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<110> ONCOTHERAPY SCIENCE, INC.
CANCER PRECISION MEDICINE, INC.
KIYOTANI, Kazuma
NAKAMURA, Yusuke

<120> SARS-CoV-2 PROTEIN-DERIVED PEPTIDES AND VACCINES INCLUDING THE SAME

<130> 0NC-X2002P

<150> JP 2021-000382

<151> 2021-01-05

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<170> PatentIn version 3.5

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<223> a peptide derived from ORF1ab polyprotein of SARS-CoV-2

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<210> 17

<211> 1273

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 17

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Asn Leu Thr Thr Arg Thr Gln Leu Pro Pro Ala Tyr Thr Asn Ser Phe
 20 25 30

Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val Leu
 35 40 45

His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr Trp
 50 55 60

Phe His Ala Ile His Val Ser Gly Thr Asn Gly Thr Lys Arg Phe Asp
 65 70 75 80

Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr Glu
 85 90 95

Lys Ser Asn Ile Ile Arg Gly Trp Ile Phe Gly Thr Thr Leu Asp Ser
 100 105 110

Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val Ile
 115 120 125

Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val Tyr
 130 135 140

Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val Tyr
 145 150 155 160

Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe Leu
 165 170 175

Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu Phe
 180 185 190

Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His Thr

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

Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser Pro
 370 375 380

Thr Lys Leu Asn Asp Leu Cys Phe Thr Asn Val Tyr Ala Asp Ser Phe
 385 390 395 400

Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr Gly
 405 410 415

Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly Cys
 420 425 430

Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly Asn
 435 440 445

Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro Phe
 450 455 460

Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro Cys
 465 470 475 480

Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr Gly
 485 490 495

Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val Val
 500 505 510

Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro Lys
 515 520 525

Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe Asn
 530 535 540

Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe Leu
 545 550 555 560

Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala Val
 565 570 575

Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser Phe
 580 585 590

Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln Val
 595 600 605

Ala Val Leu Tyr Gln Asp Val Asn Cys Thr Glu Val Pro Val Ala Ile
 610 615 620

His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly Ser
 625 630 635 640

Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His Val
 645 650 655

Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys Ala
 660 665 670

Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val Ala
 675 680 685

Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn Ser
 690 695 700

Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr Ile
 705 710 715 720

Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser Val
 725 730 735

Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn Leu
 740 745 750

Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu Thr
 755 760 765

Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala Gln
 770 775 780

Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly Phe
 785 790 795 800

Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg Ser
 805 810 815

Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala Gly
 820 825 830

Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg Asp
 835 840 845

Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro Leu
 850 855 860

Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala Gly
 865 870 875 880

Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln Ile

885

890

895

Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val Thr
 900 905 910

Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe Asn
 915 920 925

Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser Ala
 930 935 940

Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu Asn
 945 950 955 960

Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser Val
 965 970 975

Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val Gln
 980 985 990

Ile Asp Arg Leu Ile Thr Gly Arg Leu Gln Ser Leu Gln Thr Tyr Val
 995 1000 1005

Thr Gln Gln Leu Ile Arg Ala Ala Glu Ile Arg Ala Ser Ala Asn
 1010 1015 1020

Leu Ala Ala Thr Lys Met Ser Glu Cys Val Leu Gly Gln Ser Lys
 1025 1030 1035

Arg Val Asp Phe Cys Gly Lys Gly Tyr His Leu Met Ser Phe Pro
 1040 1045 1050

Gln Ser Ala Pro His Gly Val Val Phe Leu His Val Thr Tyr Val
 1055 1060 1065

Pro Ala Gln Glu Lys Asn Phe Thr Thr Ala Pro Ala Ile Cys His
 1070 1075 1080

Asp Gly Lys Ala His Phe Pro Arg Glu Gly Val Phe Val Ser Asn
 1085 1090 1095

Gly Thr His Trp Phe Val Thr Gln Arg Asn Phe Tyr Glu Pro Gln
 1100 1105 1110

Ile Ile Thr Thr Asp Asn Thr Phe Val Ser Gly Asn Cys Asp Val
 1115 1120 1125

Val Ile Gly Ile Val Asn Asn Thr Val Tyr Asp Pro Leu Gln Pro
 1130 1135 1140

Glu Leu Asp Ser Phe Lys Glu Glu Leu Asp Lys Tyr Phe Lys Asn
 1145 1150 1155

His Thr Ser Pro Asp Val Asp Leu Gly Asp Ile Ser Gly Ile Asn
 1160 1165 1170

Ala Ser Val Val Asn Ile Gln Lys Glu Ile Asp Arg Leu Asn Glu
 1175 1180 1185

Val Ala Lys Asn Leu Asn Glu Ser Leu Ile Asp Leu Gln Glu Leu
 1190 1195 1200

Gly Lys Tyr Glu Gln Tyr Ile Lys Trp Pro Trp Tyr Ile Trp Leu
 1205 1210 1215

Gly Phe Ile Ala Gly Leu Ile Ala Ile Val Met Val Thr Ile Met
 1220 1225 1230

Leu Cys Cys Met Thr Ser Cys Cys Ser Cys Leu Lys Gly Cys Cys
 1235 1240 1245

Ser Cys Gly Ser Cys Cys Lys Phe Asp Glu Asp Asp Ser Glu Pro
 1250 1255 1260

Val Leu Lys Gly Val Lys Leu His Tyr Thr
 1265 1270

<210> 18

<211> 75

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 18

Met Tyr Ser Phe Val Ser Glu Glu Thr Gly Thr Leu Ile Val Asn Ser
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Val Leu Leu Phe Leu Ala Phe Val Val Phe Leu Leu Val Thr Leu Ala
 20 25 30

Ile Leu Thr Ala Leu Arg Leu Cys Ala Tyr Cys Cys Asn Ile Val Asn
 35 40 45

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

Leu Asn Ser Ser Arg Val Pro Asp Leu Leu Val
 65 70 75

<210> 19
 <211> 222
 <212> PRT
 <213> Severe acute respiratory syndrome coronavirus 2

<400> 19

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

Leu Glu Gln Trp Asn Leu Val Ile Gly Phe Leu Phe Leu Thr Trp Ile
 20 25 30

Cys Leu Leu Gln Phe Ala Tyr Ala Asn Arg Asn Arg Phe Leu Tyr Ile
 35 40 45

Ile Lys Leu Ile Phe Leu Trp Leu Leu Trp Pro Val Thr Leu Ala Cys
 50 55 60

Phe Val Leu Ala Ala Val Tyr Arg Ile Asn Trp Ile Thr Gly Gly Ile
 65 70 75 80

Ala Ile Ala Met Ala Cys Leu Val Gly Leu Met Trp Leu Ser Tyr Phe
 85 90 95

Ile Ala Ser Phe Arg Leu Phe Ala Arg Thr Arg Ser Met Trp Ser Phe
 100 105 110

Asn Pro Glu Thr Asn Ile Leu Leu Asn Val Pro Leu His Gly Thr Ile
 115 120 125

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

Leu Arg Gly His Leu Arg Ile Ala Gly His His Leu Gly Arg Cys Asp
 145 150 155 160

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

Ser Tyr Tyr Lys Leu Gly Ala Ser Gln Arg Val Ala Gly Asp Ser Gly
 180 185 190

Phe Ala Ala Tyr Ser Arg Tyr Arg Ile Gly Asn Tyr Lys Leu Asn Thr
 195 200 205

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

<210> 20

<211> 419

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 20

Met Ser Asp Asn Gly Pro Gln Asn Gln Arg Asn Ala Pro Arg Ile Thr
 1 5 10 15

Phe Gly Gly Pro Ser Asp Ser Thr Gly Ser Asn Gln Asn Gly Glu Arg
 20 25 30

Ser Gly Ala Arg Ser Lys Gln Arg Arg Pro Gln Gly Leu Pro Asn Asn
 35 40 45

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

Lys Phe Pro Arg Gly Gln Gly Val Pro Ile Asn Thr Asn Ser Ser Pro
65 70 75 80

Asp Asp Gln Ile Gly Tyr Tyr Arg Arg Ala Thr Arg Arg Ile Arg Gly
85 90 95

Gly Asp Gly Lys Met Lys Asp Leu Ser Pro Arg Trp Tyr Phe Tyr Tyr
100 105 110

Leu Gly Thr Gly Pro Glu Ala Gly Leu Pro Tyr Gly Ala Asn Lys Asp
115 120 125

Gly Ile Ile Trp Val Ala Thr Glu Gly Ala Leu Asn Thr Pro Lys Asp
130 135 140

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

Leu Pro Gln Gly Thr Thr Leu Pro Lys Gly Phe Tyr Ala Glu Gly Ser
165 170 175

Arg Gly Gly Ser Gln Ala Ser Ser Arg Ser Ser Ser Arg Ser Arg Asn
180 185 190

Ser Ser Arg Asn Ser Thr Pro Gly Ser Ser Arg Gly Thr Ser Pro Ala
195 200 205

Arg Met Ala Gly Asn Gly Gly Asp Ala Ala Leu Ala Leu Leu Leu Leu
210 215 220

Asp Arg Leu Asn Gln Leu Glu Ser Lys Met Ser Gly Lys Gly Gln Gln
225 230 235 240

Gln Gln Gly Gln Thr Val Thr Lys Lys Ser Ala Ala Glu Ala Ser Lys
 245 250 255

Lys Pro Arg Gln Lys Arg Thr Ala Thr Lys Ala Tyr Asn Val Thr Gln
 260 265 270

Ala Phe Gly Arg Arg Gly Pro Glu Gln Thr Gln Gly Asn Phe Gly Asp
 275 280 285

Gln Glu Leu Ile Arg Gln Gly Thr Asp Tyr Lys His Trp Pro Gln Ile
 290 295 300

Ala Gln Phe Ala Pro Ser Ala Ser Ala Phe Phe Gly Met Ser Arg Ile
 305 310 315 320

Gly Met Glu Val Thr Pro Ser Gly Thr Trp Leu Thr Tyr Thr Gly Ala
 325 330 335

Ile Lys Leu Asp Asp Lys Asp Pro Asn Phe Lys Asp Gln Val Ile Leu
 340 345 350

Leu Asn Lys His Ile Asp Ala Tyr Lys Thr Phe Pro Pro Thr Glu Pro
 355 360 365

Lys Lys Asp Lys Lys Lys Lys Ala Asp Glu Thr Gln Ala Leu Pro Gln
 370 375 380

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

Asp Asp Phe Ser Lys Gln Leu Gln Gln Ser Met Ser Ser Ala Asp Ser

405

410

415

Thr Gln Ala

<210> 21

<211> 7096

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 21

Met	Glu	Ser	Leu	Val	Pro	Gly	Phe	Asn	Glu	Lys	Thr	His	Val	Gln	Leu
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Ser	Leu	Pro	Val	Leu	Gln	Val	Arg	Asp	Val	Leu	Val	Arg	Gly	Phe	Gly
		20					25						30		

Asp	Ser	Val	Glu	Glu	Val	Leu	Ser	Glu	Ala	Arg	Gln	His	Leu	Lys	Asp
	35					40					45				

Gly	Thr	Cys	Gly	Leu	Val	Glu	Val	Glu	Lys	Gly	Val	Leu	Pro	Gln	Leu
	50					55					60				

Glu	Gln	Pro	Tyr	Val	Phe	Ile	Lys	Arg	Ser	Asp	Ala	Arg	Thr	Ala	Pro
65					70					75				80	

His	Gly	His	Val	Met	Val	Glu	Leu	Val	Ala	Glu	Leu	Glu	Gly	Ile	Gln
				85					90					95	

Tyr	Gly	Arg	Ser	Gly	Glu	Thr	Leu	Gly	Val	Leu	Val	Pro	His	Val	Gly
			100					105					110		

Glu	Ile	Pro	Val	Ala	Tyr	Arg	Lys	Val	Leu	Leu	Arg	Lys	Asn	Gly	Asn
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115		120		125
Lys Gly Ala Gly Gly His Ser Tyr Gly Ala Asp Leu Lys Ser Phe Asp				
130		135		140
Leu Gly Asp Glu Leu Gly Thr Asp Pro Tyr Glu Asp Phe Gln Glu Asn				
145		150		155
Trp Asn Thr Lys His Ser Ser Gly Val Thr Arg Glu Leu Met Arg Glu				
		165		170
				175
Leu Asn Gly Gly Ala Tyr Thr Arg Tyr Val Asp Asn Asn Phe Cys Gly				
		180		185
				190
Pro Asp Gly Tyr Pro Leu Glu Cys Ile Lys Asp Leu Leu Ala Arg Ala				
		195		200
				205
Gly Lys Ala Ser Cys Thr Leu Ser Glu Gln Leu Asp Phe Ile Asp Thr				
		210		215
				220
Lys Arg Gly Val Tyr Cys Cys Arg Glu His Glu His Glu Ile Ala Trp				
		225		230
				235
				240
Tyr Thr Glu Arg Ser Glu Lys Ser Tyr Glu Leu Gln Thr Pro Phe Glu				
		245		250
				255
Ile Lys Leu Ala Lys Lys Phe Asp Thr Phe Asn Gly Glu Cys Pro Asn				
		260		265
				270
Phe Val Phe Pro Leu Asn Ser Ile Ile Lys Thr Ile Gln Pro Arg Val				
		275		280
				285

Glu Lys Lys Lys Leu Asp Gly Phe Met Gly Arg Ile Arg Ser Val Tyr
 290 295 300

Pro Val Ala Ser Pro Asn Glu Cys Asn Gln Met Cys Leu Ser Thr Leu
 305 310 315 320

Met Lys Cys Asp His Cys Gly Glu Thr Ser Trp Gln Thr Gly Asp Phe
 325 330 335

Val Lys Ala Thr Cys Glu Phe Cys Gly Thr Glu Asn Leu Thr Lys Glu
 340 345 350

Gly Ala Thr Thr Cys Gly Tyr Leu Pro Gln Asn Ala Val Val Lys Ile
 355 360 365

Tyr Cys Pro Ala Cys His Asn Ser Glu Val Gly Pro Glu His Ser Leu
 370 375 380

Ala Glu Tyr His Asn Glu Ser Gly Leu Lys Thr Ile Leu Arg Lys Gly
 385 390 395 400

Gly Arg Thr Ile Ala Phe Gly Gly Cys Val Phe Ser Tyr Val Gly Cys
 405 410 415

His Asn Lys Cys Ala Tyr Trp Val Pro Arg Ala Ser Ala Asn Ile Gly
 420 425 430

Cys Asn His Thr Gly Val Val Gly Glu Gly Ser Glu Gly Leu Asn Asp
 435 440 445

Asn Leu Leu Glu Ile Leu Gln Lys Glu Lys Val Asn Ile Asn Ile Val
 450 455 460

Gly Asp Phe Lys Leu Asn Glu Glu Ile Ala Ile Ile Leu Ala Ser Phe
 465 470 475 480

Ser Ala Ser Thr Ser Ala Phe Val Glu Thr Val Lys Gly Leu Asp Tyr
 485 490 495

Lys Ala Phe Lys Gln Ile Val Glu Ser Cys Gly Asn Phe Lys Val Thr
 500 505 510

Lys Gly Lys Ala Lys Lys Gly Ala Trp Asn Ile Gly Glu Gln Lys Ser
 515 520 525

Ile Leu Ser Pro Leu Tyr Ala Phe Ala Ser Glu Ala Ala Arg Val Val
 530 535 540

Arg Ser Ile Phe Ser Arg Thr Leu Glu Thr Ala Gln Asn Ser Val Arg
 545 550 555 560

Val Leu Gln Lys Ala Ala Ile Thr Ile Leu Asp Gly Ile Ser Gln Tyr
 565 570 575

Ser Leu Arg Leu Ile Asp Ala Met Met Phe Thr Ser Asp Leu Ala Thr
 580 585 590

Asn Asn Leu Val Val Met Ala Tyr Ile Thr Gly Gly Val Val Gln Leu
 595 600 605

Thr Ser Gln Trp Leu Thr Asn Ile Phe Gly Thr Val Tyr Glu Lys Leu
 610 615 620

Lys Pro Val Leu Asp Trp Leu Glu Glu Lys Phe Lys Glu Gly Val Glu
 625 630 635 640

Phe Leu Arg Asp Gly Trp Glu Ile Val Lys Phe Ile Ser Thr Cys Ala
 645 650 655

Cys Glu Ile Val Gly Gly Gln Ile Val Thr Cys Ala Lys Glu Ile Lys
 660 665 670

Glu Ser Val Gln Thr Phe Phe Lys Leu Val Asn Lys Phe Leu Ala Leu
 675 680 685

Cys Ala Asp Ser Ile Ile Ile Gly Gly Ala Lys Leu Lys Ala Leu Asn
 690 695 700

Leu Gly Glu Thr Phe Val Thr His Ser Lys Gly Leu Tyr Arg Lys Cys
 705 710 715 720

Val Lys Ser Arg Glu Glu Thr Gly Leu Leu Met Pro Leu Lys Ala Pro
 725 730 735

Lys Glu Ile Ile Phe Leu Glu Gly Glu Thr Leu Pro Thr Glu Val Leu
 740 745 750

Thr Glu Glu Val Val Leu Lys Thr Gly Asp Leu Gln Pro Leu Glu Gln
 755 760 765

Pro Thr Ser Glu Ala Val Glu Ala Pro Leu Val Gly Thr Pro Val Cys
 770 775 780

Ile Asn Gly Leu Met Leu Leu Glu Ile Lys Asp Thr Glu Lys Tyr Cys
 785 790 795 800

Ala Leu Ala Pro Asn Met Met Val Thr Asn Asn Thr Phe Thr Leu Lys

805

810

815

Gly Gly Ala Pro Thr Lys Val Thr Phe Gly Asp Asp Thr Val Ile Glu
 820 825 830

Val Gln Gly Tyr Lys Ser Val Asn Ile Thr Phe Glu Leu Asp Glu Arg
 835 840 845

Ile Asp Lys Val Leu Asn Glu Lys Cys Ser Ala Tyr Thr Val Glu Leu
 850 855 860

Gly Thr Glu Val Asn Glu Phe Ala Cys Val Val Ala Asp Ala Val Ile
 865 870 875 880

Lys Thr Leu Gln Pro Val Ser Glu Leu Leu Thr Pro Leu Gly Ile Asp
 885 890 895

Leu Asp Glu Trp Ser Met Ala Thr Tyr Tyr Leu Phe Asp Glu Ser Gly
 900 905 910

Glu Phe Lys Leu Ala Ser His Met Tyr Cys Ser Phe Tyr Pro Pro Asp
 915 920 925

Glu Asp Glu Glu Glu Gly Asp Cys Glu Glu Glu Glu Phe Glu Pro Ser
 930 935 940

Thr Gln Tyr Glu Tyr Gly Thr Glu Asp Asp Tyr Gln Gly Lys Pro Leu
 945 950 955 960

Glu Phe Gly Ala Thr Ser Ala Ala Leu Gln Pro Glu Glu Glu Gln Glu
 965 970 975

Glu Asp Trp Leu Asp Asp Asp Ser Gln Gln Thr Val Gly Gln Gln Asp
 980 985 990

Gly Ser Glu Asp Asn Gln Thr Thr Thr Ile Gln Thr Ile Val Glu Val
 995 1000 1005

Gln Pro Gln Leu Glu Met Glu Leu Thr Pro Val Val Gln Thr Ile
 1010 1015 1020

Glu Val Asn Ser Phe Ser Gly Tyr Leu Lys Leu Thr Asp Asn Val
 1025 1030 1035

Tyr Ile Lys Asn Ala Asp Ile Val Glu Glu Ala Lys Lys Val Lys
 1040 1045 1050

Pro Thr Val Val Val Asn Ala Ala Asn Val Tyr Leu Lys His Gly
 1055 1060 1065

Gly Gly Val Ala Gly Ala Leu Asn Lys Ala Thr Asn Asn Ala Met
 1070 1075 1080

Gln Val Glu Ser Asp Asp Tyr Ile Ala Thr Asn Gly Pro Leu Lys
 1085 1090 1095

Val Gly Gly Ser Cys Val Leu Ser Gly His Asn Leu Ala Lys His
 1100 1105 1110

Cys Leu His Val Val Gly Pro Asn Val Asn Lys Gly Glu Asp Ile
 1115 1120 1125

Gln Leu Leu Lys Ser Ala Tyr Glu Asn Phe Asn Gln His Glu Val
 1130 1135 1140

Leu Leu Ala Pro Leu Leu Ser Ala Gly Ile Phe Gly Ala Asp Pro
 1145 1150 1155

Ile His Ser Leu Arg Val Cys Val Asp Thr Val Arg Thr Asn Val
 1160 1165 1170

Tyr Leu Ala Val Phe Asp Lys Asn Leu Tyr Asp Lys Leu Val Ser
 1175 1180 1185

Ser Phe Leu Glu Met Lys Ser Glu Lys Gln Val Glu Gln Lys Ile
 1190 1195 1200

Ala Glu Ile Pro Lys Glu Glu Val Lys Pro Phe Ile Thr Glu Ser
 1205 1210 1215

Lys Pro Ser Val Glu Gln Arg Lys Gln Asp Asp Lys Lys Ile Lys
 1220 1225 1230

Ala Cys Val Glu Glu Val Thr Thr Thr Leu Glu Glu Thr Lys Phe
 1235 1240 1245

Leu Thr Glu Asn Leu Leu Leu Tyr Ile Asp Ile Asn Gly Asn Leu
 1250 1255 1260

His Pro Asp Ser Ala Thr Leu Val Ser Asp Ile Asp Ile Thr Phe
 1265 1270 1275

Leu Lys Lys Asp Ala Pro Tyr Ile Val Gly Asp Val Val Gln Glu
 1280 1285 1290

Gly Val Leu Thr Ala Val Val Ile Pro Thr Lys Lys Ala Gly Gly
 1295 1300 1305

Thr Thr Glu Met Leu Ala Lys Ala Leu Arg Lys Val Pro Thr Asp
 1310 1315 1320

Asn Tyr Ile Thr Thr Tyr Pro Gly Gln Gly Leu Asn Gly Tyr Thr
 1325 1330 1335

Val Glu Glu Ala Lys Thr Val Leu Lys Lys Cys Lys Ser Ala Phe
 1340 1345 1350

Tyr Ile Leu Pro Ser Ile Ile Ser Asn Glu Lys Gln Glu Ile Leu
 1355 1360 1365

Gly Thr Val Ser Trp Asn Leu Arg Glu Met Leu Ala His Ala Glu
 1370 1375 1380

Glu Thr Arg Lys Leu Met Pro Val Cys Val Glu Thr Lys Ala Ile
 1385 1390 1395

Val Ser Thr Ile Gln Arg Lys Tyr Lys Gly Ile Lys Ile Gln Glu
 1400 1405 1410

Gly Val Val Asp Tyr Gly Ala Arg Phe Tyr Phe Tyr Thr Ser Lys
 1415 1420 1425

Thr Thr Val Ala Ser Leu Ile Asn Thr Leu Asn Asp Leu Asn Glu
 1430 1435 1440

Thr Leu Val Thr Met Pro Leu Gly Tyr Val Thr His Gly Leu Asn
 1445 1450 1455

Leu Glu Glu Ala Ala Arg Tyr Met Arg Ser Leu Lys Val Pro Ala

Asp Asp Thr Leu Arg Val Glu Ala Phe Glu Tyr Tyr His Thr Thr
 1625 1630 1635

Asp Pro Ser Phe Leu Gly Arg Tyr Met Ser Ala Leu Asn His Thr
 1640 1645 1650

Lys Lys Trp Lys Tyr Pro Gln Val Asn Gly Leu Thr Ser Ile Lys
 1655 1660 1665

Trp Ala Asp Asn Asn Cys Tyr Leu Ala Thr Ala Leu Leu Thr Leu
 1670 1675 1680

Gln Gln Ile Glu Leu Lys Phe Asn Pro Pro Ala Leu Gln Asp Ala
 1685 1690 1695

Tyr Tyr Arg Ala Arg Ala Gly Glu Ala Ala Asn Phe Cys Ala Leu
 1700 1705 1710

Ile Leu Ala Tyr Cys Asn Lys Thr Val Gly Glu Leu Gly Asp Val
 1715 1720 1725

Arg Glu Thr Met Ser Tyr Leu Phe Gln His Ala Asn Leu Asp Ser
 1730 1735 1740

Cys Lys Arg Val Leu Asn Val Val Cys Lys Thr Cys Gly Gln Gln
 1745 1750 1755

Gln Thr Thr Leu Lys Gly Val Glu Ala Val Met Tyr Met Gly Thr
 1760 1765 1770

Leu Ser Tyr Glu Gln Phe Lys Lys Gly Val Gln Ile Pro Cys Thr
 1775 1780 1785

Cys Gly Lys Gln Ala Thr Lys Tyr Leu Val Gln Gln Glu Ser Pro
 1790 1795 1800

Phe Val Met Met Ser Ala Pro Pro Ala Gln Tyr Glu Leu Lys His
 1805 1810 1815

Gly Thr Phe Thr Cys Ala Ser Glu Tyr Thr Gly Asn Tyr Gln Cys
 1820 1825 1830

Gly His Tyr Lys His Ile Thr Ser Lys Glu Thr Leu Tyr Cys Ile
 1835 1840 1845

Asp Gly Ala Leu Leu Thr Lys Ser Ser Glu Tyr Lys Gly Pro Ile
 1850 1855 1860

Thr Asp Val Phe Tyr Lys Glu Asn Ser Tyr Thr Thr Thr Ile Lys
 1865 1870 1875

Pro Val Thr Tyr Lys Leu Asp Gly Val Val Cys Thr Glu Ile Asp
 1880 1885 1890

Pro Lys Leu Asp Asn Tyr Tyr Lys Lys Asp Asn Ser Tyr Phe Thr
 1895 1900 1905

Glu Gln Pro Ile Asp Leu Val Pro Asn Gln Pro Tyr Pro Asn Ala
 1910 1915 1920

Ser Phe Asp Asn Phe Lys Phe Val Cys Asp Asn Ile Lys Phe Ala
 1925 1930 1935

Asp Asp Leu Asn Gln Leu Thr Gly Tyr Lys Lys Pro Ala Ser Arg
 1940 1945 1950

Glu Leu Lys Val Thr Phe Phe Pro Asp Leu Asn Gly Asp Val Val
 1955 1960 1965

Ala Ile Asp Tyr Lys His Tyr Thr Pro Ser Phe Lys Lys Gly Ala
 1970 1975 1980

Lys Leu Leu His Lys Pro Ile Val Trp His Val Asn Asn Ala Thr
 1985 1990 1995

Asn Lys Ala Thr Tyr Lys Pro Asn Thr Trp Cys Ile Arg Cys Leu
 2000 2005 2010

Trp Ser Thr Lys Pro Val Glu Thr Ser Asn Ser Phe Asp Val Leu
 2015 2020 2025

Lys Ser Glu Asp Ala Gln Gly Met Asp Asn Leu Ala Cys Glu Asp
 2030 2035 2040

Leu Lys Pro Val Ser Glu Glu Val Val Glu Asn Pro Thr Ile Gln
 2045 2050 2055

Lys Asp Val Leu Glu Cys Asn Val Lys Thr Thr Glu Val Val Gly
 2060 2065 2070

Asp Ile Ile Leu Lys Pro Ala Asn Asn Ser Leu Lys Ile Thr Glu
 2075 2080 2085

Glu Val Gly His Thr Asp Leu Met Ala Ala Tyr Val Asp Asn Ser
 2090 2095 2100

Ser Leu Thr Ile Lys Lys Pro Asn Glu Leu Ser Arg Val Leu Gly

2105							2110							2115
Leu	Lys	Thr	Leu	Ala	Thr	His	Gly	Leu	Ala	Ala	Val	Asn	Ser	Val
2120						2125					2130			
Pro	Trp	Asp	Thr	Ile	Ala	Asn	Tyr	Ala	Lys	Pro	Phe	Leu	Asn	Lys
2135						2140					2145			
Val	Val	Ser	Thr	Thr	Thr	Asn	Ile	Val	Thr	Arg	Cys	Leu	Asn	Arg
2150						2155					2160			
Val	Cys	Thr	Asn	Tyr	Met	Pro	Tyr	Phe	Phe	Thr	Leu	Leu	Leu	Gln
2165						2170					2175			
Leu	Cys	Thr	Phe	Thr	Arg	Ser	Thr	Asn	Ser	Arg	Ile	Lys	Ala	Ser
2180						2185					2190			
Met	Pro	Thr	Thr	Ile	Ala	Lys	Asn	Thr	Val	Lys	Ser	Val	Gly	Lys
2195						2200					2205			
Phe	Cys	Leu	Glu	Ala	Ser	Phe	Asn	Tyr	Leu	Lys	Ser	Pro	Asn	Phe
2210						2215					2220			
Ser	Lys	Leu	Ile	Asn	Ile	Ile	Ile	Trp	Phe	Leu	Leu	Leu	Ser	Val
2225						2230					2235			
Cys	Leu	Gly	Ser	Leu	Ile	Tyr	Ser	Thr	Ala	Ala	Leu	Gly	Val	Leu
2240						2245					2250			
Met	Ser	Asn	Leu	Gly	Met	Pro	Ser	Tyr	Cys	Thr	Gly	Tyr	Arg	Glu
2255						2260					2265			

Gly Tyr Leu Asn Ser Thr Asn Val Thr Ile Ala Thr Tyr Cys Thr
 2270 2275 2280

Gly Ser Ile Pro Cys Ser Val Cys Leu Ser Gly Leu Asp Ser Leu
 2285 2290 2295

Asp Thr Tyr Pro Ser Leu Glu Thr Ile Gln Ile Thr Ile Ser Ser
 2300 2305 2310

Phe Lys Trp Asp Leu Thr Ala Phe Gly Leu Val Ala Glu Trp Phe
 2315 2320 2325

Leu Ala Tyr Ile Leu Phe Thr Arg Phe Phe Tyr Val Leu Gly Leu
 2330 2335 2340

Ala Ala Ile Met Gln Leu Phe Phe Ser Tyr Phe Ala Val His Phe
 2345 2350 2355

Ile Ser Asn Ser Trp Leu Met Trp Leu Ile Ile Asn Leu Val Gln
 2360 2365 2370

Met Ala Pro Ile Ser Ala Met Val Arg Met Tyr Ile Phe Phe Ala
 2375 2380 2385

Ser Phe Tyr Tyr Val Trp Lys Ser Tyr Val His Val Val Asp Gly
 2390 2395 2400

Cys Asn Ser Ser Thr Cys Met Met Cys Tyr Lys Arg Asn Arg Ala
 2405 2410 2415

Thr Arg Val Glu Cys Thr Thr Ile Val Asn Gly Val Arg Arg Ser
 2420 2425 2430

Phe Tyr Val Tyr Ala Asn Gly Gly Lys Gly Phe Cys Lys Leu His
 2435 2440 2445

Asn Trp Asn Cys Val Asn Cys Asp Thr Phe Cys Ala Gly Ser Thr
 2450 2455 2460

Phe Ile Ser Asp Glu Val Ala Arg Asp Leu Ser Leu Gln Phe Lys
 2465 2470 2475

Arg Pro Ile Asn Pro Thr Asp Gln Ser Ser Tyr Ile Val Asp Ser
 2480 2485 2490

Val Thr Val Lys Asn Gly Ser Ile His Leu Tyr Phe Asp Lys Ala
 2495 2500 2505

Gly Gln Lys Thr Tyr Glu Arg His Ser Leu Ser His Phe Val Asn
 2510 2515 2520

Leu Asp Asn Leu Arg Ala Asn Asn Thr Lys Gly Ser Leu Pro Ile
 2525 2530 2535

Asn Val Ile Val Phe Asp Gly Lys Ser Lys Cys Glu Glu Ser Ser
 2540 2545 2550

Ala Lys Ser Ala Ser Val Tyr Tyr Ser Gln Leu Met Cys Gln Pro
 2555 2560 2565

Ile Leu Leu Leu Asp Gln Ala Leu Val Ser Asp Val Gly Asp Ser
 2570 2575 2580

Ala Glu Val Ala Val Lys Met Phe Asp Ala Tyr Val Asn Thr Phe
 2585 2590 2595

Ser Ser Thr Phe Asn Val Pro Met Glu Lys Leu Lys Thr Leu Val
 2600 2605 2610

Ala Thr Ala Glu Ala Glu Leu Ala Lys Asn Val Ser Leu Asp Asn
 2615 2620 2625

Val Leu Ser Thr Phe Ile Ser Ala Ala Arg Gln Gly Phe Val Asp
 2630 2635 2640

Ser Asp Val Glu Thr Lys Asp Val Val Glu Cys Leu Lys Leu Ser
 2645 2650 2655

His Gln Ser Asp Ile Glu Val Thr Gly Asp Ser Cys Asn Asn Tyr
 2660 2665 2670

Met Leu Thr Tyr Asn Lys Val Glu Asn Met Thr Pro Arg Asp Leu
 2675 2680 2685

Gly Ala Cys Ile Asp Cys Ser Ala Arg His Ile Asn Ala Gln Val
 2690 2695 2700

Ala Lys Ser His Asn Ile Ala Leu Ile Trp Asn Val Lys Asp Phe
 2705 2710 2715

Met Ser Leu Ser Glu Gln Leu Arg Lys Gln Ile Arg Ser Ala Ala
 2720 2725 2730

Lys Lys Asn Asn Leu Pro Phe Lys Leu Thr Cys Ala Thr Thr Arg
 2735 2740 2745

Gln Val Val Asn Val Val Thr Thr Lys Ile Ala Leu Lys Gly Gly

2750		2755		2760
Lys Ile Val Asn Asn Trp Leu Lys Gln Leu Ile Lys Val Thr Leu				
2765		2770		2775
Val Phe Leu Phe Val Ala Ala Ile Phe Tyr Leu Ile Thr Pro Val				
2780		2785		2790
His Val Met Ser Lys His Thr Asp Phe Ser Ser Glu Ile Ile Gly				
2795		2800		2805
Tyr Lys Ala Ile Asp Gly Gly Val Thr Arg Asp Ile Ala Ser Thr				
2810		2815		2820
Asp Thr Cys Phe Ala Asn Lys His Ala Asp Phe Asp Thr Trp Phe				
2825		2830		2835
Ser Gln Arg Gly Gly Ser Tyr Thr Asn Asp Lys Ala Cys Pro Leu				
2840		2845		2850
Ile Ala Ala Val Ile Thr Arg Glu Val Gly Phe Val Val Pro Gly				
2855		2860		2865
Leu Pro Gly Thr Ile Leu Arg Thr Thr Asn Gly Asp Phe Leu His				
2870		2875		2880
Phe Leu Pro Arg Val Phe Ser Ala Val Gly Asn Ile Cys Tyr Thr				
2885		2890		2895
Pro Ser Lys Leu Ile Glu Tyr Thr Asp Phe Ala Thr Ser Ala Cys				
2900		2905		2910

Val Leu Ala Ala Glu Cys Thr Ile Phe Lys Asp Ala Ser Gly Lys
 2915 2920 2925

Pro Val Pro Tyr Cys Tyr Asp Thr Asn Val Leu Glu Gly Ser Val
 2930 2935 2940

Ala Tyr Glu Ser Leu Arg Pro Asp Thr Arg Tyr Val Leu Met Asp
 2945 2950 2955

Gly Ser Ile Ile Gln Phe Pro Asn Thr Tyr Leu Glu Gly Ser Val
 2960 2965 2970

Arg Val Val Thr Thr Phe Asp Ser Glu Tyr Cys Arg His Gly Thr
 2975 2980 2985

Cys Glu Arg Ser Glu Ala Gly Val Cys Val Ser Thr Ser Gly Arg
 2990 2995 3000

Trp Val Leu Asn Asn Asp Tyr Tyr Arg Ser Leu Pro Gly Val Phe
 3005 3010 3015

Cys Gly Val Asp Ala Val Asn Leu Leu Thr Asn Met Phe Thr Pro
 3020 3025 3030

Leu Ile Gln Pro Ile Gly Ala Leu Asp Ile Ser Ala Ser Ile Val
 3035 3040 3045

Ala Gly Gly Ile Val Ala Ile Val Val Thr Cys Leu Ala Tyr Tyr
 3050 3055 3060

Phe Met Arg Phe Arg Arg Ala Phe Gly Glu Tyr Ser His Val Val
 3065 3070 3075

Ala Phe Asn Thr Leu Leu Phe Leu Met Ser Phe Thr Val Leu Cys
 3080 3085 3090

Leu Thr Pro Val Tyr Ser Phe Leu Pro Gly Val Tyr Ser Val Ile
 3095 3100 3105

Tyr Leu Tyr Leu Thr Phe Tyr Leu Thr Asn Asp Val Ser Phe Leu
 3110 3115 3120

Ala His Ile Gln Trp Met Val Met Phe Thr Pro Leu Val Pro Phe
 3125 3130 3135

Trp Ile Thr Ile Ala Tyr Ile Ile Cys Ile Ser Thr Lys His Phe
 3140 3145 3150

Tyr Trp Phe Phe Ser Asn Tyr Leu Lys Arg Arg Val Val Phe Asn
 3155 3160 3165

Gly Val Ser Phe Ser Thr Phe Glu Glu Ala Ala Leu Cys Thr Phe
 3170 3175 3180

Leu Leu Asn Lys Glu Met Tyr Leu Lys Leu Arg Ser Asp Val Leu
 3185 3190 3195

Leu Pro Leu Thr Gln Tyr Asn Arg Tyr Leu Ala Leu Tyr Asn Lys
 3200 3205 3210

Tyr Lys Tyr Phe Ser Gly Ala Met Asp Thr Thr Ser Tyr Arg Glu
 3215 3220 3225

Ala Ala Cys Cys His Leu Ala Lys Ala Leu Asn Asp Phe Ser Asn
 3230 3235 3240

Ser Gly Ser Asp Val Leu Tyr Gln Pro Pro Gln Thr Ser Ile Thr
 3245 3250 3255

Ser Ala Val Leu Gln Ser Gly Phe Arg Lys Met Ala Phe Pro Ser
 3260 3265 3270

Gly Lys Val Glu Gly Cys Met Val Gln Val Thr Cys Gly Thr Thr
 3275 3280 3285

Thr Leu Asn Gly Leu Trp Leu Asp Asp Val Val Tyr Cys Pro Arg
 3290 3295 3300

His Val Ile Cys Thr Ser Glu Asp Met Leu Asn Pro Asn Tyr Glu
 3305 3310 3315

Asp Leu Leu Ile Arg Lys Ser Asn His Asn Phe Leu Val Gln Ala
 3320 3325 3330

Gly Asn Val Gln Leu Arg Val Ile Gly His Ser Met Gln Asn Cys
 3335 3340 3345

Val Leu Lys Leu Lys Val Asp Thr Ala Asn Pro Lys Thr Pro Lys
 3350 3355 3360

Tyr Lys Phe Val Arg Ile Gln Pro Gly Gln Thr Phe Ser Val Leu
 3365 3370 3375

Ala Cys Tyr Asn Gly Ser Pro Ser Gly Val Tyr Gln Cys Ala Met
 3380 3385 3390

Arg Pro Asn Phe Thr Ile Lys Gly Ser Phe Leu Asn Gly Ser Cys

3395		3400		3405
Gly Ser Val Gly Phe Asn Ile Asp Tyr Asp Cys Val Ser Phe Cys				
3410		3415		3420
Tyr Met His His Met Glu Leu Pro Thr Gly Val His Ala Gly Thr				
3425		3430		3435
Asp Leu Glu Gly Asn Phe Tyr Gly Pro Phe Val Asp Arg Gln Thr				
3440		3445		3450
Ala Gln Ala Ala Gly Thr Asp Thr Thr Ile Thr Val Asn Val Leu				
3455		3460		3465
Ala Trp Leu Tyr Ala Ala Val Ile Asn Gly Asp Arg Trp Phe Leu				
3470		3475		3480
Asn Arg Phe Thr Thr Thr Leu Asn Asp Phe Asn Leu Val Ala Met				
3485		3490		3495
Lys Tyr Asn Tyr Glu Pro Leu Thr Gln Asp His Val Asp Ile Leu				
3500		3505		3510
Gly Pro Leu Ser Ala Gln Thr Gly Ile Ala Val Leu Asp Met Cys				
3515		3520		3525
Ala Ser Leu Lys Glu Leu Leu Gln Asn Gly Met Asn Gly Arg Thr				
3530		3535		3540
Ile Leu Gly Ser Ala Leu Leu Glu Asp Glu Phe Thr Pro Phe Asp				
3545		3550		3555

Val Val Arg Gln Cys Ser Gly Val Thr Phe Gln Ser Ala Val Lys
 3560 3565 3570

Arg Thr Ile Lys Gly Thr His His Trp Leu Leu Leu Thr Ile Leu
 3575 3580 3585

Thr Ser Leu Leu Val Leu Val Gln Ser Thr Gln Trp Ser Leu Phe
 3590 3595 3600

Phe Phe Leu Tyr Glu Asn Ala Phe Leu Pro Phe Ala Met Gly Ile
 3605 3610 3615

Ile Ala Met Ser Ala Phe Ala Met Met Phe Val Lys His Lys His
 3620 3625 3630

Ala Phe Leu Cys Leu Phe Leu Leu Pro Ser Leu Ala Thr Val Ala
 3635 3640 3645

Tyr Phe Asn Met Val Tyr Met Pro Ala Ser Trp Val Met Arg Ile
 3650 3655 3660

Met Thr Trp Leu Asp Met Val Asp Thr Ser Leu Ser Gly Phe Lys
 3665 3670 3675

Leu Lys Asp Cys Val Met Tyr Ala Ser Ala Val Val Leu Leu Ile
 3680 3685 3690

Leu Met Thr Ala Arg Thr Val Tyr Asp Asp Gly Ala Arg Arg Val
 3695 3700 3705

Trp Thr Leu Met Asn Val Leu Thr Leu Val Tyr Lys Val Tyr Tyr
 3710 3715 3720

Gly Asn Ala Leu Asp Gln Ala Ile Ser Met Trp Ala Leu Ile Ile
 3725 3730 3735

Ser Val Thr Ser Asn Tyr Ser Gly Val Val Thr Thr Val Met Phe
 3740 3745 3750

Leu Ala Arg Gly Ile Val Phe Met Cys Val Glu Tyr Cys Pro Ile
 3755 3760 3765

Phe Phe Ile Thr Gly Asn Thr Leu Gln Cys Ile Met Leu Val Tyr
 3770 3775 3780

Cys Phe Leu Gly Tyr Phe Cys Thr Cys Tyr Phe Gly Leu Phe Cys
 3785 3790 3795

Leu Leu Asn Arg Tyr Phe Arg Leu Thr Leu Gly Val Tyr Asp Tyr
 3800 3805 3810

Leu Val Ser Thr Gln Glu Phe Arg Tyr Met Asn Ser Gln Gly Leu
 3815 3820 3825

Leu Pro Pro Lys Asn Ser Ile Asp Ala Phe Lys Leu Asn Ile Lys
 3830 3835 3840

Leu Leu Gly Val Gly Gly Lys Pro Cys Ile Lys Val Ala Thr Val
 3845 3850 3855

Gln Ser Lys Met Ser Asp Val Lys Cys Thr Ser Val Val Leu Leu
 3860 3865 3870

Ser Val Leu Gln Gln Leu Arg Val Glu Ser Ser Ser Lys Leu Trp
 3875 3880 3885

Ala Gln Cys Val Gln Leu His Asn Asp Ile Leu Leu Ala Lys Asp
 3890 3895 3900

Thr Thr Glu Ala Phe Glu Lys Met Val Ser Leu Leu Ser Val Leu
 3905 3910 3915

Leu Ser Met Gln Gly Ala Val Asp Ile Asn Lys Leu Cys Glu Glu
 3920 3925 3930

Met Leu Asp Asn Arg Ala Thr Leu Gln Ala Ile Ala Ser Glu Phe
 3935 3940 3945

Ser Ser Leu Pro Ser Tyr Ala Ala Phe Ala Thr Ala Gln Glu Ala
 3950 3955 3960

Tyr Glu Gln Ala Val Ala Asn Gly Asp Ser Glu Val Val Leu Lys
 3965 3970 3975

Lys Leu Lys Lys Ser Leu Asn Val Ala Lys Ser Glu Phe Asp Arg
 3980 3985 3990

Asp Ala Ala Met Gln Arg Lys Leu Glu Lys Met Ala Asp Gln Ala
 3995 4000 4005

Met Thr Gln Met Tyr Lys Gln Ala Arg Ser Glu Asp Lys Arg Ala
 4010 4015 4020

Lys Val Thr Ser Ala Met Gln Thr Met Leu Phe Thr Met Leu Arg
 4025 4030 4035

Lys Leu Asp Asn Asp Ala Leu Asn Asn Ile Ile Asn Asn Ala Arg

4040		4045		4050
Asp Gly Cys Val Pro Leu Asn Ile Ile Pro Leu Thr Thr Ala Ala				
4055		4060		4065
Lys Leu Met Val Val Ile Pro Asp Tyr Asn Thr Tyr Lys Asn Thr				
4070		4075		4080
Cys Asp Gly Thr Thr Phe Thr Tyr Ala Ser Ala Leu Trp Glu Ile				
4085		4090		4095
Gln Gln Val Val Asp Ala Asp Ser Lys Ile Val Gln Leu Ser Glu				
4100		4105		4110
Ile Ser Met Asp Asn Ser Pro Asn Leu Ala Trp Pro Leu Ile Val				
4115		4120		4125
Thr Ala Leu Arg Ala Asn Ser Ala Val Lys Leu Gln Asn Asn Glu				
4130		4135		4140
Leu Ser Pro Val Ala Leu Arg Gln Met Ser Cys Ala Ala Gly Thr				
4145		4150		4155
Thr Gln Thr Ala Cys Thr Asp Asp Asn Ala Leu Ala Tyr Tyr Asn				
4160		4165		4170
Thr Thr Lys Gly Gly Arg Phe Val Leu Ala Leu Leu Ser Asp Leu				
4175		4180		4185
Gln Asp Leu Lys Trp Ala Arg Phe Pro Lys Ser Asp Gly Thr Gly				
4190		4195		4200

Thr Ile Tyr Thr Glu Leu Glu Pro Pro Cys Arg Phe Val Thr Asp
 4205 4210 4215

Thr Pro Lys Gly Pro Lys Val Lys Tyr Leu Tyr Phe Ile Lys Gly
 4220 4225 4230

Leu Asn Asn Leu Asn Arg Gly Met Val Leu Gly Ser Leu Ala Ala
 4235 4240 4245

Thr Val Arg Leu Gln Ala Gly Asn Ala Thr Glu Val Pro Ala Asn
 4250 4255 4260

Ser Thr Val Leu Ser Phe Cys Ala Phe Ala Val Asp Ala Ala Lys
 4265 4270 4275

Ala Tyr Lys Asp Tyr Leu Ala Ser Gly Gly Gln Pro Ile Thr Asn
 4280 4285 4290

Cys Val Lys Met Leu Cys Thr His Thr Gly Thr Gly Gln Ala Ile
 4295 4300 4305

Thr Val Thr Pro Glu Ala Asn Met Asp Gln Glu Ser Phe Gly Gly
 4310 4315 4320

Ala Ser Cys Cys Leu Tyr Cys Arg Cys His Ile Asp His Pro Asn
 4325 4330 4335

Pro Lys Gly Phe Cys Asp Leu Lys Gly Lys Tyr Val Gln Ile Pro
 4340 4345 4350

Thr Thr Cys Ala Asn Asp Pro Val Gly Phe Thr Leu Lys Asn Thr
 4355 4360 4365

Val Cys Thr Val Cys Gly Met Trp Lys Gly Tyr Gly Cys Ser Cys
 4370 4375 4380

Asp Gln Leu Arg Glu Pro Met Leu Gln Ser Ala Asp Ala Gln Ser
 4385 4390 4395

Phe Leu Asn Arg Val Cys Gly Val Ser Ala Ala Arg Leu Thr Pro
 4400 4405 4410

Cys Gly Thr Gly Thr Ser Thr Asp Val Val Tyr Arg Ala Phe Asp
 4415 4420 4425

Ile Tyr Asn Asp Lys Val Ala Gly Phe Ala Lys Phe Leu Lys Thr
 4430 4435 4440

Asn Cys Cys Arg Phe Gln Glu Lys Asp Glu Asp Asp Asn Leu Ile
 4445 4450 4455

Asp Ser Tyr Phe Val Val Lys Arg His Thr Phe Ser Asn Tyr Gln
 4460 4465 4470

His Glu Glu Thr Ile Tyr Asn Leu Leu Lys Asp Cys Pro Ala Val
 4475 4480 4485

Ala Lys His Asp Phe Phe Lys Phe Arg Ile Asp Gly Asp Met Val
 4490 4495 4500

Pro His Ile Ser Arg Gln Arg Leu Thr Lys Tyr Thr Met Ala Asp
 4505 4510 4515

Leu Val Tyr Ala Leu Arg His Phe Asp Glu Gly Asn Cys Asp Thr
 4520 4525 4530

Leu Lys Glu Ile Leu Val Thr Tyr Asn Cys Cys Asp Asp Asp Tyr
 4535 4540 4545

Phe Asn Lys Lys Asp Trp Tyr Asp Phe Val Glu Asn Pro Asp Ile
 4550 4555 4560

Leu Arg Val Tyr Ala Asn Leu Gly Glu Arg Val Arg Gln Ala Leu
 4565 4570 4575

Leu Lys Thr Val Gln Phe Cys Asp Ala Met Arg Asn Ala Gly Ile
 4580 4585 4590

Val Gly Val Leu Thr Leu Asp Asn Gln Asp Leu Asn Gly Asn Trp
 4595 4600 4605

Tyr Asp Phe Gly Asp Phe Ile Gln Thr Thr Pro Gly Ser Gly Val
 4610 4615 4620

Pro Val Val Asp Ser Tyr Tyr Ser Leu Leu Met Pro Ile Leu Thr
 4625 4630 4635

Leu Thr Arg Ala Leu Thr Ala Glu Ser His Val Asp Thr Asp Leu
 4640 4645 4650

Thr Lys Pro Tyr Ile Lys Trp Asp Leu Leu Lys Tyr Asp Phe Thr
 4655 4660 4665

Glu Glu Arg Leu Lys Leu Phe Asp Arg Tyr Phe Lys Tyr Trp Asp
 4670 4675 4680

Gln Thr Tyr His Pro Asn Cys Val Asn Cys Leu Asp Asp Arg Cys

4685		4690		4695
Ile Leu His Cys Ala Asn Phe Asn Val Leu Phe Ser Thr Val Phe				
4700		4705		4710
Pro Pro Thr Ser Phe Gly Pro Leu Val Arg Lys Ile Phe Val Asp				
4715		4720		4725
Gly Val Pro Phe Val Val Ser Thr Gly Tyr His Phe Arg Glu Leu				
4730		4735		4740
Gly Val Val His Asn Gln Asp Val Asn Leu His Ser Ser Arg Leu				
4745		4750		4755
Ser Phe Lys Glu Leu Leu Val Tyr Ala Ala Asp Pro Ala Met His				
4760		4765		4770
Ala Ala Ser Gly Asn Leu Leu Leu Asp Lys Arg Thr Thr Cys Phe				
4775		4780		4785
Ser Val Ala Ala Leu Thr Asn Asn Val Ala Phe Gln Thr Val Lys				
4790		4795		4800
Pro Gly Asn Phe Asn Lys Asp Phe Tyr Asp Phe Ala Val Ser Lys				
4805		4810		4815
Gly Phe Phe Lys Glu Gly Ser Ser Val Glu Leu Lys His Phe Phe				
4820		4825		4830
Phe Ala Gln Asp Gly Asn Ala Ala Ile Ser Asp Tyr Asp Tyr Tyr				
4835		4840		4845

Arg Tyr Asn Leu Pro Thr Met Cys Asp Ile Arg Gln Leu Leu Phe
 4850 4855 4860

Val Val Glu Val Val Asp Lys Tyr Phe Asp Cys Tyr Asp Gly Gly
 4865 4870 4875

Cys Ile Asn Ala Asn Gln Val Ile Val Asn Asn Leu Asp Lys Ser
 4880 4885 4890

Ala Gly Phe Pro Phe Asn Lys Trp Gly Lys Ala Arg Leu Tyr Tyr
 4895 4900 4905

Asp Ser Met Ser Tyr Glu Asp Gln Asp Ala Leu Phe Ala Tyr Thr
 4910 4915 4920

Lys Arg Asn Val Ile Pro Thr Ile Thr Gln Met Asn Leu Lys Tyr
 4925 4930 4935

Ala Ile Ser Ala Lys Asn Arg Ala Arg Thr Val Ala Gly Val Ser
 4940 4945 4950

Ile Cys Ser Thr Met Thr Asn Arg Gln Phe His Gln Lys Leu Leu
 4955 4960 4965

Lys Ser Ile Ala Ala Thr Arg Gly Ala Thr Val Val Ile Gly Thr
 4970 4975 4980

Ser Lys Phe Tyr Gly Gly Trp His Asn Met Leu Lys Thr Val Tyr
 4985 4990 4995

Ser Asp Val Glu Asn Pro His Leu Met Gly Trp Asp Tyr Pro Lys
 5000 5005 5010

Cys Asp Arg Ala Met Pro Asn Met Leu Arg Ile Met Ala Ser Leu
 5015 5020 5025

Val Leu Ala Arg Lys His Thr Thr Cys Cys Ser Leu Ser His Arg
 5030 5035 5040

Phe Tyr Arg Leu Ala Asn Glu Cys Ala Gln Val Leu Ser Glu Met
 5045 5050 5055

Val Met Cys Gly Gly Ser Leu Tyr Val Lys Pro Gly Gly Thr Ser
 5060 5065 5070

Ser Gly Asp Ala Thr Thr Ala Tyr Ala Asn Ser Val Phe Asn Ile
 5075 5080 5085

Cys Gln Ala Val Thr Ala Asn Val Asn Ala Leu Leu Ser Thr Asp
 5090 5095 5100

Gly Asn Lys Ile Ala Asp Lys Tyr Val Arg Asn Leu Gln His Arg
 5105 5110 5115

Leu Tyr Glu Cys Leu Tyr Arg Asn Arg Asp Val Asp Thr Asp Phe
 5120 5125 5130

Val Asn Glu Phe Tyr Ala Tyr Leu Arg Lys His Phe Ser Met Met
 5135 5140 5145

Ile Leu Ser Asp Asp Ala Val Val Cys Phe Asn Ser Thr Tyr Ala
 5150 5155 5160

Ser Gln Gly Leu Val Ala Ser Ile Lys Asn Phe Lys Ser Val Leu
 5165 5170 5175

Tyr Tyr Gln Asn Asn Val Phe Met Ser Glu Ala Lys Cys Trp Thr
 5180 5185 5190

Glu Thr Asp Leu Thr Lys Gly Pro His Glu Phe Cys Ser Gln His
 5195 5200 5205

Thr Met Leu Val Lys Gln Gly Asp Asp Tyr Val Tyr Leu Pro Tyr
 5210 5215 5220

Pro Asp Pro Ser Arg Ile Leu Gly Ala Gly Cys Phe Val Asp Asp
 5225 5230 5235

Ile Val Lys Thr Asp Gly Thr Leu Met Ile Glu Arg Phe Val Ser
 5240 5245 5250

Leu Ala Ile Asp Ala Tyr Pro Leu Thr Lys His Pro Asn Gln Glu
 5255 5260 5265

Tyr Ala Asp Val Phe His Leu Tyr Leu Gln Tyr Ile Arg Lys Leu
 5270 5275 5280

His Asp Glu Leu Thr Gly His Met Leu Asp Met Tyr Ser Val Met
 5285 5290 5295

Leu Thr Asn Asp Asn Thr Ser Arg Tyr Trp Glu Pro Glu Phe Tyr
 5300 5305 5310

Glu Ala Met Tyr Thr Pro His Thr Val Leu Gln Ala Val Gly Ala
 5315 5320 5325

Cys Val Leu Cys Asn Ser Gln Thr Ser Leu Arg Cys Gly Ala Cys

5330		5335		5340
Ile Arg Arg Pro Phe Leu Cys Cys Lys Cys Cys Tyr Asp His Val				
5345		5350		5355
Ile Ser Thr Ser His Lys Leu Val Leu Ser Val Asn Pro Tyr Val				
5360		5365		5370
Cys Asn Ala Pro Gly Cys Asp Val Thr Asp Val Thr Gln Leu Tyr				
5375		5380		5385
Leu Gly Gly Met Ser Tyr Tyr Cys Lys Ser His Lys Pro Pro Ile				
5390		5395		5400
Ser Phe Pro Leu Cys Ala Asn Gly Gln Val Phe Gly Leu Tyr Lys				
5405		5410		5415
Asn Thr Cys Val Gly Ser Asp Asn Val Thr Asp Phe Asn Ala Ile				
5420		5425		5430
Ala Thr Cys Asp Trp Thr Asn Ala Gly Asp Tyr Ile Leu Ala Asn				
5435		5440		5445
Thr Cys Thr Glu Arg Leu Lys Leu Phe Ala Ala Glu Thr Leu Lys				
5450		5455		5460
Ala Thr Glu Glu Thr Phe Lys Leu Ser Tyr Gly Ile Ala Thr Val				
5465		5470		5475
Arg Glu Val Leu Ser Asp Arg Glu Leu His Leu Ser Trp Glu Val				
5480		5485		5490

Gly Lys Pro Arg Pro Pro Leu Asn Arg Asn Tyr Val Phe Thr Gly
 5495 5500 5505

Tyr Arg Val Thr Lys Asn Ser Lys Val Gln Ile Gly Glu Tyr Thr
 5510 5515 5520

Phe Glu Lys Gly Asp Tyr Gly Asp Ala Val Val Tyr Arg Gly Thr
 5525 5530 5535

Thr Thr Tyr Lys Leu Asn Val Gly Asp Tyr Phe Val Leu Thr Ser
 5540 5545 5550

His Thr Val Met Pro Leu Ser Ala Pro Thr Leu Val Pro Gln Glu
 5555 5560 5565

His Tyr Val Arg Ile Thr Gly Leu Tyr Pro Thr Leu Asn Ile Ser
 5570 5575 5580

Asp Glu Phe Ser Ser Asn Val Ala Asn Tyr Gln Lys Val Gly Met
 5585 5590 5595

Gln Lys Tyr Ser Thr Leu Gln Gly Pro Pro Gly Thr Gly Lys Ser
 5600 5605 5610

His Phe Ala Ile Gly Leu Ala Leu Tyr Tyr Pro Ser Ala Arg Ile
 5615 5620 5625

Val Tyr Thr Ala Cys Ser His Ala Ala Val Asp Ala Leu Cys Glu
 5630 5635 5640

Lys Ala Leu Lys Tyr Leu Pro Ile Asp Lys Cys Ser Arg Ile Ile
 5645 5650 5655

Pro Ala Arg Ala Arg Val Glu Cys Phe Asp Lys Phe Lys Val Asn
5660 5665 5670

Ser Thr Leu Glu Gln Tyr Val Phe Cys Thr Val Asn Ala Leu Pro
5675 5680 5685

Glu Thr Thr Ala Asp Ile Val Val Phe Asp Glu Ile Ser Met Ala
5690 5695 5700

Thr Asn Tyr Asp Leu Ser Val Val Asn Ala Arg Leu Arg Ala Lys
5705 5710 5715

His Tyr Val Tyr Ile Gly Asp Pro Ala Gln Leu Pro Ala Pro Arg
5720 5725 5730

Thr Leu Leu Thr Lys Gly Thr Leu Glu Pro Glu Tyr Phe Asn Ser
5735 5740 5745

Val Cys Arg Leu Met Lys Thr Ile Gly Pro Asp Met Phe Leu Gly
5750 5755 5760

Thr Cys Arg Arg Cys Pro Ala Glu Ile Val Asp Thr Val Ser Ala
5765 5770 5775

Leu Val Tyr Asp Asn Lys Leu Lys Ala His Lys Asp Lys Ser Ala
5780 5785 5790

Gln Cys Phe Lys Met Phe Tyr Lys Gly Val Ile Thr His Asp Val
5795 5800 5805

Ser Ser Ala Ile Asn Arg Pro Gln Ile Gly Val Val Arg Glu Phe
5810 5815 5820

Leu Thr Arg Asn Pro Ala Trp Arg Lys Ala Val Phe Ile Ser Pro
 5825 5830 5835

Tyr Asn Ser Gln Asn Ala Val Ala Ser Lys Ile Leu Gly Leu Pro
 5840 5845 5850

Thr Gln Thr Val Asp Ser Ser Gln Gly Ser Glu Tyr Asp Tyr Val
 5855 5860 5865

Ile Phe Thr Gln Thr Thr Glu Thr Ala His Ser Cys Asn Val Asn
 5870 5875 5880

Arg Phe Asn Val Ala Ile Thr Arg Ala Lys Val Gly Ile Leu Cys
 5885 5890 5895

Ile Met Ser Asp Arg Asp Leu Tyr Asp Lys Leu Gln Phe Thr Ser
 5900 5905 5910

Leu Glu Ile Pro Arg Arg Asn Val Ala Thr Leu Gln Ala Glu Asn
 5915 5920 5925

Val Thr Gly Leu Phe Lys Asp Cys Ser Lys Val Ile Thr Gly Leu
 5930 5935 5940

His Pro Thr Gln Ala Pro Thr His Leu Ser Val Asp Thr Lys Phe
 5945 5950 5955

Lys Thr Glu Gly Leu Cys Val Asp Ile Pro Gly Ile Pro Lys Asp
 5960 5965 5970

Met Thr Tyr Arg Arg Leu Ile Ser Met Met Gly Phe Lys Met Asn

5975		5980		5985
Tyr Gln Val Asn Gly Tyr Pro Asn Met Phe Ile Thr Arg Glu Glu				
5990		5995		6000
Ala Ile Arg His Val Arg Ala Trp Ile Gly Phe Asp Val Glu Gly				
6005		6010		6015
Cys His Ala Thr Arg Glu Ala Val Gly Thr Asn Leu Pro Leu Gln				
6020		6025		6030
Leu Gly Phe Ser Thr Gly Val Asn Leu Val Ala Val Pro Thr Gly				
6035		6040		6045
Tyr Val Asp Thr Pro Asn Asn Thr Asp Phe Ser Arg Val Ser Ala				
6050		6055		6060
Lys Pro Pro Pro Gly Asp Gln Phe Lys His Leu Ile Pro Leu Met				
6065		6070		6075
Tyr Lys Gly Leu Pro Trp Asn Val Val Arg Ile Lys Ile Val Gln				
6080		6085		6090
Met Leu Ser Asp Thr Leu Lys Asn Leu Ser Asp Arg Val Val Phe				
6095		6100		6105
Val Leu Trp Ala His Gly Phe Glu Leu Thr Ser Met Lys Tyr Phe				
6110		6115		6120
Val Lys Ile Gly Pro Glu Arg Thr Cys Cys Leu Cys Asp Arg Arg				
6125		6130		6135

Ala Thr Cys Phe Ser Thr Ala Ser Asp Thr Tyr Ala Cys Trp His
6140 6145 6150

His Ser Ile Gly Phe Asp Tyr Val Tyr Asn Pro Phe Met Ile Asp
6155 6160 6165

Val Gln Gln Trp Gly Phe Thr Gly Asn Leu Gln Ser Asn His Asp
6170 6175 6180

Leu Tyr Cys Gln Val His Gly Asn Ala His Val Ala Ser Cys Asp
6185 6190 6195

Ala Ile Met Thr Arg Cys Leu Ala Val His Glu Cys Phe Val Lys
6200 6205 6210

Arg Val Asp Trp Thr Ile Glu Tyr Pro Ile Ile Gly Asp Glu Leu
6215 6220 6225

Lys Ile Asn Ala Ala Cys Arg Lys Val Gln His Met Val Val Lys
6230 6235 6240

Ala Ala Leu Leu Ala Asp Lys Phe Pro Val Leu His Asp Ile Gly
6245 6250 6255

Asn Pro Lys Ala Ile Lys Cys Val Pro Gln Ala Asp Val Glu Trp
6260 6265 6270

Lys Phe Tyr Asp Ala Gln Pro Cys Ser Asp Lys Ala Tyr Lys Ile
6275 6280 6285

Glu Glu Leu Phe Tyr Ser Tyr Ala Thr His Ser Asp Lys Phe Thr
6290 6295 6300

Asp Gly Val Cys Leu Phe Trp Asn Cys Asn Val Asp Arg Tyr Pro
6305 6310 6315

Ala Asn Ser Ile Val Cys Arg Phe Asp Thr Arg Val Leu Ser Asn
6320 6325 6330

Leu Asn Leu Pro Gly Cys Asp Gly Gly Ser Leu Tyr Val Asn Lys
6335 6340 6345

His Ala Phe His Thr Pro Ala Phe Asp Lys Ser Ala Phe Val Asn
6350 6355 6360

Leu Lys Gln Leu Pro Phe Phe Tyr Tyr Ser Asp Ser Pro Cys Glu
6365 6370 6375

Ser His Gly Lys Gln Val Val Ser Asp Ile Asp Tyr Val Pro Leu
6380 6385 6390

Lys Ser Ala Thr Cys Ile Thr Arg Cys Asn Leu Gly Gly Ala Val
6395 6400 6405

Cys Arg His His Ala Asn Glu Tyr Arg Leu Tyr Leu Asp Ala Tyr
6410 6415 6420

Asn Met Met Ile Ser Ala Gly Phe Ser Leu Trp Val Tyr Lys Gln
6425 6430 6435

Phe Asp Thr Tyr Asn Leu Trp Asn Thr Phe Thr Arg Leu Gln Ser
6440 6445 6450

Leu Glu Asn Val Ala Phe Asn Val Val Asn Lys Gly His Phe Asp
6455 6460 6465

Gly Gln Gln Gly Glu Val Pro Val Ser Ile Ile Asn Asn Thr Val
6470 6475 6480

Tyr Thr Lys Val Asp Gly Val Asp Val Glu Leu Phe Glu Asn Lys
6485 6490 6495

Thr Thr Leu Pro Val Asn Val Ala Phe Glu Leu Trp Ala Lys Arg
6500 6505 6510

Asn Ile Lys Pro Val Pro Glu Val Lys Ile Leu Asn Asn Leu Gly
6515 6520 6525

Val Asp Ile Ala Ala Asn Thr Val Ile Trp Asp Tyr Lys Arg Asp
6530 6535 6540

Ala Pro Ala His Ile Ser Thr Ile Gly Val Cys Ser Met Thr Asp
6545 6550 6555

Ile Ala Lys Lys Pro Thr Glu Thr Ile Cys Ala Pro Leu Thr Val
6560 6565 6570

Phe Phe Asp Gly Arg Val Asp Gly Gln Val Asp Leu Phe Arg Asn
6575 6580 6585

Ala Arg Asn Gly Val Leu Ile Thr Glu Gly Ser Val Lys Gly Leu
6590 6595 6600

Gln Pro Ser Val Gly Pro Lys Gln Ala Ser Leu Asn Gly Val Thr
6605 6610 6615

Leu Ile Gly Glu Ala Val Lys Thr Gln Phe Asn Tyr Tyr Lys Lys

6620						6625						6630			
Val	Asp	Gly	Val	Val	Gln	Gln	Leu	Pro	Glu	Thr	Tyr	Phe	Thr	Gln	
6635						6640					6645				
Ser	Arg	Asn	Leu	Gln	Glu	Phe	Lys	Pro	Arg	Ser	Gln	Met	Glu	Ile	
6650						6655					6660				
Asp	Phe	Leu	Glu	Leu	Ala	Met	Asp	Glu	Phe	Ile	Glu	Arg	Tyr	Lys	
6665						6670					6675				
Leu	Glu	Gly	Tyr	Ala	Phe	Glu	His	Ile	Val	Tyr	Gly	Asp	Phe	Ser	
6680						6685					6690				
His	Ser	Gln	Leu	Gly	Gly	Leu	His	Leu	Leu	Ile	Gly	Leu	Ala	Lys	
6695						6700					6705				
Arg	Phe	Lys	Glu	Ser	Pro	Phe	Glu	Leu	Glu	Asp	Phe	Ile	Pro	Met	
6710						6715					6720				
Asp	Ser	Thr	Val	Lys	Asn	Tyr	Phe	Ile	Thr	Asp	Ala	Gln	Thr	Gly	
6725						6730					6735				
Ser	Ser	Lys	Cys	Val	Cys	Ser	Val	Ile	Asp	Leu	Leu	Leu	Asp	Asp	
6740						6745					6750				
Phe	Val	Glu	Ile	Ile	Lys	Ser	Gln	Asp	Leu	Ser	Val	Val	Ser	Lys	
6755						6760					6765				
Val	Val	Lys	Val	Thr	Ile	Asp	Tyr	Thr	Glu	Ile	Ser	Phe	Met	Leu	
6770						6775					6780				

Trp Cys Lys Asp Gly His Val Glu Thr Phe Tyr Pro Lys Leu Gln
 6785 6790 6795

Ser Ser Gln Ala Trp Gln Pro Gly Val Ala Met Pro Asn Leu Tyr
 6800 6805 6810

Lys Met Gln Arg Met Leu Leu Glu Lys Cys Asp Leu Gln Asn Tyr
 6815 6820 6825

Gly Asp Ser Ala Thr Leu Pro Lys Gly Ile Met Met Asn Val Ala
 6830 6835 6840

Lys Tyr Thr Gln Leu Cys Gln Tyr Leu Asn Thr Leu Thr Leu Ala
 6845 6850 6855

Val Pro Tyr Asn Met Arg Val Ile His Phe Gly Ala Gly Ser Asp
 6860 6865 6870

Lys Gly Val Ala Pro Gly Thr Ala Val Leu Arg Gln Trp Leu Pro
 6875 6880 6885

Thr Gly Thr Leu Leu Val Asp Ser Asp Leu Asn Asp Phe Val Ser
 6890 6895 6900

Asp Ala Asp Ser Thr Leu Ile Gly Asp Cys Ala Thr Val His Thr
 6905 6910 6915

Ala Asn Lys Trp Asp Leu Ile Ile Ser Asp Met Tyr Asp Pro Lys
 6920 6925 6930

Thr Lys Asn Val Thr Lys Glu Asn Asp Ser Lys Glu Gly Phe Phe
 6935 6940 6945

Thr Tyr Ile Cys Gly Phe Ile Gln Gln Lys Leu Ala Leu Gly Gly
6950 6955 6960

Ser Val Ala Ile Lys Ile Thr Glu His Ser Trp Asn Ala Asp Leu
6965 6970 6975

Tyr Lys Leu Met Gly His Phe Ala Trp Trp Thr Ala Phe Val Thr
6980 6985 6990

Asn Val Asn Ala Ser Ser Ser Glu Ala Phe Leu Ile Gly Cys Asn
6995 7000 7005

Tyr Leu Gly Lys Pro Arg Glu Gln Ile Asp Gly Tyr Val Met His
7010 7015 7020

Ala Asn Tyr Ile Phe Trp Arg Asn Thr Asn Pro Ile Gln Leu Ser
7025 7030 7035

Ser Tyr Ser Leu Phe Asp Met Ser Lys Phe Pro Leu Lys Leu Arg
7040 7045 7050

Gly Thr Ala Val Met Ser Leu Lys Glu Gly Gln Ile Asn Asp Met
7055 7060 7065

Ile Leu Ser Leu Leu Ser Lys Gly Arg Leu Ile Ile Arg Glu Asn
7070 7075 7080

Asn Arg Val Val Ile Ser Ser Asp Val Leu Val Asn Asn
7085 7090 7095

<210> 22

<211> 275

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 22

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

Ala	Thr	Ile	Pro	Ile	Gln	Ala	Ser	Leu	Pro	Phe	Gly	Trp	Leu	Ile	Val
		35					40					45			

Gly	Val	Ala	Leu	Leu	Ala	Val	Phe	Gln	Ser	Ala	Ser	Lys	Ile	Ile	Thr
	50					55					60				

Leu	Lys	Lys	Arg	Trp	Gln	Leu	Ala	Leu	Ser	Lys	Gly	Val	His	Phe	Val
65					70					75					80

Cys	Asn	Leu	Leu	Leu	Leu	Phe	Val	Thr	Val	Tyr	Ser	His	Leu	Leu	Leu
				85					90					95	

Val	Ala	Ala	Gly	Leu	Glu	Ala	Pro	Phe	Leu	Tyr	Leu	Tyr	Ala	Leu	Val
			100					105					110		

Tyr	Phe	Leu	Gln	Ser	Ile	Asn	Phe	Val	Arg	Ile	Ile	Met	Arg	Leu	Trp
		115						120				125			

Leu	Cys	Trp	Lys	Cys	Arg	Ser	Lys	Asn	Pro	Leu	Leu	Tyr	Asp	Ala	Asn
	130						135				140				

Tyr	Phe	Leu	Cys	Trp	His	Thr	Asn	Cys	Tyr	Asp	Tyr	Cys	Ile	Pro	Tyr
145					150					155					160

Asn Ser Val Thr Ser Ser Ile Val Ile Thr Ser Gly Asp Gly Thr Thr
 165 170 175

Ser Pro Ile Ser Glu His Asp Tyr Gln Ile Gly Gly Tyr Thr Glu Lys
 180 185 190

Trp Glu Ser Gly Val Lys Asp Cys Val Val Leu His Ser Tyr Phe Thr
 195 200 205

Ser Asp Tyr Tyr Gln Leu Tyr Ser Thr Gln Leu Ser Thr Asp Thr Gly
 210 215 220

Val Glu His Val Thr Phe Phe Ile Tyr Asn Lys Ile Val Asp Glu Pro
 225 230 235 240

Glu Glu His Val Gln Ile His Thr Ile Asp Gly Ser Ser Gly Val Val
 245 250 255

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

Val Pro Leu
 275

<210> 23

<211> 61

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 23

Met Phe His Leu Val Asp Phe Gln Val Thr Ile Ala Glu Ile Leu Leu
 1 5 10 15

Ile Ile Met Arg Thr Phe Lys Val Ser Ile Trp Asn Leu Asp Tyr Ile
 20 25 30

Ile Asn Leu Ile Ile Lys Asn Leu Ser Lys Ser Leu Thr Glu Asn Lys
 35 40 45

Tyr Ser Gln Leu Asp Glu Glu Gln Pro Met Glu Ile Asp
 50 55 60

<210> 24

<211> 121

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 24

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

Leu Tyr His Tyr Gln Glu Cys Val Arg Gly Thr Thr Val Leu Leu Lys
 20 25 30

Glu Pro Cys Ser Ser Gly Thr Tyr Glu Gly Asn Ser Pro Phe His Pro
 35 40 45

Leu Ala Asp Asn Lys Phe Ala Leu Thr Cys Phe Ser Thr Gln Phe Ala
 50 55 60

Phe Ala Cys Pro Asp Gly Val Lys His Val Tyr Gln Leu Arg Ala Arg
 65 70 75 80

Ser Val Ser Pro Lys Leu Phe Ile Arg Gln Glu Glu Val Gln Glu Leu
 85 90 95

Tyr Ser Pro Ile Phe Leu Ile Val Ala Ala Ile Val Phe Ile Thr Leu
 100 105 110

Cys Phe Thr Leu Lys Arg Lys Thr Glu
 115 120

<210> 25

<211> 121

<212> PRT

<213> Severe acute respiratory syndrome coronavirus 2

<400> 25

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

His Gln Glu Cys Ser Leu Gln Ser Cys Thr Gln His Gln Pro Tyr Val
 20 25 30

Val Asp Asp Pro Cys Pro Ile His Phe Tyr Ser Lys Trp Tyr Ile Arg
 35 40 45

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

Ala Gly Ser Lys Ser Pro Ile Gln Tyr Ile Asp Ile Gly Asn Tyr Thr
 65 70 75 80

Val Ser Cys Leu Pro Phe Thr Ile Asn Cys Gln Glu Pro Lys Leu Gly
 85 90 95

Ser Leu Val Val Arg Cys Ser Phe Tyr Glu Asp Phe Leu Glu Tyr His
 100 105 110

Asp Val Arg Val Val Leu Asp Phe Ile
 115 120

<210> 26
 <211> 38
 <212> PRT
 <213> Severe acute respiratory syndrome coronavirus 2
 <400> 26

Met Gly Tyr Ile Asn Val Phe Ala Phe Pro Phe Thr Ile Tyr Ser Leu
 1 5 10 15

Leu Leu Cys Arg Met Asn Ser Arg Asn Tyr Ile Ala Gln Val Asp Val
 20 25 30

Val Asn Phe Asn Leu Thr
 35

<210> 27
 <211> 4
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> a linker peptide

<400> 27

Asn Lys Arg Lys
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<210> 28
 <211> 22
 <212> DNA
 <213> Artificial Sequence

<220>

<223> a PCR primer for the TCR analysis

<400> 28

gtctaccagg cattcgcttc at

22

<210> 29

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> a PCR primer for the TCR analysis

<400> 29

tcagctggac cacagccgca gcgt

24

<210> 30

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> a PCR primer for the TCR analysis

<400> 30

tcagaaatcc tttctcttga c

21

<210> 31

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> a PCR primer for the TCR analysis

<400> 31

ctagcctctg gaatcctttc tctt

24