

<110> ADIMMUNE CORPORATION

<120> IMMUNOGENIC COMPOSITION

<130>

<150> US 63/019,442

<151> 2020-05-04

<160> 12

<170> PatentIn version 3.5

<210> 1

<211> 458

<212> PRT

<213> Artificial Sequence

<220>

<223> Recombinant Spike Protein

<400> 1

Asn	Ile	Thr	Asn	Leu	Cys	Pro	Phe	Gly	Glu	Val	Phe	Asn	Ala	Thr	Arg
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Phe	Ala	Ser	Val	Tyr	Ala	Trp	Asn	Arg	Lys	Arg	Ile	Ser	Asn	Cys	Val
			20					25						30	

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

Cys	Tyr	Gly	Val	Ser	Pro	Thr	Lys	Leu	Asn	Asp	Leu	Cys	Phe	Thr	Asn
			50				55				60				

Val Tyr Ala Asp Ser Phe Val Ile Arg Gly Asp Glu Val Arg Gln Ile
 65 70 75 80

Ala Pro Gly Gln Thr Gly Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro
 85 90 95

Asp Asp Phe Thr Gly Cys Val Ile Ala Trp Asn Ser Asn Asn Leu Asp
 100 105 110

Ser Lys Val Gly Gly Asn Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys
 115 120 125

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

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

Pro Leu Gln Ser Tyr Gly Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln
 165 170 175

Pro Tyr Arg Val Val Val Leu Ser Phe Glu Leu Leu His Ala Pro Ala
 180 185 190

Thr Val Cys Gly Pro Lys Lys Ser Thr Asn Leu Val Lys Asn Lys Cys
 195 200 205

Val Asn Phe Asn Phe Asn Gly Leu Thr Gly Thr Gly Gly Gly Ser Gly
 210 215 220

Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser Thr Cys Pro Pro Cys
 225 230 235 240

Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe Leu Phe Pro Pro
 245 250 255

Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys
 260 265 270

Val Val Val Asp Val Ser His Glu Asp Pro Glu Val Lys Phe Asn Trp
 275 280 285

Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu
 290 295 300

Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr Val Leu
 305 310 315 320

His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn
 325 330 335

Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser Lys Ala Lys Gly
 340 345 350

Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Glu Glu
 355 360 365

Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr
 370 375 380

Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn
 385 390 395 400

Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe
 405 410 415

Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn
 420 425 430

Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr
 435 440 445

Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
 450 455

<210> 2
 <211> 755
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Recombinant Spike Protein

<400> 2
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Ala Ile Pro Thr Asn Phe Thr Ile Ser Val Thr Thr Glu Ile Leu Pro

20

25

30

Val Ser Met Thr Lys Thr Ser Val Asp Cys Thr Met Tyr Ile Cys Gly
 35 40 45

Asp Ser Thr Glu Cys Ser Asn Leu Leu Leu Gln Tyr Gly Ser Phe Cys
 50 55 60

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

Asn Thr Gln Glu Val Phe Ala Gln Val Lys Gln Ile Tyr Lys Thr Pro
 85 90 95

Pro Ile Lys Asp Phe Gly Gly Phe Asn Phe Ser Gln Ile Leu Pro Asp
 100 105 110

Pro Ser Lys Pro Ser Lys Arg Ser Phe Ile Glu Asp Leu Leu Phe Asn
 115 120 125

Lys Val Thr Leu Ala Asp Ala Gly Phe Ile Lys Gln Tyr Gly Asp Cys
 130 135 140

Leu Gly Asp Ile Ala Ala Arg Asp Leu Ile Cys Ala Gln Lys Phe Asn
 145 150 155 160

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

Tyr Thr Ser Ala Leu Leu Ala Gly Thr Ile Thr Ser Gly Trp Thr Phe
 180 185 190

Gly Ala Gly Ala Ala Leu Gln Ile Pro Phe Ala Met Gln Met Ala Tyr
 195 200 205

Arg Phe Asn Gly Ile Gly Val Thr Gln Asn Val Leu Tyr Glu Asn Gln
 210 215 220

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

Ser Leu Ser Ser Thr Ala Ser Ala Leu Gly Lys Leu Gln Asp Val Val
 245 250 255

Asn Gln Asn Ala Gln Ala Leu Asn Thr Leu Val Lys Gln Leu Ser Ser
 260 265 270

Asn Phe Gly Ala Ile Ser Ser Val Leu Asn Asp Ile Leu Ser Arg Leu
 275 280 285

Asp Lys Val Glu Ala Glu Val Gln Ile Asp Arg Leu Ile Thr Gly Arg
 290 295 300

Leu Gln Ser Leu Gln Thr Tyr Val Thr Gln Gln Leu Ile Arg Ala Ala
 305 310 315 320

Glu Ile Arg Ala Ser Ala Asn Leu Ala Ala Thr Lys Met Ser Glu Cys

325

330

335

Val Leu Gly Gln Ser Lys Arg Val Asp Phe Cys Gly Lys Gly Tyr His
 340 345 350

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

Val Thr Tyr Val Pro Ala Gln Glu Lys Asn Phe Thr Thr Ala Pro Ala
 370 375 380

Ile Cys His Asp Gly Lys Ala His Phe Pro Arg Glu Gly Val Phe Val
 385 390 395 400

Ser Asn Gly Thr His Trp Phe Val Thr Gln Arg Asn Phe Tyr Glu Pro
 405 410 415

Gln Ile Ile Thr Thr Asp Asn Thr Phe Val Ser Gly Asn Cys Asp Val
 420 425 430

Val Ile Gly Ile Val Asn Asn Thr Val Tyr Asp Pro Leu Gln Pro Glu
 435 440 445

Leu Asp Ser Phe Lys Glu Glu Leu Asp Lys Tyr Phe Lys Asn His Thr
 450 455 460

Ser Pro Asp Val Asp Leu Gly Asp Ile Ser Gly Ile Asn Ala Ser Val
 465 470 475 480

Val Asn Ile Gln Lys Glu Ile Asp Arg Leu Asn Glu Val Ala Lys Asn
 485 490 495

Leu Asn Glu Ser Leu Ile Asp Leu Gln Glu Leu Gly Lys Tyr Glu Gln
 500 505 510

Tyr Ile Lys Trp Pro Gly Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly
 515 520 525

Ser Gly Gly Ser Thr Cys Pro Pro Cys Pro Ala Pro Glu Leu Leu Gly
 530 535 540

Gly Pro Ser Val Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met
 545 550 555 560

Ile Ser Arg Thr Pro Glu Val Thr Cys Val Val Val Asp Val Ser His
 565 570 575

Glu Asp Pro Glu Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val
 580 585 590

His Asn Ala Lys Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr
 595 600 605

Arg Val Val Ser Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly
 610 615 620

Lys Glu Tyr Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile

625 630 635 640

Glu Lys Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val
 645 650 655

Tyr Thr Leu Pro Pro Ser Arg Glu Glu Met Thr Lys Asn Gln Val Ser
 660 665 670

Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu
 675 680 685

Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro
 690 695 700

Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val
 705 710 715 720

Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met
 725 730 735

His Glu Ala Leu His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser
 740 745 750

Pro Gly Lys
 755

<210> 3
 <211> 908
 <212> PRT

<213> Artificial Sequence

<220>

<223> Recombinant Spike Protein

<400> 3

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Phe	Thr	Arg	Gly	Val	Tyr	Tyr	Pro	Asp	Lys	Val	Phe	Arg	Ser	Ser	Val
			20					25					30		

Leu	His	Ser	Thr	Gln	Asp	Leu	Phe	Leu	Pro	Phe	Phe	Ser	Asn	Val	Thr
		35					40					45			

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

Asp	Asn	Pro	Val	Leu	Pro	Phe	Asn	Asp	Gly	Val	Tyr	Phe	Ala	Ser	Thr
65					70					75					80

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

Ser	Lys	Thr	Gln	Ser	Leu	Leu	Ile	Val	Asn	Asn	Ala	Thr	Asn	Val	Val
			100					105					110		

Ile	Lys	Val	Cys	Glu	Phe	Gln	Phe	Cys	Asn	Asp	Pro	Phe	Leu	Gly	Val
		115					120					125			

Tyr Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val
 130 135 140

Tyr Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe
 145 150 155 160

Leu Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu
 165 170 175

Phe Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His
 180 185 190

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

Glu Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln
 210 215 220

Thr Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser
 225 230 235 240

Ser Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln
 245 250 255

Pro Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp
 260 265 270

Ala Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu
 275 280 285

Lys Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg
 290 295 300

Val Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu
 305 310 315 320

Cys Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr
 325 330 335

Ala Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val
 340 345 350

Leu Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser
 355 360 365

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

Phe Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr
 385 390 395 400

Gly Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly
 405 410 415

Cys Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly
 420 425 430

Asn Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro
 435 440 445

Phe Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro
 450 455 460

Cys Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr
 465 470 475 480

Gly Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val
 485 490 495

Val Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro
 500 505 510

Lys Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe
 515 520 525

Asn Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe
 530 535 540

Leu Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala
 545 550 555 560

Val Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser
 565 570 575

Phe Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln
 580 585 590

Val Ala Val Leu Tyr Gln Asp Val Asn Cys Thr Glu Val Pro Val Ala
 595 600 605

Ile His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly
 610 615 620

Ser Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His
 625 630 635 640

Val Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys
 645 650 655

Ala Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Gly Gly
 660 665 670

Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser Gly Gly Ser Thr Cys Pro
 675 680 685

Pro Cys Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe Leu Phe
 690 695 700

Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val
 705 710 715 720

Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro Glu Val Lys Phe
 725 730 735

Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro
 740 745 750

Arg Glu Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr
 755 760 765

Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val
 770 775 780

Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser Lys Ala
 785 790 795 800

Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg
 805 810 815

Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly
 820 825 830

Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro
 835 840 845

Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser
 850 855 860

Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln
 865 870 875 880

Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His
 885 890 895

Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
 900 905

<210> 4
 <211> 1436
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Recombinant Spike Protein

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Phe Thr Arg Gly Val Tyr Tyr Pro Asp Lys Val Phe Arg Ser Ser Val
 20 25 30

Leu His Ser Thr Gln Asp Leu Phe Leu Pro Phe Phe Ser Asn Val Thr
 35 40 45

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

Asp Asn Pro Val Leu Pro Phe Asn Asp Gly Val Tyr Phe Ala Ser Thr
 65 70 75 80

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

Ser Lys Thr Gln Ser Leu Leu Ile Val Asn Asn Ala Thr Asn Val Val
 100 105 110

Ile Lys Val Cys Glu Phe Gln Phe Cys Asn Asp Pro Phe Leu Gly Val
 115 120 125

Tyr Tyr His Lys Asn Asn Lys Ser Trp Met Glu Ser Glu Phe Arg Val
 130 135 140

Tyr Ser Ser Ala Asn Asn Cys Thr Phe Glu Tyr Val Ser Gln Pro Phe
 145 150 155 160

Leu Met Asp Leu Glu Gly Lys Gln Gly Asn Phe Lys Asn Leu Arg Glu
 165 170 175

Phe Val Phe Lys Asn Ile Asp Gly Tyr Phe Lys Ile Tyr Ser Lys His
 180 185 190

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

Glu Pro Leu Val Asp Leu Pro Ile Gly Ile Asn Ile Thr Arg Phe Gln
 210 215 220

Thr Leu Leu Ala Leu His Arg Ser Tyr Leu Thr Pro Gly Asp Ser Ser
 225 230 235 240

Ser Gly Trp Thr Ala Gly Ala Ala Ala Tyr Tyr Val Gly Tyr Leu Gln

245

250

255

Pro Arg Thr Phe Leu Leu Lys Tyr Asn Glu Asn Gly Thr Ile Thr Asp
 260 265 270

Ala Val Asp Cys Ala Leu Asp Pro Leu Ser Glu Thr Lys Cys Thr Leu
 275 280 285

Lys Ser Phe Thr Val Glu Lys Gly Ile Tyr Gln Thr Ser Asn Phe Arg
 290 295 300

Val Gln Pro Thr Glu Ser Ile Val Arg Phe Pro Asn Ile Thr Asn Leu
 305 310 315 320

Cys Pro Phe Gly Glu Val Phe Asn Ala Thr Arg Phe Ala Ser Val Tyr
 325 330 335

Ala Trp Asn Arg Lys Arg Ile Ser Asn Cys Val Ala Asp Tyr Ser Val
 340 345 350

Leu Tyr Asn Ser Ala Ser Phe Ser Thr Phe Lys Cys Tyr Gly Val Ser
 355 360 365

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

Phe Val Ile Arg Gly Asp Glu Val Arg Gln Ile Ala Pro Gly Gln Thr
 385 390 395 400

Gly Lys Ile Ala Asp Tyr Asn Tyr Lys Leu Pro Asp Asp Phe Thr Gly
 405 410 415

Cys Val Ile Ala Trp Asn Ser Asn Asn Leu Asp Ser Lys Val Gly Gly
 420 425 430

Asn Tyr Asn Tyr Leu Tyr Arg Leu Phe Arg Lys Ser Asn Leu Lys Pro
 435 440 445

Phe Glu Arg Asp Ile Ser Thr Glu Ile Tyr Gln Ala Gly Ser Thr Pro
 450 455 460

Cys Asn Gly Val Glu Gly Phe Asn Cys Tyr Phe Pro Leu Gln Ser Tyr
 465 470 475 480

Gly Phe Gln Pro Thr Asn Gly Val Gly Tyr Gln Pro Tyr Arg Val Val
 485 490 495

Val Leu Ser Phe Glu Leu Leu His Ala Pro Ala Thr Val Cys Gly Pro
 500 505 510

Lys Lys Ser Thr Asn Leu Val Lys Asn Lys Cys Val Asn Phe Asn Phe
 515 520 525

Asn Gly Leu Thr Gly Thr Gly Val Leu Thr Glu Ser Asn Lys Lys Phe
 530 535 540

Leu Pro Phe Gln Gln Phe Gly Arg Asp Ile Ala Asp Thr Thr Asp Ala

545 550 555 560

Val Arg Asp Pro Gln Thr Leu Glu Ile Leu Asp Ile Thr Pro Cys Ser
565 570 575

Phe Gly Gly Val Ser Val Ile Thr Pro Gly Thr Asn Thr Ser Asn Gln
580 585 590

Val Ala Val Leu Tyr Gln Asp Val Asn Cys Thr Glu Val Pro Val Ala
595 600 605

Ile His Ala Asp Gln Leu Thr Pro Thr Trp Arg Val Tyr Ser Thr Gly
610 615 620

Ser Asn Val Phe Gln Thr Arg Ala Gly Cys Leu Ile Gly Ala Glu His
625 630 635 640

Val Asn Asn Ser Tyr Glu Cys Asp Ile Pro Ile Gly Ala Gly Ile Cys
645 650 655

Ala Ser Tyr Gln Thr Gln Thr Asn Ser Pro Arg Arg Ala Arg Ser Val
660 665 670

Ala Ser Gln Ser Ile Ile Ala Tyr Thr Met Ser Leu Gly Ala Glu Asn
675 680 685

Ser Val Ala Tyr Ser Asn Asn Ser Ile Ala Ile Pro Thr Asn Phe Thr
690 695 700

Ile Ser Val Thr Thr Glu Ile Leu Pro Val Ser Met Thr Lys Thr Ser
705 710 715 720

Val Asp Cys Thr Met Tyr Ile Cys Gly Asp Ser Thr Glu Cys Ser Asn
725 730 735

Leu Leu Leu Gln Tyr Gly Ser Phe Cys Thr Gln Leu Asn Arg Ala Leu
740 745 750

Thr Gly Ile Ala Val Glu Gln Asp Lys Asn Thr Gln Glu Val Phe Ala
755 760 765

Gln Val Lys Gln Ile Tyr Lys Thr Pro Pro Ile Lys Asp Phe Gly Gly
770 775 780

Phe Asn Phe Ser Gln Ile Leu Pro Asp Pro Ser Lys Pro Ser Lys Arg
785 790 795 800

Ser Phe Ile Glu Asp Leu Leu Phe Asn Lys Val Thr Leu Ala Asp Ala
805 810 815

Gly Phe Ile Lys Gln Tyr Gly Asp Cys Leu Gly Asp Ile Ala Ala Arg
820 825 830

Asp Leu Ile Cys Ala Gln Lys Phe Asn Gly Leu Thr Val Leu Pro Pro
835 840 845

Leu Leu Thr Asp Glu Met Ile Ala Gln Tyr Thr Ser Ala Leu Leu Ala

850

855

860

Gly Thr Ile Thr Ser Gly Trp Thr Phe Gly Ala Gly Ala Ala Leu Gln
 865 870 875 880

Ile Pro Phe Ala Met Gln Met Ala Tyr Arg Phe Asn Gly Ile Gly Val
 885 890 895

Thr Gln Asn Val Leu Tyr Glu Asn Gln Lys Leu Ile Ala Asn Gln Phe
 900 905 910

Asn Ser Ala Ile Gly Lys Ile Gln Asp Ser Leu Ser Ser Thr Ala Ser
 915 920 925

Ala Leu Gly Lys Leu Gln Asp Val Val Asn Gln Asn Ala Gln Ala Leu
 930 935 940

Asn Thr Leu Val Lys Gln Leu Ser Ser Asn Phe Gly Ala Ile Ser Ser
 945 950 955 960

Val Leu Asn Asp Ile Leu Ser Arg Leu Asp Lys Val Glu Ala Glu Val
 965 970 975

Gln Ile Asp Arg Leu Ile Thr Gly Arg Leu Gln Ser Leu Gln Thr Tyr
 980 985 990

Val Thr Gln Gln Leu Ile Arg Ala Ala Glu Ile Arg Ala Ser Ala Asn
 995 1000 1005

Leu Ala Ala Thr Lys Met Ser Glu Cys Val Leu Gly Gln Ser Lys
1010 1015 1020

Arg Val Asp Phe Cys Gly Lys Gly Tyr His Leu Met Ser Phe Pro
1025 1030 1035

Gln Ser Ala Pro His Gly Val Val Phe Leu His Val Thr Tyr Val
1040 1045 1050

Pro Ala Gln Glu Lys Asn Phe Thr Thr Ala Pro Ala Ile Cys His
1055 1060 1065

Asp Gly Lys Ala His Phe Pro Arg Glu Gly Val Phe Val Ser Asn
1070 1075 1080

Gly Thr His Trp Phe Val Thr Gln Arg Asn Phe Tyr Glu Pro Gln
1085 1090 1095

Ile Ile Thr Thr Asp Asn Thr Phe Val Ser Gly Asn Cys Asp Val
1100 1105 1110

Val Ile Gly Ile Val Asn Asn Thr Val Tyr Asp Pro Leu Gln Pro
1115 1120 1125

Glu Leu Asp Ser Phe Lys Glu Glu Leu Asp Lys Tyr Phe Lys Asn
1130 1135 1140

His Thr Ser Pro Asp Val Asp Leu Gly Asp Ile Ser Gly Ile Asn

1145

1150

1155

Ala	Ser	Val	Val	Asn	Ile	Gln	Lys	Glu	Ile	Asp	Arg	Leu	Asn	Glu
1160						1165					1170			

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

Gly	Lys	Tyr	Glu	Gln	Tyr	Ile	Lys	Trp	Pro	Gly	Gly	Ser	Gly	Gly
1190						1195					1200			

Ser	Gly	Gly	Ser	Gly	Gly	Ser	Gly	Gly	Ser	Thr	Cys	Pro	Pro	Cys
1205						1210					1215			

Pro	Ala	Pro	Glu	Leu	Leu	Gly	Gly	Pro	Ser	Val	Phe	Leu	Phe	Pro
1220						1225					1230			

Pro	Lys	Pro	Lys	Asp	Thr	Leu	Met	Ile	Ser	Arg	Thr	Pro	Glu	Val
1235						1240					1245			

Thr	Cys	Val	Val	Val	Asp	Val	Ser	His	Glu	Asp	Pro	Glu	Val	Lys
1250						1255					1260			

Phe	Asn	Trp	Tyr	Val	Asp	Gly	Val	Glu	Val	His	Asn	Ala	Lys	Thr
1265						1270					1275			

Lys	Pro	Arg	Glu	Glu	Gln	Tyr	Asn	Ser	Thr	Tyr	Arg	Val	Val	Ser
1280						1285					1290			

Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr
1295 1300 1305

Lys Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys
1310 1315 1320

Thr Ile Ser Lys Ala Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr
1325 1330 1335

Thr Leu Pro Pro Ser Arg Glu Glu Met Thr Lys Asn Gln Val Ser
1340 1345 1350

Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val
1355 1360 1365

Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr
1370 1375 1380

Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr Ser Lys
1385 1390 1395

Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn Val Phe Ser
1400 1405 1410

Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys
1415 1420 1425

Ser Leu Ser Leu Ser Pro Gly Lys

1430

1435

<210> 5

<211> 40

<212> PRT

<213> Artificial Sequence

<220>

<223> Signal Peptide

<400> 5

Met Leu Leu Val Asn Gln Ser His Gln Gly Phe Asn Lys Glu His Thr
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Ser Lys Met Val Ser Ala Ile Val Leu Tyr Val Leu Leu Ala Ala Ala
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Ala His Ser Ala Phe Ala Ala Asp
 35 40

<210> 6

<211> 1982

<212> DNA

<213> Artificial Sequence

<220>

<223> Recombinant Spike Protein

<400> 6

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ctggtcaacc agagccacca gggtttcaac aaggaacaca cctcaaagat ggtgtccgcc 180

atcgtgctgt acgtcctgct ggctgctgct gctcactcag ctttcgctgc cgacaacatc	240
accaacctgt gcccatcgg cgaggctctc aacgctacta ggctcgctc cgtgtacgt	300
tggaaccgca agcgtatcag caactgcgtg gccgactact ctgtcctgta caactccgt	360
agcttctcta ctttcaagtg ctacggagtg tcacctacca agctgaacga cctgtgcttc	420
actaacgtgt acgccgactc cttcgctcgc cgcggtgacg aagtgcgtca gatcgcccca	480
ggacagaccg gcaagatcgc tgactacaac tacaagctgc ctgacgactt cactggatgc	540
gtcatcgctt ggaacagcaa caacctggac tctaaagtgg gtggcaacta caactacctg	600
tacaggctgt tcagaaagag caacctgaag ctttcgaga gggacatcag caccgaaatc	660
taccaggccg gttctactcc ctgcaacggc gtcgaaggat tcaactgcta ctccccctg	720
cagtcttacg gcttccagcc aaccaacggg gtgggctacc agccttacag agtggtcgtg	780
ctgagcttcg aactcctcca cgtccagct actgtctgcg gtctaagaa gtctactaac	840
ctggtgaaga acaagtgcgt caacttcaac ttcaacggc tgactggaac tggaggtggc	900
tccggaggta gcggcggatc tgggtggctca ggaggttcta cttgccctcc ctgcccagct	960
cctgagctgc tgggcggacc ctccgtgttc ctgttccac ctaagccaaa ggacactctg	1020
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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
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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
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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
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Asp Asp Phe Ser Lys Gln Leu Gln Gln Ser Met Ser Ser Ala Asp Ser
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Thr Gln Ala

<210> 11

<211> 75

<212> PRT

<213> Coronavirus

<400> 11

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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
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Leu	Asn	Ser	Ser	Arg	Val	Pro	Asp	Leu	Leu	Val
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<211> 222

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<213> Coronavirus

<400> 12

Met Ala Asp Ser Asn Gly Thr Ile Thr Val Glu Glu Leu Lys Lys Leu
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Leu Glu Gln Trp Asn Leu Val Ile Gly Phe Leu Phe Leu Thr Trp Ile
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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