	Phe	Leu	Ala	Leu	Leu	Ser	Ala	Gly	Gly	Tyr		
		195					200					205					
Phe	Gly	Tyr	Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn		
	210					215					220						
Ser	Lys	Lys	Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln		
225					230					235					240		
Glu	Ile	Gly	Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Val	Lys	His	Gly	Leu		
				245					250					255			
Ile	Phe	Ser	Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala		
			260					265					270				
Gly	Tyr	Tyr	Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys		
		275					280					285					
Glu	Leu	Gln	Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala		
	290					295					300						
Thr	Leu	Thr	Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Ala		
305					310					315					320		
Val	Gly	Gln	Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Ala		
				325					330					335			
Phe	Leu	Ala	Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala		
			340					345					350				
Lys	Tyr	Pro	Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala		
		355					360					365					
Arg	Tyr	Arg	Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys		
	370					375					380						
Glu	Ser	Thr	Thr	Ile	Glu	Ser	Leu	Ile	Asp	Glu	Met	Leu	Ala	Ala	Met		
385					390					395					400		
Asp	Lys	Asn	Leu	Ser	Pro	Tyr	Tyr	Ser	Thr	Ile	Lys	Ser	Lys	Asn	Leu		
				405					410					415			
Thr	Val	Asn	Glu	Leu	Leu	Thr	Ile	Ala	Ser	Leu	Val	Glu	Lys	Glu	Gly		
			420					425					430				
Ala	Lys	Thr	Glu	Asp	Arg	Lys	Leu	Ile	Ala	Gly	Val	Phe	Tyr	Asn	Arg		
		435					440					445					
Leu	Asn	Arg	Asp	Met	Pro	Leu	Gln	Ser	Asn	Ile	Ala	Ile	Leu	Tyr	Ala		
	450					455					460						
Gln	Gly	Lys	Leu	Gly	Gln	Asn	Ile	Ser	Leu	Ala	Glu	Asp	Val	Ala	Ile		
465					470					475					480		

Asp Thr Asn Ile Asp Ser Pro Tyr Asn Val Tyr Lys Asn Val Gly Leu
485 490 495

Met Pro Gly Pro Val Asp Ser Pro Ser Leu Asp Ala Ile Glu Ser Ser
500 505 510

Ile Asn Gln Thr Lys Ser Asp Asn Leu Tyr Phe Val Ala Asp Val Thr
515 520 525

Glu Gly Lys Val Tyr Tyr Ala Asn Asn Gln Glu Asp His Asp Arg Asn
530 535 540

Val Ala Glu His Val Asn Ser Lys Leu Asn
545 550

<210> 25

<211> 531

<212> PRT

<213> Streptococcus pneumoniae

<400> 25

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

Ile Leu Arg Asp Leu Glu Lys Val Lys Gly Tyr Asp Glu Val Leu Lys
20 25 30

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

Glu Leu Met Ala Asp Ser Leu Ser Thr Val Glu Glu Ile Met Arg Lys
50 55 60

Ala Pro Thr Val Pro Thr His Pro Ser Gln Gly Val Pro Ala Ser Pro
65 70 75 80

Ala Asp Glu Ile Gln Arg Glu Thr Pro Gly Val Pro Ser His Pro Ser
85 90 95

Gln Asp Val Pro Ser Ser Pro Ala Glu Glu Ser Gly Ser Arg Pro Gly
100 105 110

Pro Gly Pro Val Arg Pro Lys Lys Leu Glu Arg Glu Tyr Asn Glu Thr
115 120 125

Pro Thr Arg Val Ala Val Ser Tyr Thr Thr Ala Glu Lys Lys Ala Glu
130 135 140

Gln Ala Gly Pro Glu Thr Pro Thr Pro Ala Thr Glu Thr Val Asp Ile
145 150 155 160

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

Lys Pro Lys Lys Glu Lys Lys Ser His Val Lys Ala Phe Val Ile Ser
180 185 190

Phe Leu Val Phe Leu Ala Leu Leu Ser Ala Gly Gly Tyr Phe Gly Tyr
195 200 205

Gln	Tyr	Val	Leu	Asp	Ser	Leu	Leu	Pro	Ile	Asp	Ala	Asn	Ser	Lys	Lys	210	215	220
Tyr	Val	Thr	Val	Gly	Ile	Pro	Glu	Gly	Ser	Asn	Val	Gln	Glu	Ile	Gly	225	230	235
Thr	Thr	Leu	Glu	Lys	Ala	Gly	Leu	Ile	Lys	His	Gly	Leu	Ile	Phe	Ser	245	250	255
Phe	Tyr	Ala	Lys	Tyr	Lys	Asn	Tyr	Thr	Asp	Leu	Lys	Ala	Gly	Tyr	Tyr	260	265	270
Asn	Leu	Gln	Lys	Ser	Met	Ser	Thr	Glu	Asp	Leu	Leu	Lys	Glu	Leu	Gln	275	280	285
Lys	Gly	Gly	Thr	Asp	Glu	Pro	Gln	Glu	Pro	Val	Leu	Ala	Thr	Leu	Thr	290	295	300
Ile	Pro	Glu	Gly	Tyr	Thr	Leu	Asp	Gln	Ile	Ala	Gln	Thr	Val	Gly	Gln	305	310	315
Leu	Gln	Gly	Asp	Phe	Lys	Glu	Ser	Leu	Thr	Ala	Glu	Ala	Phe	Leu	Ala	325	330	335
Lys	Val	Gln	Asp	Glu	Thr	Phe	Ile	Ser	Gln	Ala	Val	Ala	Lys	Tyr	Pro	340	345	350
Thr	Leu	Leu	Glu	Ser	Leu	Pro	Val	Lys	Asp	Ser	Gly	Ala	Arg	Tyr	Arg	355	360	365
Leu	Glu	Gly	Tyr	Leu	Phe	Pro	Ala	Thr	Tyr	Ser	Ile	Lys	Glu	Ser	Thr	370	375	380
Thr	Ile	Glu	Ser	Leu	Ile	Asp	Glu	Met	Leu	Ala	Ala	Met	Asp	Lys	Asn	385	390	395
Leu	Ser	Pro	Tyr	Tyr	Ser	Thr	Ile	Lys	Ser	Lys	Asn	Leu	Thr	Val	Asn	405	410	415
Glu	Leu	Leu	Thr	Ile	Ala	Ser	Leu	Val	Glu	Lys	Glu	Gly	Ala	Lys	Thr	420	425	430
Glu	Asp	Arg	Lys	Leu	Ile	Ala	Gly	Val	Phe	Tyr	Asn	Arg	Leu	Asn	Arg	435	440	445
Asp	Met	Pro	Leu	Gln	Ser	Asn	Ile	Ala	Ile	Leu	Tyr	Ala	Gln	Gly	Lys	450	455	460
Leu	Gly	Gln	Asn	Ile	Ser	Leu	Ala	Glu	Asp	Val	Ala	Ile	Asp	Thr	Asn	465	470	475
Ile	Asp	Ser	Pro	Tyr	Asn	Val	Tyr	Lys	Asn	Val	Gly	Leu	Met	Pro	Gly	485	490	495
Pro	Val	Asp	Ser	Pro	Ser	Leu	Asp	Ala	Ile	Glu	Ser	Ser	Ile	Asn	Gln	500	505	510
Thr	Lys	Ser	Asp	Thr	Leu	Leu	Cys	Ser	Arg	Cys	His	Arg	Arg	Gln	Gly	515	520	525
Leu	Leu	Cys																

<210> 26
 <211> 380
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 26

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

275		280		285
Ser Phe Ser Gly Tyr Arg Pro Gly Asp Ser Gly Asp His Gly Lys Gly				
290		295		300
Leu Ala Ile Asp Phe Met Val Pro Glu Arg Ser Glu Leu Gly Asp Lys				
305		310		315
Ile Ala Glu Tyr Ala Ile Gln Asn Met Ala Ser Arg Gly Ile Ser Tyr				
		325		330
Ile Ile Trp Lys Gln Arg Phe Tyr Ala Pro Phe Asp Ser Lys Tyr Gly				
		340		345
Pro Ala Asn Thr Trp Asn Pro Met Pro Asp Arg Gly Ser Val Thr Glu				
		355		360
Asn His Tyr Asp His Val His Val Ser Met Asn Gly				
370		375		380

<210> 27

<211> 380

<212> PRT

<213> Streptococcus pneumoniae

<400> 27

Met Lys Lys Arg Met Leu Leu Ala Ser Thr Val Ala Leu Ser Phe Ala				
1		5		10
Pro Val Leu Ala Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser				
		20		25
Val Glu Gln Ile Gln Asn Asp Leu Thr Lys Thr Asp Asn Lys Thr Ser				
		35		40
Tyr Thr Val Gln Tyr Gly Asp Thr Leu Ser Thr Ile Ala Glu Ala Leu				
		50		55
Gly Val Asp Val Thr Val Leu Ala Asn Leu Asn Lys Ile Thr Asn Met				
65		70		75
Asp Leu Ile Phe Pro Glu Thr Val Leu Thr Thr Thr Val Asn Glu Ala				
		85		90
Glu Glu Val Thr Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser				
		100		105
Glu Glu Val Thr Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr				
		115		120
Val Asp Asp Gln Thr Val Gln Val Ala Asp Leu Ser Gln Pro Ile Ala				
		130		135
Glu Ala Pro Lys Glu Val Ala Ser Ser Ser Glu Val Thr Lys Thr Val				
145		150		155
Ile Ala Ser Glu Glu Val Ala Pro Ser Thr Gly Thr Ser Val Pro Glu				
		165		170
Glu Gln Thr Ala Glu Thr Ser Ser Ala Val Ala Glu Glu Ala Pro Gln				

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

<210> 28

<211> 380

<212> PRT

<213> Streptococcus pneumoniae

<400> 28

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

85					90					95					
Glu	Glu	Val	Thr	Glu	Val	Glu	Ile	Gln	Thr	Pro	Gln	Ala	Asp	Ser	Ser
			100					105					110		
Glu	Glu	Val	Thr	Thr	Ala	Thr	Ala	Asp	Leu	Thr	Thr	Asn	Gln	Val	Thr
		115					120					125			
Val	Asp	Asp	Gln	Thr	Val	Gln	Val	Ala	Asp	Leu	Ser	Gln	Pro	Ile	Ala
	130					135					140				
Glu	Ala	Pro	Lys	Glu	Val	Ala	Ser	Ser	Ser	Glu	Val	Thr	Lys	Thr	Val
145						150					155				160
Ile	Ala	Ser	Glu	Glu	Val	Ala	Pro	Ser	Thr	Gly	Thr	Ser	Val	Pro	Glu
				165					170					175	
Glu	Gln	Thr	Ala	Glu	Thr	Ser	Ser	Ala	Val	Ala	Glu	Glu	Ala	Pro	Gln
			180					185					190		
Glu	Thr	Thr	Pro	Gly	Glu	Lys	Gln	Glu	Thr	Gln	Ala	Ser	Pro	Gln	Ala
			195				200					205			
Ala	Ser	Ala	Val	Glu	Ala	Thr	Thr	Thr	Ser	Ser	Glu	Ala	Lys	Glu	Val
	210					215					220				
Ala	Ser	Ser	Asn	Gly	Ala	Thr	Ala	Ala	Val	Ser	Thr	Tyr	Gln	Pro	Glu
225						230					235				240
Glu	Thr	Lys	Ile	Ile	Ser	Thr	Thr	Tyr	Glu	Ala	Pro	Ala	Ala	Pro	Asp
			245						250					255	
Tyr	Ala	Gly	Leu	Ala	Val	Ala	Lys	Ser	Glu	Asn	Ala	Gly	Leu	Gln	Pro
			260					265					270		
Gln	Thr	Ala	Ala	Phe	Lys	Glu	Glu	Ile	Ala	Asn	Leu	Phe	Gly	Ile	Thr
			275				280					285			
Ser	Phe	Ser	Gly	Tyr	Arg	Pro	Gly	Asp	Ser	Gly	Asp	His	Gly	Lys	Gly
	290					295					300				
Leu	Ala	Ile	Asp	Phe	Met	Val	Pro	Glu	Ser	Ser	Glu	Leu	Gly	Asp	Lys
305						310					315				320
Ile	Ala	Glu	Tyr	Ala	Ile	Gln	Asn	Met	Ala	Ser	Arg	Gly	Ile	Ser	Tyr
			325						330					335	
Ile	Ile	Trp	Lys	Gln	Arg	Phe	Tyr	Ala	Pro	Phe	Asp	Ser	Lys	Tyr	Gly
			340					345					350		
Pro	Ala	Asn	Thr	Trp	Asn	Pro	Met	Pro	Asp	Arg	Gly	Ser	Val	Thr	Glu
		355					360					365			
Asn	His	Tyr	Asp	His	Val	His	Val	Ser	Met	Asn	Gly				
	370					375					380				

<210> 29

<211> 380

<212> PRT

<213> Streptococcus pneumoniae

<400> 29

Met	Lys	Lys	Arg	Met	Leu	Leu	Ala	Ser	Thr	Val	Ala	Leu	Ser	Phe	Ala	
1				5					10					15		
Pro	Val	Leu	Ala	Thr	Gln	Ala	Glu	Glu	Val	Leu	Trp	Thr	Ala	Arg	Ser	
			20					25					30			
Val	Glu	Gln	Ile	Gln	Asn	Asp	Leu	Thr	Lys	Thr	Asp	Asn	Lys	Thr	Ser	
		35					40					45				
Tyr	Thr	Val	Gln	Tyr	Gly	Asp	Thr	Leu	Ser	Thr	Ile	Ala	Glu	Ala	Leu	
	50					55					60					
Gly	Val	Asp	Val	Thr	Val	Leu	Ala	Asn	Leu	Asn	Lys	Ile	Thr	Asn	Met	
65					70					75					80	
Asp	Leu	Ile	Phe	Pro	Glu	Thr	Val	Leu	Thr	Thr	Thr	Val	Asn	Glu	Ala	
				85					90					95		
Glu	Glu	Val	Thr	Glu	Val	Glu	Ile	Gln	Thr	Pro	Gln	Ala	Asp	Ser	Ser	
			100					105					110			
Glu	Glu	Val	Thr	Thr	Ala	Thr	Ala	Asp	Leu	Thr	Thr	Asn	Gln	Val	Thr	
		115					120					125				
Val	Asp	Asp	Gln	Thr	Val	Gln	Val	Ala	Asp	Leu	Ser	Gln	Pro	Ile	Ala	
	130					135					140					
Glu	Ala	Pro	Lys	Glu	Val	Ala	Ser	Ser	Ser	Glu	Val	Thr	Lys	Thr	Val	
145					150					155					160	
Ile	Ala	Ser	Glu	Glu	Val	Ala	Pro	Ser	Thr	Gly	Thr	Ser	Val	Pro	Glu	
				165					170					175		
Glu	Gln	Thr	Thr	Glu	Thr	Thr	Arg	Pro	Val	Glu	Glu	Ala	Thr	Pro	Gln	
			180					185					190			
Glu	Thr	Thr	Pro	Ala	Glu	Lys	Gln	Glu	Thr	Gln	Ala	Ser	Pro	Gln	Ala	
		195					200					205				
Ala	Ser	Ala	Val	Glu	Val	Thr	Thr	Thr	Ser	Ser	Glu	Ala	Lys	Glu	Val	
	210					215					220					
Ala	Ser	Ser	Asn	Gly	Ala	Thr	Ala	Ala	Val	Ser	Thr	Tyr	Gln	Pro	Glu	
225					230					235					240	
Glu	Thr	Lys	Ile	Ile	Ser	Thr	Thr	Tyr	Glu	Ala	Pro	Ala	Ala	Pro	Asp	
			245						250					255		
Tyr	Ala	Gly	Leu	Ala	Val	Ala	Lys	Ser	Glu	Asn	Ala	Gly	Leu	Gln	Pro	
			260					265					270			
Gln	Thr	Ala	Ala	Phe	Lys	Glu	Glu	Ile	Ala	Asn	Leu	Phe	Gly	Ile	Thr	
		275					280					285				
Ser	Phe	Ser	Gly	Tyr	Arg	Pro	Gly	Asp	Ser	Gly	Asp	His	Gly	Lys	Gly	
	290					295					300					
Leu	Ala	Ile	Asp	Phe	Met	Val	Pro	Glu	His	Ser	Glu	Leu	Gly	Asp	Lys	
305					310					315					320	

Ile Ala Glu Tyr Ala Ile Gln Asn Met Ala Ser Arg Gly Ile Ser Tyr
325 330 335

Ile Ile Trp Lys Gln Arg Phe Tyr Ala Pro Phe Asp Ser Lys Tyr Gly
340 345 350

Pro Ala Asn Thr Trp Asn Pro Met Pro Asp Arg Gly Ser Val Thr Glu
355 360 365

Asn His Tyr Asp His Val His Val Ser Met Asn Gly
370 375 380

<210> 30

<211> 392

<212> PRT

<213> Streptococcus pneumoniae

<400> 30

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

Pro Val Leu Ala Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser
20 25 30

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

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

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

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

Glu Glu Val Thr Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser
100 105 110

Glu Glu Val Thr Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr
115 120 125

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

Glu Ala Pro Lys Glu Val Ala Ser Ser Ser Glu Val Thr Lys Thr Val
145 150 155 160

Ile Ala Ser Glu Glu Val Ala Pro Ser Thr Gly Thr Ser Val Pro Glu
165 170 175

Glu Gln Thr Ala Glu Thr Ser Ser Ala Val Ala Glu Glu Ala Pro Gln
180 185 190

Glu Thr Thr Pro Ala Glu Lys Gln Glu Thr Gln Val Ser Ser Gln Thr
195 200 205

Glu Ser Ala Val Glu Ala Thr Thr Met Pro Val Glu Glu Lys Ala Thr
210 215 220

Glu Thr Thr Ala Thr Ser Ser Glu Ala Lys Glu Val Ala Ser Ser Asn
 225 230 235 240
 Gly Ala Thr Ala Ala Val Ser Thr Tyr Gln Pro Glu Glu Thr Lys Thr
 245 250 255
 Ile Ser Thr Thr Tyr Glu Ala Pro Ala Ala Pro Asp Tyr Ala Gly Leu
 260 265 270
 Ala Val Ala Lys Ser Glu Asn Ala Gly Leu Gln Pro Gln Thr Ala Ala
 275 280 285
 Phe Lys Glu Glu Ile Ala Asn Leu Phe Gly Ile Thr Ser Phe Ser Gly
 290 295 300
 Tyr Arg Pro Gly Asp Ser Gly Asp His Gly Lys Gly Leu Ala Ile Asp
 305 310 315 320
 Phe Met Val Pro Glu Ser Ser Glu Leu Gly Asp Lys Ile Ala Glu Tyr
 325 330 335
 Ala Ile Gln Asn Met Ala Ser Arg Gly Ile Ser Tyr Ile Ile Trp Lys
 340 345 350
 Gln Arg Phe Tyr Ala Pro Phe Asp Ser Lys Tyr Gly Pro Ala Asn Thr
 355 360 365
 Trp Asn Pro Met Pro Asp Arg Gly Ser Val Thr Glu Asn His Tyr Asp
 370 375 380
 His Val His Val Ser Met Asn Gly
 385 390

<210> 31

<211> 376

<212> PRT

<213> Streptococcus pneumoniae

<400> 31

Met Leu Leu Ala Ser Thr Val Ala Leu Ser Phe Ala Pro Val Leu Ala
 1 5 10 15
 Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser Val Glu Gln Ile
 20 25 30
 Gln Asn Asp Leu Thr Lys Thr Asp Asn Lys Thr Ser Tyr Thr Val Gln
 35 40 45
 Tyr Gly Asp Thr Leu Ser Thr Ile Ala Glu Ala Leu Gly Val Asp Val
 50 55 60
 Thr Val Leu Ala Asn Leu Asn Lys Ile Thr Asn Met Asp Leu Ile Phe
 65 70 75 80
 Pro Glu Thr Val Leu Thr Thr Thr Val Asn Glu Ala Glu Glu Val Thr
 85 90 95
 Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser Glu Glu Val Thr
 100 105 110

Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr Val Asp Asp Gln
 115 120 125
 Thr Val Gln Val Ala Asp Leu Ser Gln Pro Ile Ala Glu Ala Pro Lys
 130 135 140
 Glu Val Ala Ser Ser Ser Glu Val Thr Lys Thr Val Ile Ala Ser Glu
 145 150 155 160
 Glu Val Ala Pro Ser Thr Gly Thr Ser Val Pro Glu Glu Gln Thr Ala
 165 170 175
 Glu Thr Thr Arg Pro Val Glu Glu Ala Thr Pro Gln Glu Thr Thr Pro
 180 185 190
 Ala Glu Lys Gln Glu Thr Gln Ala Ser Pro Gln Ala Ala Leu Ala Val
 195 200 205
 Glu Ala Thr Thr Thr Ser Ser Glu Ala Lys Glu Val Ala Ser Ser Asn
 210 215 220
 Gly Ala Thr Ala Ala Val Ser Thr Tyr Gln Ser Glu Glu Thr Lys Val
 225 230 235 240
 Ile Ser Thr Thr Tyr Glu Ala Pro Ala Ala Pro Asp Tyr Ala Gly Leu
 245 250 255
 Ala Val Ala Lys Ser Glu Asn Ala Gly Leu Gln Pro Gln Thr Ala Ala
 260 265 270
 Phe Lys Glu Glu Ile Ala Asn Leu Phe Gly Ile Thr Ser Phe Ser Gly
 275 280 285
 Tyr Arg Pro Gly Asp Ser Gly Asp His Gly Lys Gly Leu Ala Ile Asp
 290 295 300
 Phe Met Val Pro Glu Arg Ser Glu Leu Gly Asp Lys Ile Ala Glu Tyr
 305 310 315 320
 Ala Ile Gln Asn Met Ala Ser Arg Gly Ile Ser Tyr Ile Ile Trp Lys
 325 330 335
 Gln Arg Phe Tyr Ala Pro Phe Asp Ser Lys Tyr Gly Pro Ala Asn Thr
 340 345 350
 Trp Asn Pro Met Pro Asp Arg Gly Ser Val Thr Glu Asn His Tyr Asp
 355 360 365
 His Val His Val Ser Met Asn Gly
 370 375

<210> 32

<211> 370

<212> PRT

<213> Streptococcus pneumoniae

<400> 32

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

Pro	Val	Leu	Ala	Thr	Gln	Ala	Glu	Glu	Val	Leu	Trp	Thr	Ala	Arg	Ser	20	25	30	
Val	Glu	Gln	Ile	Gln	Asn	Asp	Leu	Thr	Lys	Thr	Asp	Asn	Lys	Thr	Ser	35	40	45	
Tyr	Thr	Val	Gln	Tyr	Gly	Asp	Thr	Leu	Ser	Thr	Ile	Ala	Glu	Ala	Leu	50	55	60	
Gly	Val	Asp	Val	Thr	Val	Leu	Ala	Asn	Leu	Asn	Lys	Ile	Thr	Asn	Met	65	70	75	80
Asp	Leu	Ile	Phe	Pro	Glu	Thr	Val	Leu	Thr	Thr	Thr	Val	Asn	Glu	Ala	85	90	95	
Glu	Glu	Val	Thr	Glu	Val	Glu	Ile	Gln	Thr	Pro	Gln	Ala	Asp	Ser	Ser	100	105	110	
Glu	Glu	Val	Thr	Thr	Ala	Thr	Ala	Asp	Leu	Thr	Thr	Asn	Gln	Val	Thr	115	120	125	
Val	Asp	Asp	Gln	Thr	Val	Gln	Val	Ala	Asp	Leu	Ser	Gln	Pro	Ile	Ala	130	135	140	
Glu	Val	Thr	Lys	Thr	Val	Ile	Ala	Ser	Glu	Glu	Val	Ala	Pro	Ser	Thr	145	150	155	160
Gly	Thr	Ser	Val	Pro	Glu	Glu	Gln	Thr	Thr	Glu	Thr	Thr	Arg	Pro	Val	165	170	175	
Glu	Glu	Ala	Thr	Pro	Gln	Glu	Thr	Thr	Pro	Ala	Glu	Lys	Gln	Glu	Thr	180	185	190	
Gln	Ala	Ser	Pro	Gln	Ala	Ala	Ser	Ala	Val	Glu	Val	Thr	Thr	Thr	Ser	195	200	205	
Ser	Glu	Ala	Lys	Glu	Val	Ala	Ser	Ser	Asn	Gly	Ala	Thr	Ala	Ala	Val	210	215	220	
Ser	Thr	Tyr	Gln	Pro	Glu	Glu	Thr	Lys	Ile	Ile	Ser	Thr	Thr	Tyr	Glu	225	230	235	240
Ala	Pro	Ala	Ala	Pro	Asp	Tyr	Ala	Gly	Leu	Ala	Val	Ala	Lys	Ser	Glu	245	250	255	
Asn	Ala	Gly	Leu	Gln	Pro	Gln	Thr	Ala	Ala	Phe	Lys	Glu	Glu	Ile	Ala	260	265	270	
Asn	Leu	Phe	Gly	Ile	Thr	Ser	Phe	Ser	Gly	Tyr	Arg	Pro	Gly	Asp	Ser	275	280	285	
Gly	Asp	His	Gly	Lys	Gly	Leu	Ala	Ile	Asp	Phe	Met	Val	Pro	Glu	Arg	290	295	300	
Ser	Glu	Leu	Gly	Asp	Lys	Ile	Ala	Glu	Tyr	Ala	Ile	Gln	Asn	Met	Ala	305	310	315	320
Ser	Arg	Gly	Ile	Ser	Tyr	Ile	Ile	Trp	Lys	Gln	Arg	Phe	Tyr	Ala	Pro	325	330	335	

Phe Asp Ser Lys Tyr Gly Pro Ala Asn Thr Trp Asn Pro Met Pro Asp
340 345 350

Arg Gly Ser Val Thr Glu Asn His Tyr Asp His Val His Val Ser Met
355 360 365

Asn Gly
370

<210> 33

<211> 370

<212> PRT

<213> Streptococcus pneumoniae

<400> 33

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

Pro Val Leu Ala Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser
20 25 30

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

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

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

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

Glu Glu Val Thr Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser
100 105 110

Glu Glu Val Thr Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr
115 120 125

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

Glu Val Thr Lys Thr Val Ile Ala Ser Glu Glu Val Ala Pro Ser Thr
145 150 155 160

Gly Thr Ser Val Pro Glu Glu Gln Thr Thr Glu Thr Thr Arg Pro Val
165 170 175

Glu Glu Ala Thr Pro Gln Glu Thr Thr Pro Ala Glu Lys Gln Glu Thr
180 185 190

Gln Ala Ser Pro Gln Ala Ala Ser Ala Val Glu Val Thr Thr Thr Ser
195 200 205

Ser Glu Ala Lys Glu Val Ala Ser Ser Asn Gly Ala Thr Ala Ala Val
210 215 220

Ser Thr Tyr Gln Pro Glu Glu Thr Lys Ile Ile Ser Thr Thr Tyr Glu
225 230 235 240

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

<210> 35

<211> 380

<212> PRT

<213> Streptococcus pneumoniae

<400> 35

Met Lys Lys Arg Met Leu Leu Ala Ser Thr Val Ala Leu Ser Phe Ala
 1 5 10 15
 Pro Val Leu Ala Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser
 20 25 30
 Val Glu Gln Ile Gln Asn Asp Leu Thr Lys Thr Asp Asn Lys Thr Ser
 35 40 45

Tyr	Thr	Val	Gln	Tyr	Gly	Asp	Thr	Leu	Ser	Thr	Ile	Ala	Glu	Ala	Leu	50	55	60	
Gly	Val	Asp	Val	Thr	Val	Leu	Ala	Asn	Leu	Asn	Lys	Ile	Thr	Asn	Met	65	70	75	80
Asp	Leu	Ile	Phe	Pro	Glu	Thr	Val	Leu	Thr	Thr	Thr	Val	Asn	Glu	Ala	85	90	95	
Glu	Glu	Val	Thr	Glu	Val	Glu	Ile	Gln	Thr	Pro	Gln	Ala	Asp	Ser	Ser	100	105	110	
Glu	Glu	Val	Thr	Thr	Ala	Thr	Ala	Asp	Leu	Thr	Thr	Asn	Gln	Val	Thr	115	120	125	
Val	Asp	Val	Gln	Thr	Val	Gln	Val	Ala	Asp	Leu	Ser	Gln	Pro	Ile	Ala	130	135	140	
Glu	Ala	Pro	Lys	Glu	Val	Ala	Ser	Ser	Ser	Glu	Val	Thr	Lys	Thr	Val	145	150	155	160
Ile	Ala	Ser	Glu	Glu	Val	Ala	Pro	Ser	Thr	Gly	Thr	Ser	Val	Pro	Glu	165	170	175	
Glu	Gln	Thr	Ala	Glu	Thr	Thr	Arg	Pro	Val	Glu	Glu	Ala	Thr	Pro	Gln	180	185	190	
Glu	Thr	Thr	Pro	Ala	Lys	Lys	Gln	Glu	Thr	Gln	Ala	Ser	Pro	Gln	Ala	195	200	205	
Ala	Ser	Ala	Val	Glu	Ala	Thr	Thr	Thr	Ser	Ser	Glu	Ala	Lys	Glu	Val	210	215	220	
Ala	Ser	Ser	Asn	Gly	Ala	Thr	Ala	Ala	Val	Ser	Thr	Tyr	Gln	Pro	Glu	225	230	235	240
Glu	Thr	Lys	Val	Ile	Ser	Thr	Thr	Tyr	Glu	Ala	Pro	Ala	Ala	Pro	Asp	245	250	255	
Tyr	Ala	Gly	Leu	Ala	Val	Ala	Lys	Ser	Glu	Asn	Ala	Gly	Leu	Gln	Pro	260	265	270	
Gln	Thr	Ala	Ala	Phe	Lys	Glu	Glu	Ile	Ala	Asn	Leu	Phe	Gly	Ile	Thr	275	280	285	
Ser	Phe	Ser	Gly	Tyr	Arg	Pro	Gly	Asp	Ser	Gly	Asp	His	Gly	Lys	Gly	290	295	300	
Leu	Ala	Ile	Asp	Phe	Met	Val	Ala	Glu	Arg	Ser	Glu	Leu	Gly	Asp	Lys	305	310	315	320
Ile	Ala	Glu	Tyr	Ala	Ile	Gln	Asn	Met	Ala	Ser	Arg	Gly	Ile	Ser	Tyr	325	330	335	
Ile	Ile	Trp	Lys	Gln	Arg	Phe	Tyr	Ala	Pro	Phe	Asp	Ser	Lys	Tyr	Gly	340	345	350	
Pro	Ala	Asn	Thr	Trp	Asn	Pro	Met	Pro	Asp	Arg	Gly	Ser	Val	Thr	Glu	355	360	365	
Asn	His	Tyr	Asp	His	Val	His	Val	Ser	Met	Asn	Gly								

370

375

380

<210> 36

<211> 388

<212> PRT

<213> Streptococcus pneumoniae

<400> 36

Met Leu Leu Ala Ser Thr Val Ala Leu Ser Phe Ala Pro Val Leu Ala
 1 5 10 15

Thr Gln Ala Glu Glu Val Leu Trp Thr Ala Arg Ser Val Glu Gln Ile
 20 25 30

Gln Asn Asp Leu Thr Lys Thr Asp Asn Lys Thr Ser Tyr Thr Val Gln
 35 40 45

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

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

Pro Glu Thr Val Leu Thr Thr Thr Val Asn Glu Ala Glu Glu Val Thr
 85 90 95

Glu Val Glu Ile Gln Thr Pro Gln Ala Asp Ser Ser Glu Glu Val Thr
 100 105 110

Thr Ala Thr Ala Asp Leu Thr Thr Asn Gln Val Thr Val Asp Asp Gln
 115 120 125

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

Glu Val Ala Ser Asn Ser Glu Val Ala Glu Thr Val Thr Ala Ala Glu
 145 150 155 160

Glu Val Ala Leu Ser Thr Asp Ser Thr Thr Pro Glu Gly Gln Pro Ala
 165 170 175

Glu Thr Thr Ser Pro Val Glu Glu Val Ala Pro Gln Ala Thr Thr Leu
 180 185 190

Ala Glu Lys Gln Glu Thr Gln Val Ser Ser Gln Thr Glu Ser Ala Val
 195 200 205

Glu Ala Thr Thr Met Pro Val Glu Glu Lys Ala Thr Glu Thr Thr Ala
 210 215 220

Thr Ser Ser Glu Ala Lys Glu Val Ala Ser Ser Asn Gly Ala Thr Ala
 225 230 235 240

Ala Val Ser Thr Tyr Gln Pro Glu Glu Thr Lys Thr Ile Ser Thr Thr
 245 250 255

Tyr Glu Ala Pro Ala Ala Pro Asp Tyr Ala Gly Leu Ala Val Ala Lys
 260 265 270

Ser Glu Asn Ala Gly Leu Gln Pro Gln Thr Ala Ala Phe Lys Glu Glu

275						280						285					
Ile	Ala	Asn	Leu	Phe	Gly	Ile	Thr	Ser	Phe	Ser	Gly	Tyr	Arg	Pro	Gly		
290						295					300						
Asp	Ser	Gly	Asp	His	Gly	Lys	Gly	Leu	Ala	Ile	Asp	Phe	Met	Val	Pro		
305					310					315				320			
Glu	Ser	Ser	Glu	Leu	Gly	Asp	Lys	Ile	Ala	Glu	Tyr	Ala	Ile	Gln	Asn		
				325					330					335			
Met	Ala	Ser	Arg	Gly	Ile	Ser	Tyr	Ile	Ile	Trp	Lys	Gln	Arg	Phe	Tyr		
			340					345					350				
Ala	Pro	Phe	Asp	Ser	Lys	Tyr	Gly	Pro	Ala	Asn	Thr	Trp	Asn	Pro	Met		
		355					360						365				
Pro	Asp	Arg	Gly	Ser	Val	Thr	Glu	Asn	His	Tyr	Asp	His	Val	His	Val		
	370						375				380						
Ser	Met	Asn	Gly														
385																	

<210> 37

<211> 721

<212> PRT

<213> Streptococcus pneumoniae

<400> 37

Met	Lys	Lys	Lys	Phe	Leu	Ala	Phe	Leu	Leu	Ile	Leu	Phe	Pro	Ile	Phe
1				5					10					15	
Ser	Leu	Gly	Ile	Ala	Lys	Ala	Glu	Thr	Ile	Lys	Ile	Val	Ser	Asp	Thr
			20					25					30		
Ala	Tyr	Ala	Pro	Phe	Glu	Phe	Lys	Asp	Ser	Asp	Gln	Thr	Tyr	Lys	Gly
		35					40					45			
Ile	Asp	Val	Asp	Ile	Ile	Asn	Lys	Val	Ala	Glu	Ile	Lys	Gly	Trp	Asn
	50					55					60				
Ile	Gln	Met	Ser	Tyr	Pro	Gly	Phe	Asp	Ala	Ala	Val	Asn	Ala	Val	Gln
65					70				75						80
Ala	Gly	Gln	Ala	Asp	Ala	Ile	Met	Ala	Gly	Met	Thr	Lys	Thr	Lys	Glu
				85					90					95	
Arg	Glu	Lys	Val	Phe	Thr	Met	Ser	Asp	Thr	Tyr	Tyr	Asp	Thr	Lys	Val
			100					105					110		
Val	Ile	Ala	Thr	Thr	Lys	Ser	His	Lys	Ile	Ser	Lys	Tyr	Asp	Gln	Leu
		115					120					125			
Thr	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ala	Gln	Arg	Phe
	130					135					140				
Leu	Glu	Thr	Ile	Lys	Asp	Lys	Tyr	Gly	Phe	Thr	Ile	Lys	Thr	Phe	Asp
145					150					155					160
Thr	Gly	Asp	Leu	Met	Asn	Asn	Ser	Leu	Ser	Ala	Gly	Ala	Ile	Asp	Ala

165										170					175				
Met	Met	Asp	Asp	Lys	Pro	Val	Ile	Glu	Tyr	Ala	Ile	Asn	Gln	Gly	Gln				
			180					185					190						
Asp	Leu	His	Ile	Glu	Met	Asp	Gly	Glu	Ala	Val	Gly	Ser	Phe	Ala	Phe				
		195					200					205							
Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn				
	210					215					220								
Gln	Ala	Leu	Ser	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile				
225					230					235					240				
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr				
				245					250						255				
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala				
			260					265					270						
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln				
		275					280					285							
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln				
	290					295					300								
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser				
305					310					315					320				
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val				
				325					330					335					
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr				
			340					345					350						
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr				
		355					360					365							
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser				
	370					375					380								
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys				
385					390					395					400				
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Asp	Asp	Ser	Leu	Asn	Thr	Gly	Ala				
				405					410					415					
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser				
			420					425					430						
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu				
		435					440					445							
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met				
	450					455					460								
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys				
465					470					475					480				
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser				
				485					490					495					

Thr Val Asp Glu Thr Thr Leu Trp Gly Leu Leu Gln Asn Asn Tyr Lys
 500 505 510
 Gln Leu Leu Ser Gly Leu Gly Ile Thr Leu Ala Leu Ala Leu Ile Ser
 515 520 525
 Phe Ala Ile Ala Ile Val Ile Gly Ile Ile Phe Gly Met Phe Ser Val
 530 535 540
 Ser Pro Tyr Lys Ser Leu Arg Val Ile Ser Glu Ile Phe Val Asp Val
 545 550 555 560
 Ile Arg Gly Ile Pro Leu Met Ile Leu Ala Ala Phe Ile Phe Trp Gly
 565 570 575
 Ile Pro Asn Phe Ile Glu Ser Ile Thr Gly Gln Gln Ser Pro Ile Asn
 580 585 590
 Asp Phe Val Ala Gly Thr Ile Ala Leu Ser Leu Asn Ala Ala Ala Tyr
 595 600 605
 Ile Ala Glu Ile Val Arg Gly Gly Ile Gln Ala Val Pro Val Gly Gln
 610 615 620
 Met Glu Ala Ser Arg Ser Leu Gly Ile Ser Tyr Gly Lys Thr Met Arg
 625 630 635 640
 Lys Ile Ile Leu Pro Gln Val Thr Lys Leu Met Leu Pro Asn Phe Val
 645 650 655
 Asn Gln Phe Val Ile Ala Leu Lys Asp Thr Thr Ile Val Ser Ala Ile
 660 665 670
 Gly Leu Val Glu Leu Phe Gln Thr Gly Lys Ile Ile Ile Ala Arg Asn
 675 680 685
 Tyr Gln Ser Phe Lys Met Tyr Ala Ile Leu Ala Ile Phe Tyr Leu Val
 690 695 700
 Ile Ile Thr Leu Leu Thr Arg Leu Ala Lys Arg Leu Glu Lys Arg Ile
 705 710 715 720
 Arg

<210> 38

<211> 721

<212> PRT

<213> Streptococcus pneumoniae

<400> 38

Met Lys Lys Lys Phe Leu Ala Phe Leu Leu Ile Leu Phe Pro Ile Phe
 1 5 10 15
 Ser Leu Gly Ile Ala Lys Ala Glu Thr Ile Lys Ile Val Ser Asp Thr
 20 25 30
 Ala Tyr Ala Pro Phe Glu Phe Lys Asp Ser Asp Gln Thr Tyr Lys Gly
 35 40 45

Ile	Asp	Val	Asp	Ile	Ile	Asn	Lys	Val	Ala	Glu	Ile	Lys	Gly	Trp	Asn		
	50					55					60						
Ile	Gln	Met	Ser	Tyr	Pro	Gly	Phe	Asp	Ala	Ala	Val	Asn	Ala	Val	Gln		
65					70					75					80		
Ala	Gly	Gln	Ala	Asp	Ala	Ile	Met	Ala	Gly	Met	Thr	Lys	Thr	Lys	Glu		
				85					90					95			
Arg	Glu	Lys	Val	Phe	Thr	Met	Ser	Asp	Thr	Tyr	Tyr	Asp	Thr	Lys	Val		
			100					105					110				
Val	Ile	Ala	Thr	Thr	Lys	Ser	His	Lys	Ile	Ser	Lys	Tyr	Asp	Gln	Leu		
		115					120					125					
Thr	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ala	Gln	Arg	Phe		
	130					135					140						
Leu	Glu	Thr	Ile	Lys	Asp	Lys	Tyr	Gly	Phe	Thr	Ile	Lys	Thr	Phe	Asp		
145					150					155					160		
Thr	Gly	Asp	Leu	Met	Asn	Asn	Ser	Leu	Ser	Ala	Gly	Ala	Ile	Asp	Ala		
				165					170					175			
Met	Met	Asp	Asp	Lys	Pro	Val	Ile	Glu	Tyr	Ala	Ile	Asn	Gln	Gly	Gln		
			180					185					190				
Asp	Leu	His	Ile	Glu	Met	Asp	Gly	Glu	Ala	Val	Gly	Ser	Phe	Ala	Phe		
		195					200					205					
Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn		
	210					215					220						
Gln	Ala	Leu	Ser	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile		
225					230					235					240		
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr		
				245					250					255			
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala		
			260					265					270				
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln		
		275					280					285					
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln		
	290					295					300						
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser		
305					310					315					320		
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val		
				325					330					335			
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr		
			340					345					350				
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr		
		355					360					365					

Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser	370	375	380	
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys	385	390	395	400
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Asp	Asp	Ser	Leu	Asn	Thr	Gly	Ala	405	410	415	
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser	420	425	430	
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu	435	440	445	
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met	450	455	460	
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys	465	470	475	480
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser	485	490	495	
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys	500	505	510	
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser	515	520	525	
Phe	Ala	Ile	Ala	Ile	Val	Ile	Gly	Ile	Ile	Phe	Gly	Met	Phe	Ser	Val	530	535	540	
Ser	Pro	Tyr	Lys	Ser	Leu	Arg	Val	Ile	Ser	Glu	Ile	Phe	Val	Asp	Val	545	550	555	560
Ile	Arg	Gly	Ile	Pro	Leu	Met	Ile	Leu	Ala	Ala	Phe	Ile	Phe	Trp	Gly	565	570	575	
Ile	Pro	Asn	Phe	Ile	Glu	Ser	Ile	Thr	Gly	Gln	Gln	Ser	Pro	Ile	Asn	580	585	590	
Asp	Phe	Val	Ala	Gly	Thr	Ile	Ala	Leu	Ser	Leu	Asn	Ala	Ala	Ala	Tyr	595	600	605	
Ile	Ala	Glu	Ile	Val	Arg	Gly	Gly	Ile	Gln	Ala	Val	Pro	Val	Gly	Gln	610	615	620	
Met	Glu	Ala	Ser	Arg	Ser	Leu	Gly	Ile	Ser	Tyr	Gly	Lys	Thr	Met	Arg	625	630	635	640
Lys	Ile	Ile	Leu	Pro	Gln	Val	Thr	Lys	Leu	Met	Leu	Pro	Asn	Phe	Val	645	650	655	
Asn	Gln	Phe	Val	Ile	Ala	Leu	Lys	Asp	Thr	Thr	Ile	Val	Ser	Ala	Ile	660	665	670	
Gly	Leu	Val	Glu	Leu	Phe	Gln	Thr	Gly	Lys	Ile	Ile	Ile	Ala	Arg	Asn	675	680	685	
Tyr	Gln	Ser	Phe	Lys	Met	Tyr	Ala	Ile	Leu	Ala	Ile	Phe	Tyr	Leu	Val				

690

695

700

Ile Ile Thr Leu Leu Thr Arg Leu Ala Lys Arg Leu Glu Lys Arg Ile
 705 710 715 720

Arg

<210> 39

<211> 721

<212> PRT

<213> Streptococcus pneumoniae

<400> 39

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

Ile Asp Val Asp Ile Ile Asn Lys Val Ala Glu Ile Lys Gly Trp Asn
 50 55 60

Ile Gln Met Ser Tyr Pro Gly Phe Asp Ala Ala Val Asn Ala Val Gln
 65 70 75 80

Ala Gly Gln Ala Asp Ala Ile Met Ala Gly Met Thr Lys Thr Lys Glu
 85 90 95

Arg Glu Lys Val Phe Thr Met Ser Asp Thr Tyr Tyr Asp Thr Lys Val
 100 105 110

Val Ile Ala Thr Thr Lys Ser His Lys Ile Ser Lys Tyr Asp Gln Leu
 115 120 125

Thr Gly Lys Thr Val Gly Val Lys Asn Gly Thr Ala Ala Gln Arg Phe
 130 135 140

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

Thr Gly Asp Leu Met Asn Asn Ser Leu Ser Ala Gly Ala Ile Asp Ala
 165 170 175

Met Met Asp Asp Lys Pro Val Ile Glu Tyr Ala Ile Asn Gln Gly Gln
 180 185 190

Asp Leu His Ile Glu Met Asp Gly Glu Ala Val Gly Ser Phe Ala Phe
 195 200 205

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

Gln Ala Leu Ser Glu Met Lys Lys Asp Gly Ser Leu Asp Lys Ile Ile
 225 230 235 240

Lys Lys Trp Thr Ala Ser Ser Ser Ser Ala Val Pro Thr Thr Thr Thr

245										250					255				
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala				
			260					265					270						
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln				
		275					280					285							
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln				
	290					295					300								
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser				
305					310					315					320				
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val				
				325					330					335					
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr				
			340					345						350					
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr				
		355					360					365							
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser				
	370					375					380								
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys				
385					390					395					400				
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Tyr	Asp	Ser	Leu	Asn	Thr	Gly	Ala				
				405					410					415					
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser				
			420					425						430					
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu				
		435					440					445							
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met				
	450					455					460								
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys				
465					470					475					480				
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser				
				485					490					495					
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys				
			500					505					510						
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser				
		515					520					525							
Phe	Ala	Ile	Ala	Ile	Val	Ile	Gly	Ile	Ile	Phe	Gly	Met	Phe	Ser	Val				
	530					535					540								
Ser	Pro	Tyr	Lys	Ser	Leu	Arg	Val	Ile	Ser	Glu	Ile	Phe	Val	Asp	Val				
545					550					555					560				
Ile	Arg	Gly	Ile	Pro	Leu	Met	Ile	Leu	Ala	Ala	Phe	Ile	Phe	Trp	Gly				
				565					570					575					

Ile Pro Asn Phe Ile Glu Ser Ile Thr Gly Gln Gln Ser Pro Ile Asn
 580 585 590
 Asp Phe Val Ala Gly Thr Ile Ala Leu Ser Leu Asn Ala Ala Ala Tyr
 595 600 605
 Ile Ala Glu Ile Val Arg Gly Gly Ile Gln Ala Val Pro Val Gly Gln
 610 615 620
 Met Glu Ala Ser Arg Ser Leu Gly Ile Ser Tyr Gly Lys Thr Met Arg
 625 630 635 640
 Lys Ile Ile Leu Pro Gln Ala Thr Lys Leu Met Leu Pro Asn Phe Val
 645 650 655
 Asn Gln Phe Val Ile Ala Leu Lys Asp Thr Thr Ile Val Ser Ala Ile
 660 665 670
 Gly Leu Val Glu Leu Phe Gln Thr Gly Lys Ile Ile Ile Ala Arg Asn
 675 680 685
 Tyr Gln Ser Phe Lys Met Tyr Ala Ile Leu Ala Ile Phe Tyr Leu Val
 690 695 700
 Ile Ile Thr Leu Leu Thr Arg Leu Ala Lys Arg Leu Glu Lys Arg Ile
 705 710 715 720
 Arg

<210> 40
 <211> 721
 <212> PRT
 <213> Streptococcus pneumoniae

<400> 40
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 20 25 30
 Ala Tyr Ala Pro Phe Glu Phe Lys Asp Ser Asp Gln Thr Tyr Lys Gly
 35 40 45
 Ile Asp Val Asp Ile Ile Asn Lys Val Ala Glu Ile Lys Gly Trp Asn
 50 55 60
 Ile Gln Met Ser Tyr Pro Gly Phe Asp Ala Ala Val Asn Ala Val Gln
 65 70 75 80
 Ala Gly Gln Ala Asp Ala Ile Met Ala Gly Met Thr Lys Thr Lys Glu
 85 90 95
 Arg Glu Lys Val Phe Thr Met Ser Asp Thr Tyr Tyr Asp Thr Lys Val
 100 105 110
 Val Ile Ala Thr Thr Lys Ser His Lys Ile Ser Lys Tyr Asp Gln Leu
 115 120 125

Thr	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ala	Gln	Arg	Phe		
	130					135					140						
Leu	Glu	Thr	Ile	Lys	Asp	Lys	Tyr	Gly	Phe	Thr	Ile	Lys	Thr	Phe	Asp		
145				150						155					160		
Thr	Gly	Asp	Leu	Met	Asn	Asn	Ser	Leu	Ser	Ala	Gly	Ala	Ile	Asp	Ala		
				165					170					175			
Met	Met	Asp	Asp	Lys	Pro	Val	Ile	Glu	Tyr	Ala	Ile	Asn	Gln	Gly	Gln		
			180					185					190				
Asp	Leu	His	Ile	Glu	Met	Asp	Gly	Glu	Ala	Val	Gly	Ser	Phe	Ala	Phe		
	195						200					205					
Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn		
	210					215					220						
Gln	Ala	Leu	Ala	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile		
225					230					235					240		
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr		
				245					250					255			
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala		
			260					265					270				
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln		
	275						280					285					
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln		
	290					295					300						
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser		
305					310					315					320		
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val		
				325					330					335			
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr		
			340					345					350				
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr		
	355					360						365					
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser		
	370					375					380						
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys		
385					390					395					400		
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Tyr	Asp	Ser	Leu	Asn	Thr	Gly	Ala		
				405					410					415			
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser		
			420				425						430				
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu		
	435						440					445					

Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met
450						455					460				
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys
465					470					475					480
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser
				485					490					495	
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys
			500					505					510		
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser
		515					520					525			
Phe	Ala	Ile	Ala	Ile	Val	Ile	Gly	Ile	Ile	Phe	Gly	Met	Phe	Ser	Val
	530					535					540				
Ser	Pro	Tyr	Lys	Ser	Leu	Arg	Val	Ile	Ser	Glu	Ile	Phe	Val	Asp	Val
545					550					555					560
Ile	Arg	Gly	Ile	Pro	Leu	Met	Ile	Leu	Ala	Ala	Phe	Ile	Phe	Trp	Gly
				565					570					575	
Ile	Pro	Asn	Phe	Ile	Glu	Ser	Ile	Thr	Gly	Gln	Gln	Ser	Pro	Ile	Asn
			580					585					590		
Asp	Phe	Val	Ala	Gly	Thr	Ile	Ala	Leu	Ser	Leu	Asn	Ala	Ala	Ala	Tyr
		595					600					605			
Ile	Ala	Glu	Ile	Val	Arg	Gly	Gly	Ile	Gln	Ala	Val	Pro	Val	Gly	Gln
	610					615					620				
Met	Glu	Ala	Ser	Arg	Ser	Leu	Gly	Ile	Ser	Tyr	Gly	Lys	Thr	Met	Arg
625					630					635					640
Lys	Ile	Ile	Leu	Pro	Gln	Ala	Thr	Lys	Leu	Met	Leu	Pro	Asn	Phe	Val
				645					650					655	
Asn	Gln	Phe	Val	Ile	Ala	Leu	Lys	Asp	Thr	Thr	Ile	Val	Ser	Ala	Ile
			660					665					670		
Gly	Leu	Val	Glu	Leu	Phe	Gln	Thr	Gly	Lys	Ile	Ile	Ile	Ala	Arg	Asn
		675					680					685			
Tyr	Gln	Ser	Phe	Lys	Met	Tyr	Ala	Ile	Leu	Ala	Ile	Phe	Tyr	Leu	Val
	690					695					700				
Ile	Ile	Thr	Leu	Leu	Thr	Arg	Leu	Ala	Lys	Arg	Leu	Glu	Lys	Arg	Ile
705					710					715					720

Arg

<210> 41

<211> 721

<212> PRT

<213> Streptococcus pneumoniae

<400> 41

Met	Lys	Lys	Lys	Phe	Leu	Ala	Phe	Leu	Leu	Ile	Leu	Phe	Pro	Ile	Phe	
1				5					10					15		
Ser	Leu	Gly	Ile	Ala	Lys	Ala	Glu	Thr	Ile	Lys	Ile	Val	Ser	Asp	Thr	
			20					25					30			
Ala	Tyr	Ala	Pro	Phe	Glu	Phe	Lys	Asp	Ser	Asp	Gln	Thr	Tyr	Lys	Gly	
		35					40					45				
Ile	Asp	Val	Asp	Ile	Ile	Asn	Lys	Val	Ala	Glu	Ile	Lys	Gly	Trp	Asn	
	50					55					60					
Ile	Gln	Met	Ser	Tyr	Pro	Gly	Phe	Asp	Ala	Ala	Val	Asn	Ala	Val	Gln	
65					70					75					80	
Ala	Gly	Gln	Ala	Asp	Ala	Ile	Met	Ala	Gly	Met	Thr	Lys	Thr	Lys	Glu	
				85					90					95		
Arg	Glu	Lys	Val	Phe	Thr	Met	Ser	Asp	Thr	Tyr	Tyr	Asp	Thr	Lys	Val	
			100					105					110			
Val	Ile	Ala	Thr	Thr	Lys	Ser	His	Lys	Ile	Ser	Lys	Tyr	Asp	Gln	Leu	
		115					120					125				
Thr	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ala	Gln	Arg	Phe	
	130					135					140					
Leu	Glu	Thr	Ile	Lys	Asp	Lys	Tyr	Gly	Phe	Thr	Ile	Lys	Thr	Phe	Asp	
145					150					155					160	
Thr	Gly	Asp	Leu	Met	Asn	Asn	Ser	Leu	Ser	Ala	Gly	Ala	Ile	Asp	Ala	
			165					170						175		
Met	Met	Asp	Asp	Lys	Pro	Val	Ile	Glu	Tyr	Ala	Ile	Asn	Gln	Gly	Gln	
			180					185					190			
Asp	Leu	His	Ile	Glu	Met	Asp	Gly	Glu	Ala	Val	Gly	Ser	Phe	Ala	Phe	
		195					200					205				
Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn	
	210					215					220					
Gln	Ala	Leu	Ala	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile	
225					230					235					240	
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr	
				245					250					255		
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala	
			260					265					270			
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln	
		275					280					285				
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln	
	290					295					300					
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser	
305					310					315					320	
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val	

325					330					335						
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr	
340					345					350						
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr	
355					360					365						
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser	
370					375					380						
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys	
385					390					395					400	
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Tyr	Asp	Ser	Leu	Asn	Thr	Gly	Ala	
405					410					415						
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser	
420					425					430						
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu	
435					440					445						
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met	
450					455					460						
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys	
465					470					475					480	
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser	
485					490					495						
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys	
500					505					510						
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser	
515					520					525						
Phe	Ala	Ile	Ala	Ile	Val	Ile	Gly	Ile	Ile	Phe	Gly	Met	Phe	Ser	Val	
530					535					540						
Ser	Pro	Tyr	Lys	Ser	Leu	Arg	Val	Ile	Ser	Glu	Ile	Phe	Val	Asp	Val	
545					550					555					560	
Ile	Arg	Gly	Ile	Pro	Leu	Met	Ile	Leu	Ala	Ala	Phe	Ile	Phe	Trp	Gly	
565					570					575						
Ile	Pro	Asn	Phe	Ile	Glu	Ser	Ile	Thr	Gly	Gln	Gln	Ser	Pro	Ile	Asn	
580					585					590						
Asp	Phe	Val	Ala	Gly	Thr	Ile	Ala	Leu	Ser	Leu	Asn	Ala	Ala	Ala	Tyr	
595					600					605						
Ile	Ala	Glu	Ile	Val	Arg	Gly	Gly	Ile	Gln	Ala	Val	Pro	Val	Gly	Gln	
610					615					620						
Met	Glu	Ala	Ser	Arg	Ser	Leu	Gly	Ile	Ser	Tyr	Gly	Lys	Thr	Met	Arg	
625					630					635					640	
Lys	Ile	Ile	Leu	Pro	Gln	Ala	Thr	Lys	Leu	Met	Leu	Pro	Asn	Phe	Val	
645					650					655						

Asn Gln Phe Val Ile Ala Leu Lys Asp Thr Thr Ile Val Ser Ala Ile
660 665 670

Gly Leu Val Glu Leu Phe Gln Thr Gly Lys Ile Ile Ile Ala Arg Asn
675 680 685

Tyr Gln Ser Phe Lys Met Tyr Ala Ile Leu Ala Ile Phe Tyr Leu Val
690 695 700

Ile Ile Thr Leu Leu Thr Arg Leu Ala Lys Arg Leu Glu Lys Arg Ile
705 710 715 720

Arg

<210> 42

<211> 721

<212> PRT

<213> Streptococcus pneumoniae

<400> 42

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

Ala Tyr Ala Pro Phe Glu Phe Lys Asp Ser Asp Gln Thr Tyr Lys Gly
35 40 45

Ile Asp Val Asp Ile Ile Asn Lys Val Ala Glu Ile Lys Gly Trp Asn
50 55 60

Ile Gln Met Ser Tyr Pro Gly Phe Asp Ala Ala Val Asn Ala Val Gln
65 70 75 80

Ala Gly Gln Ala Asp Ala Ile Met Ala Gly Met Thr Lys Thr Lys Glu
85 90 95

Arg Glu Lys Val Phe Thr Met Ser Asp Thr Tyr Tyr Asp Thr Lys Val
100 105 110

Val Ile Ala Thr Thr Lys Ser His Lys Ile Ser Lys Tyr Asp Gln Leu
115 120 125

Thr Gly Lys Thr Val Gly Val Lys Asn Gly Thr Ala Ala Gln Arg Phe
130 135 140

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

Thr Gly Asp Leu Met Asn Asn Ser Leu Ser Ala Gly Ala Ile Asp Ala
165 170 175

Met Met Asp Asp Lys Pro Val Ile Glu Tyr Ala Ile Asn Gln Gly Gln
180 185 190

Asp Leu His Ile Glu Met Asp Gly Glu Ala Val Gly Ser Phe Ala Phe
195 200 205

Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn		
	210					215					220						
Gln	Ala	Leu	Ala	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile		
225					230					235					240		
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr		
				245					250					255			
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala		
			260					265					270				
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln		
	275						280					285					
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln		
	290					295					300						
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser		
305					310					315					320		
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val		
				325					330					335			
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr		
			340					345					350				
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr		
		355					360					365					
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser		
	370					375					380						
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys		
385					390					395					400		
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Tyr	Asp	Ser	Leu	Asn	Thr	Gly	Ala		
				405					410					415			
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser		
			420					425					430				
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu		
		435					440					445					
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met		
	450					455					460						
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys		
465					470					475					480		
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser		
				485					490					495			
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys		
			500					505					510				
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser		
		515					520					525					

Phe Ala Ile Ala Ile Val Ile Gly Ile Ile Phe Gly Met Phe Ser Val
530 535 540
Ser Pro Tyr Lys Ser Leu Arg Val Ile Ser Glu Ile Phe Val Asp Val
545 550 555 560
Ile Arg Gly Ile Pro Leu Met Ile Leu Ala Ala Phe Ile Phe Trp Gly
565 570 575
Ile Pro Asn Phe Ile Glu Ser Ile Thr Gly Gln Gln Ser Pro Ile Asn
580 585 590
Asp Phe Val Ala Gly Thr Ile Ala Leu Ser Leu Asn Ala Ala Ala Tyr
595 600 605
Ile Ala Glu Ile Val Arg Gly Gly Ile Gln Ala Val Pro Val Gly Gln
610 615 620
Met Glu Ala Ser Arg Ser Leu Gly Ile Ser Tyr Gly Lys Thr Met Arg
625 630 635 640
Lys Ile Ile Leu Pro Gln Ala Thr Lys Leu Met Leu Pro Asn Phe Val
645 650 655
Asn Gln Phe Val Ile Ala Leu Lys Asp Thr Thr Ile Val Ser Ala Ile
660 665 670
Gly Leu Val Glu Leu Phe Gln Thr Gly Lys Ile Ile Ile Ala Arg Asn
675 680 685
Tyr Gln Ser Phe Lys Met Tyr Ala Ile Leu Ala Ile Phe Tyr Leu Val
690 695 700
Ile Ile Thr Leu Leu Thr Arg Leu Ala Lys Arg Leu Glu Lys Arg Ile
705 710 715 720

Arg

<210> 43

<211> 721

<212> PRT

<213> Streptococcus pneumoniae

<400> 43

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Ser Leu Gly Ile Ala Lys Ala Glu Thr Ile Lys Ile Val Ser Asp Thr
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Ala Tyr Ala Pro Phe Glu Phe Lys Asp Ser Asp Gln Thr Tyr Lys Gly
35 40 45
Ile Asp Val Asp Ile Ile Asn Lys Val Ala Glu Ile Lys Gly Trp Asn
50 55 60
Ile Gln Met Ser Tyr Pro Gly Phe Asp Ala Ala Val Asn Ala Val Gln
65 70 75 80

Ala	Gly	Gln	Ala	Asp	Ala	Ile	Met	Ala	Gly	Met	Thr	Lys	Thr	Lys	Glu	85	90	95	
Arg	Glu	Lys	Val	Phe	Thr	Met	Ser	Asp	Thr	Tyr	Tyr	Asp	Thr	Lys	Val	100	105	110	
Val	Ile	Ala	Thr	Thr	Lys	Ser	His	Lys	Ile	Ser	Lys	Tyr	Asp	Gln	Leu	115	120	125	
Thr	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ala	Gln	Arg	Phe	130	135	140	
Leu	Glu	Thr	Ile	Lys	Asp	Lys	Tyr	Gly	Phe	Thr	Ile	Lys	Thr	Phe	Asp	145	150	155	160
Thr	Gly	Asp	Leu	Met	Asn	Asn	Ser	Leu	Ser	Ala	Gly	Ala	Ile	Asp	Ala	165	170	175	
Met	Met	Asp	Asp	Lys	Pro	Val	Ile	Glu	Tyr	Ala	Ile	Asn	Gln	Gly	Gln	180	185	190	
Asp	Leu	His	Ile	Glu	Met	Asp	Gly	Glu	Ala	Val	Gly	Ser	Phe	Ala	Phe	195	200	205	
Gly	Val	Lys	Lys	Gly	Ser	Lys	Tyr	Glu	His	Leu	Val	Thr	Glu	Phe	Asn	210	215	220	
Gln	Ala	Leu	Ala	Glu	Met	Lys	Lys	Asp	Gly	Ser	Leu	Asp	Lys	Ile	Ile	225	230	235	240
Lys	Lys	Trp	Thr	Ala	Ser	Ser	Ser	Ser	Ala	Val	Pro	Thr	Thr	Thr	Thr	245	250	255	
Leu	Ala	Gly	Leu	Lys	Ala	Ile	Pro	Val	Lys	Ala	Lys	Tyr	Ile	Ile	Ala	260	265	270	
Ser	Asp	Ser	Ser	Phe	Ala	Pro	Phe	Val	Phe	Gln	Asn	Ser	Ser	Asn	Gln	275	280	285	
Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln	290	295	300	
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser	305	310	315	320
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val	325	330	335	
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr	340	345	350	
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr	355	360	365	
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser	370	375	380	
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys	385	390	395	400
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Tyr	Asp	Ser	Leu	Asn	Thr	Gly	Ala				

405										410					415				
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser				
			420					425					430						
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu				
		435					440					445							
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met				
	450					455					460								
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys				
465					470					475					480				
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser				
				485					490						495				
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys				
			500					505					510						
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser				
		515					520					525							
Phe	Ala	Ile	Ala	Ile	Val	Ile	Gly	Ile	Ile	Phe	Gly	Met	Phe	Ser	Val				
	530					535					540								
Ser	Pro	Tyr	Lys	Ser	Leu	Arg	Val	Ile	Ser	Glu	Ile	Phe	Val	Asp	Val				
545					550					555					560				
Ile	Arg	Gly	Ile	Pro	Leu	Met	Ile	Leu	Ala	Ala	Phe	Ile	Phe	Trp	Gly				
				565					570						575				
Ile	Pro	Asn	Phe	Ile	Glu	Ser	Ile	Thr	Gly	Gln	Gln	Ser	Pro	Ile	Asn				
			580					585					590						
Asp	Phe	Val	Ala	Gly	Thr	Ile	Ala	Leu	Ser	Leu	Asn	Ala	Ala	Ala	Tyr				
		595					600					605							
Ile	Ala	Glu	Ile	Val	Arg	Gly	Gly	Ile	Gln	Ala	Val	Pro	Val	Gly	Gln				
	610					615					620								
Met	Glu	Ala	Ser	Arg	Ser	Leu	Gly	Ile	Ser	Tyr	Gly	Lys	Thr	Met	Arg				
625					630					635					640				
Lys	Ile	Ile	Leu	Pro	Gln	Ser	Thr	Lys	Leu	Met	Leu	Pro	Asn	Phe	Val				
				645					650					655					
Asn	Gln	Phe	Val	Ile	Ala	Leu	Lys	Asp	Thr	Thr	Ile	Val	Ser	Ala	Ile				
			660					665					670						
Gly	Leu	Val	Glu	Leu	Phe	Gln	Thr	Gly	Lys	Ile	Ile	Ile	Ala	Arg	Asn				
		675					680					685							
Tyr	Gln	Ser	Phe	Lys	Met	Tyr	Ala	Ile	Leu	Ala	Ile	Phe	Tyr	Leu	Val				
	690					695					700								
Ile	Ile	Thr	Leu	Leu	Thr	Arg	Leu	Ala	Lys	Arg	Leu	Glu	Lys	Arg	Ile				
705					710					715					720				
Arg																			

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<210> 44
<211> 721
<212> PRT
<213> Streptococcus pneumoniae
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<400> 44

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

Ala Tyr Ala Pro Phe Glu Phe Lys Asp Ser Asp Gln Thr Tyr Lys Gly
35 40 45

Ile Asp Val Asp Ile Ile Asn Lys Val Ala Glu Ile Lys Gly Trp Asn
50 55 60

Ile Gln Met Ser Tyr Pro Gly Phe Asp Ala Ala Val Asn Ala Val Gln
65 70 75 80

Ala Gly Gln Ala Asp Ala Ile Met Ala Gly Met Thr Lys Thr Lys Glu
85 90 95

Arg Glu Lys Val Phe Thr Met Ser Asp Thr Tyr Tyr Asp Thr Lys Val
100 105 110

Val Ile Ala Thr Thr Lys Ser His Lys Ile Ser Lys Tyr Asp Gln Leu
115 120 125

Thr Gly Lys Thr Val Gly Val Lys Asn Gly Thr Ala Ala Gln Arg Phe
130 135 140

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

Thr Gly Asp Leu Met Asn Asn Ser Leu Ser Ala Gly Ala Ile Asp Ala
165 170 175

Met Met Asp Asp Lys Pro Val Ile Glu Tyr Ala Ile Asn Gln Gly Gln
180 185 190

Asp Leu His Ile Glu Met Asp Gly Glu Ala Val Gly Ser Phe Ala Phe
195 200 205

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

Gln Ala Leu Ala Glu Met Lys Lys Asp Gly Ser Leu Asp Lys Ile Ile
225 230 235 240

Lys Lys Trp Thr Ala Ser Ser Ser Ser Ala Val Pro Thr Thr Thr Thr
245 250 255

Leu Ala Gly Leu Lys Ala Ile Pro Val Lys Ala Lys Tyr Ile Ile Ala
260 265 270

Ser Asp Ser Ser Phe Ala Pro Phe Val Phe Gln Asn Ser Ser Asn Gln
275 280 285

Tyr	Thr	Gly	Ile	Asp	Met	Glu	Leu	Ile	Lys	Ala	Ile	Ala	Lys	Asp	Gln	290	295	300
Gly	Phe	Glu	Ile	Glu	Ile	Thr	Asn	Pro	Gly	Phe	Asp	Ala	Ala	Ile	Ser	305	310	315
Ala	Val	Gln	Ala	Gly	Gln	Ala	Asp	Gly	Ile	Ile	Ala	Gly	Met	Ser	Val	325	330	335
Thr	Asp	Ala	Arg	Lys	Ala	Thr	Phe	Asp	Phe	Ser	Glu	Ser	Tyr	Tyr	Thr	340	345	350
Ala	Asn	Thr	Ile	Leu	Gly	Val	Lys	Glu	Ser	Ser	Asn	Ile	Ala	Ser	Tyr	355	360	365
Glu	Asp	Leu	Lys	Gly	Lys	Thr	Val	Gly	Val	Lys	Asn	Gly	Thr	Ala	Ser	370	375	380
Gln	Thr	Phe	Leu	Thr	Glu	Asn	Gln	Ser	Lys	Tyr	Gly	Tyr	Lys	Ile	Lys	385	390	395
Thr	Phe	Ala	Asp	Gly	Ser	Ser	Met	Tyr	Asp	Ser	Leu	Asn	Thr	Gly	Ala	405	410	415
Ile	Asp	Ala	Val	Met	Asp	Asp	Glu	Pro	Val	Leu	Lys	Tyr	Ser	Ile	Ser	420	425	430
Gln	Gly	Gln	Lys	Leu	Lys	Thr	Pro	Ile	Ser	Gly	Thr	Pro	Ile	Gly	Glu	435	440	445
Thr	Ala	Phe	Ala	Val	Lys	Lys	Gly	Ala	Asn	Pro	Glu	Leu	Ile	Glu	Met	450	455	460
Phe	Asn	Asn	Gly	Leu	Ala	Asn	Leu	Lys	Ala	Asn	Gly	Glu	Phe	Gln	Lys	465	470	475
Ile	Leu	Asp	Lys	Tyr	Leu	Ala	Ser	Glu	Ser	Ser	Thr	Ala	Ser	Thr	Ser	485	490	495
Thr	Val	Asp	Glu	Thr	Thr	Leu	Trp	Gly	Leu	Leu	Gln	Asn	Asn	Tyr	Lys	500	505	510
Gln	Leu	Leu	Ser	Gly	Leu	Gly	Ile	Thr	Leu	Ala	Leu	Ala	Leu	Ile	Ser	515	520	525
Phe	Ala	Ile	Ala	Ile	Val	Ile	Gly	Ile	Ile	Phe	Gly	Met	Phe	Ser	Val	530	535	540
Ser	Pro	Tyr	Lys	Ser	Leu	Arg	Val	Ile	Ser	Glu	Ile	Phe	Val	Asp	Val	545	550	555
Ile	Arg	Gly	Ile	Pro	Leu	Met	Ile	Leu	Ala	Ala	Phe	Ile	Phe	Trp	Gly	565	570	575
Ile	Pro	Asn	Phe	Ile	Glu	Ser	Ile	Thr	Gly	Gln	Gln	Ser	Pro	Ile	Asn	580	585	590
Asp	Phe	Val	Ala	Gly	Thr	Ile	Ala	Leu	Ser	Leu	Asn	Ala	Ala	Ala	Tyr	595	600	605

Ile Ala Glu Ile Val Arg Gly Gly Ile Gln Ala Val Pro Val Gly Gln
610 615 620

Met Glu Ala Ser Arg Ser Leu Gly Ile Ser Tyr Gly Lys Thr Met Arg
625 630 635 640

Lys Ile Ile Leu Pro Gln Ala Thr Lys Leu Met Leu Pro Asn Phe Val
645 650 655

Asn Gln Phe Val Ile Ala Leu Lys Asp Thr Thr Ile Val Ser Ala Ile
660 665 670

Gly Leu Val Glu Leu Phe Gln Thr Gly Lys Ile Ile Ile Ala Arg Asn
675 680 685

Tyr Gln Ser Phe Lys Met Tyr Ala Ile Leu Ala Ile Phe Tyr Leu Val
690 695 700

Ile Ile Thr Leu Leu Thr Arg Leu Ala Lys Arg Leu Glu Lys Arg Ile
705 710 715 720

Ser