

SEQUENCE LISTING

<110> VLP THERAPEUTICS, LLC

<120> MALARIA VACCINE

<130> SG5972A

<160> 56

<170> PatentIn version 3.5

<210> 1

<211> 1248

<212> PRT

<213> Chikungunya virus

<400> 1

Met Glu Phe Ile Pro Thr Gln Thr Phe Tyr Asn Arg Arg Tyr Gln Pro
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 35 40 45

Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
 50 55 60

Arg Lys Asn Lys Lys Gln Lys Gln Lys Gln Gln Ala Pro Gln Asn Asn
 65 70 75 80

Thr Asn Gln Lys Lys Gln Pro Pro Lys Lys Lys Pro Ala Gln Lys Lys
 85 90 95

Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
 100 105 110

Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Thr Gly Tyr Ala Cys
 115 120 125

Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
 130 135 140

Asp Asn Ala Asp Leu Ala Lys Leu Ala Phe Lys Arg Ser Ser Lys Tyr
 145 150 155 160

Asp Leu Glu Cys Ala Gln Ile Pro Val His Met Lys Ser Asp Ala Ser
 165 170 175

Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
 180 185 190

Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
 195 200 205

Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
 210 215 220

Val Ala Ile Val Leu Gly Gly Ala Asn Glu Gly Ala Arg Thr Ala Leu
 225 230 235 240

Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
 245 250 255

Gly Ala Glu Glu Trp Ser Leu Ala Ile Pro Val Met Cys Leu Leu Ala
 260 265 270

Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
 275 280 285

Glu Lys Glu Pro Glu Glu Thr Leu Arg Met Leu Glu Asp Asn Val Met
 290 295 300

Arg Pro Gly Tyr Tyr Gln Leu Leu Gln Ala Ser Leu Thr Cys Ser Pro
 305 310 315 320

His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
 325 330 335

Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
 340 345 350

Cys His Ser Pro Val Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp
 355 360 365

Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp
 370 375 380

Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Asn His Met Pro
 385 390 395 400

Ala Asp Ala Glu Arg Ala Gly Leu Phe Val Arg Thr Ser Ala Pro Cys
 405 410 415

Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys
420 425 430

Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His
435 440 445

Ser Cys Thr His Pro Phe His His Asp Pro Pro Val Ile Gly Arg Glu
450 455 460

Lys Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr
465 470 475 480

Tyr Val Gln Ser Thr Ala Ala Thr Thr Glu Glu Ile Glu Val His Met
485 490 495

Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Ser Gln Gln Ser Gly Asn
500 505 510

Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys
515 520 525

Gly Gly Ser Asn Glu Gly Leu Thr Thr Thr Asp Lys Val Ile Asn Asn
530 535 540

Cys Lys Val Asp Gln Cys His Ala Ala Val Thr Asn His Lys Lys Trp
545 550 555 560

Gln Tyr Asn Ser Pro Leu Val Pro Arg Asn Ala Glu Leu Gly Asp Arg
565 570 575

Lys Gly Lys Ile His Ile Pro Phe Pro Leu Ala Asn Val Thr Cys Arg
580 585 590

Val Pro Lys Ala Arg Asn Pro Thr Val Thr Tyr Gly Lys Asn Gln Val
595 600 605

Ile Met Leu Leu Tyr Pro Asp His Pro Thr Leu Leu Ser Tyr Arg Asn
610 615 620

Met Gly Glu Glu Pro Asn Tyr Gln Glu Glu Trp Val Met His Lys Lys
625 630 635 640

Glu Val Val Leu Thr Val Pro Thr Glu Gly Leu Glu Val Thr Trp Gly
645 650 655

Asn Asn Glu Pro Tyr Lys Tyr Trp Pro Gln Leu Ser Thr Asn Gly Thr
660 665 670

Ala His Gly His Pro His Glu Ile Ile Leu Tyr Tyr Tyr Glu Leu Tyr

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Pro Thr Met Thr Val Val Val Val Ser Val Ala Thr Phe Ile Leu Leu		
690	695	700
Ser Met Val Gly Met Ala Ala Gly Met Cys Met Cys Ala Arg Arg Arg		
705	710	715 720
Cys Ile Thr Pro Tyr Glu Leu Thr Pro Gly Ala Thr Val Pro Phe Leu		
725	730	735
Leu Ser Leu Ile Cys Cys Ile Arg Thr Ala Lys Ala Ala Thr Tyr Gln		
740	745	750
Glu Ala Ala Ile Tyr Leu Trp Asn Glu Gln Gln Pro Leu Phe Trp Leu		
755	760	765
Gln Ala Leu Ile Pro Leu Ala Ala Leu Ile Val Leu Cys Asn Cys Leu		
770	775	780
Arg Leu Leu Pro Cys Cys Cys Lys Thr Leu Ala Phe Leu Ala Val Met		
785	790	795 800
Ser Val Gly Ala His Thr Val Ser Ala Tyr Glu His Val Thr Val Ile		
805	810	815
Pro Asn Thr Val Gly Val Pro Tyr Lys Thr Leu Val Asn Arg Pro Gly		
820	825	830
Tyr Ser Pro Met Val Leu Glu Met Glu Leu Leu Ser Val Thr Leu Glu		
835	840	845
Pro Thr Leu Ser Leu Asp Tyr Ile Thr Cys Glu Tyr Lys Thr Val Ile		
850	855	860
Pro Ser Pro Tyr Val Lys Cys Cys Gly Thr Ala Glu Cys Lys Asp Lys		
865	870	875 880
Asn Leu Pro Asp Tyr Ser Cys Lys Val Phe Thr Gly Val Tyr Pro Phe		
885	890	895
Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Ala Glu Asn Thr Gln Leu		
900	905	910
Ser Glu Ala His Val Glu Lys Ser Glu Ser Cys Lys Thr Glu Phe Ala		
915	920	925
Ser Ala Tyr Arg Ala His Thr Ala Ser Ala Ser Ala Lys Leu Arg Val		
930	935	940

Leu Tyr Gln Gly Asn Asn Ile Thr Val Thr Ala Tyr Ala Asn Gly Asp
 945 950 955 960

His Ala Val Thr Val Lys Asp Ala Lys Phe Ile Val Gly Pro Met Ser
 965 970 975

Ser Ala Trp Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys Gly Asp
 980 985 990

Val Tyr Asn Met Asp Tyr Pro Pro Phe Gly Ala Gly Arg Pro Gly Gln
 995 1000 1005

Phe Gly Asp Ile Gln Ser Arg Thr Pro Glu Ser Lys Asp Val Tyr
 1010 1015 1020

Ala Asn Thr Gln Leu Val Leu Gln Arg Pro Ala Val Gly Thr Val
 1025 1030 1035

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

Lys Glu Arg Gly Ala Ser Leu Gln His Thr Ala Pro Phe Gly Cys
 1055 1060 1065

Gln Ile Ala Thr Asn Pro Val Arg Ala Val Asn Cys Ala Val Gly
 1070 1075 1080

Asn Met Pro Ile Ser Ile Asp Ile Pro Glu Ala Ala Phe Thr Arg
 1085 1090 1095

Val Val Asp Ala Pro Ser Leu Thr Asp Met Ser Cys Glu Val Pro
 1100 1105 1110

Ala Cys Thr His Ser Ser Asp Phe Gly Gly Val Ala Ile Ile Lys
 1115 1120 1125

Tyr Ala Ala Ser Lys Lys Gly Lys Cys Ala Val His Ser Met Thr
 1130 1135 1140

Asn Ala Val Thr Ile Arg Glu Ala Glu Ile Glu Val Glu Gly Asn
 1145 1150 1155

Ser Gln Leu Gln Ile Ser Phe Ser Thr Ala Leu Ala Ser Ala Glu
 1160 1165 1170

Phe Arg Val Gln Val Cys Ser Thr Gln Val His Cys Ala Ala Glu
 1175 1180 1185

Cys His Pro Pro Lys Asp His Ile Val Asn Tyr Pro Ala Ser His
 1190 1195 1200

Thr Thr Leu Gly Val Gln Asp Ile Ser Ala Thr Ala Met Ser Trp
 1205 1210 1215

Val Gln Lys Ile Thr Gly Gly Val Gly Leu Val Val Ala Val Ala
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Ala Leu Ile Leu Ile Val Val Leu Cys Val Ser Phe Ser Arg His
 1235 1240 1245

<210> 2

<211> 1248

<212> PRT

<213> Chikungunya virus

<400> 2

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

Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
 50 55 60

Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
 65 70 75 80

Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
 85 90 95

Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
 100 105 110

Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
 115 120 125

Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
 130 135 140

Asp Asn Ala Asp Leu Ala Lys Leu Ala Phe Lys Arg Ser Ser Lys Tyr
 145 150 155 160

Asp Leu Glu Cys Ala Gln Ile Pro Val His Met Lys Ser Asp Ala Ser
 165 170 175

Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
 180 185 190

Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
 195 200 205

Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
 210 215 220

Val Ala Ile Val Leu Gly Gly Ala Asn Glu Gly Ala Arg Thr Ala Leu
 225 230 235 240

Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
 245 250 255

Gly Ala Glu Glu Trp Ser Leu Ala Leu Pro Val Leu Cys Leu Leu Ala
 260 265 270

Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
 275 280 285

Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met
 290 295 300

Arg Pro Gly Tyr Tyr Gln Leu Leu Lys Ala Ser Leu Thr Cys Ser Pro
 305 310 315 320

His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
 325 330 335

Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
 340 345 350

Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp
 355 360 365

Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp
 370 375 380

Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro
 385 390 395 400

Ala Asp Ala Glu Arg Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys
 405 410 415

Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys
420 425 430

Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His
435 440 445

Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu
450 455 460

Arg Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr
465 470 475 480

Tyr Val Gln Ser Thr Ala Ala Thr Ala Glu Glu Ile Glu Val His Met
485 490 495

Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Asn
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Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys
515 520 525

Gly Gly Ser Asn Glu Gly Leu Thr Thr Thr Asp Lys Val Ile Asn Asn
530 535 540

Cys Lys Ile Asp Gln Cys His Ala Ala Val Thr Asn His Lys Asn Trp
545 550 555 560

Gln Tyr Asn Ser Pro Leu Val Pro Arg Asn Ala Glu Leu Gly Asp Arg
565 570 575

Lys Gly Lys Ile His Ile Pro Phe Pro Leu Ala Asn Val Thr Cys Arg
580 585 590

Val Pro Lys Ala Arg Asn Pro Thr Val Thr Tyr Gly Lys Asn Gln Val
595 600 605

Thr Met Leu Leu Tyr Pro Asp His Pro Thr Leu Leu Ser Tyr Arg Asn
610 615 620

Met Gly Gln Glu Pro Asn Tyr His Glu Glu Trp Val Thr His Lys Lys
625 630 635 640

Glu Val Thr Leu Thr Val Pro Thr Glu Gly Leu Glu Val Thr Trp Gly
645 650 655

Asn Asn Glu Pro Tyr Lys Tyr Trp Pro Gln Met Ser Thr Asn Gly Thr
660 665 670

Ala His Gly His Pro His Glu Ile Ile Leu Tyr Tyr Tyr Glu Leu Tyr

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Pro Thr Met Thr Val Val Ile Val Ser Val Ala Ser Phe Val Leu Leu		
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Ser Met Val Gly Thr Ala Val Gly Met Cys Val Cys Ala Arg Arg Arg		
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Cys Ile Thr Pro Tyr Glu Leu Thr Pro Gly Ala Thr Val Pro Phe Leu		
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Leu Ser Leu Leu Cys Cys Val Arg Thr Thr Lys Ala Ala Thr Tyr Tyr		
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Glu Ala Ala Ala Tyr Leu Trp Asn Glu Gln Gln Pro Leu Phe Trp Leu		
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Gln Ala Leu Ile Pro Leu Ala Ala Leu Ile Val Leu Cys Asn Cys Leu		
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Lys Leu Leu Pro Cys Cys Cys Lys Thr Leu Ala Phe Leu Ala Val Met		
785	790	795 800
Ser Ile Gly Ala His Thr Val Ser Ala Tyr Glu His Val Thr Val Ile		
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Pro Asn Thr Val Gly Val Pro Tyr Lys Thr Leu Val Asn Arg Pro Gly		
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Tyr Ser Pro Met Val Leu Glu Met Glu Leu Gln Ser Val Thr Leu Glu		
835	840	845
Pro Thr Leu Ser Leu Asp Tyr Ile Thr Cys Glu Tyr Lys Thr Val Ile		
850	855	860
Pro Ser Pro Tyr Val Lys Cys Cys Gly Thr Ala Glu Cys Lys Asp Lys		
865	870	875 880
Ser Leu Pro Asp Tyr Ser Cys Lys Val Phe Thr Gly Val Tyr Pro Phe		
885	890	895
Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Ala Glu Asn Thr Gln Leu		
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Ser Glu Ala His Val Glu Lys Ser Glu Ser Cys Lys Thr Glu Phe Ala		
915	920	925
Ser Ala Tyr Arg Ala His Thr Ala Ser Ala Ser Ala Lys Leu Arg Val		
930	935	940

Leu Tyr Gln Gly Asn Asn Ile Thr Val Ala Ala Tyr Ala Asn Gly Asp
 945 950 955 960

His Ala Val Thr Val Lys Asp Ala Lys Phe Val Val Gly Pro Met Ser
 965 970 975

Ser Ala Trp Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys Gly Asp
 980 985 990

Val Tyr Asn Met Asp Tyr Pro Pro Phe Gly Ala Gly Arg Pro Gly Gln
 995 1000 1005

Phe Gly Asp Ile Gln Ser Arg Thr Pro Glu Ser Lys Asp Val Tyr
 1010 1015 1020

Ala Asn Thr Gln Leu Val Leu Gln Arg Pro Ala Ala Gly Thr Val
 1025 1030 1035

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

Lys Glu Arg Gly Ala Ser Leu Gln His Thr Ala Pro Phe Gly Cys
 1055 1060 1065

Gln Ile Ala Thr Asn Pro Val Arg Ala Val Asn Cys Ala Val Gly
 1070 1075 1080

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asp Ala Ala Phe Thr Arg
 1085 1090 1095

Val Val Asp Ala Pro Ser Val Thr Asp Met Ser Cys Glu Val Pro
 1100 1105 1110

Ala Cys Thr His Ser Ser Asp Phe Gly Gly Val Ala Ile Ile Lys
 1115 1120 1125

Tyr Thr Ala Ser Lys Lys Gly Lys Cys Ala Val His Ser Met Thr
 1130 1135 1140

Asn Ala Val Thr Ile Arg Glu Ala Asp Val Glu Val Glu Gly Asn
 1145 1150 1155

Ser Gln Leu Gln Ile Ser Phe Ser Thr Ala Leu Ala Ser Ala Glu
 1160 1165 1170

Phe Arg Val Gln Val Cys Ser Thr Gln Val His Cys Ala Ala Ala
 1175 1180 1185

Cys His Pro Pro Lys Asp His Ile Val Asn Tyr Pro Ala Ser His
1190 1195 1200

Thr Thr Leu Gly Val Gln Asp Ile Ser Thr Thr Ala Met Ser Trp
1205 1210 1215

Val Gln Lys Ile Thr Gly Gly Val Gly Leu Ile Val Ala Val Ala
1220 1225 1230

Ala Leu Ile Leu Ile Val Val Leu Cys Val Ser Phe Ser Arg His
1235 1240 1245

<210> 3

<211> 1255

<212> PRT

<213> Venezuelan equine encephalitis virus

<400> 3

Met Phe Pro Phe Gln Pro Met Tyr Pro Met Gln Pro Met Pro Tyr Arg
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Asn Pro Phe Ala Ala Pro Arg Arg Pro Trp Phe Pro Arg Thr Asp Pro
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Phe Leu Ala Met Gln Val Gln Glu Leu Thr Arg Ser Met Ala Asn Leu
35 40 45

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Ala
50 55 60

Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
65 70 75 80

Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro
85 90 95

Asn Pro Lys Ala Gln Asn Gly Asn Lys Lys Lys Thr Asn Lys Lys Pro
100 105 110

Gly Lys Arg Gln Arg Met Val Met Lys Leu Glu Ser Asp Lys Thr Phe
115 120 125

Pro Ile Met Leu Glu Gly Lys Ile Asn Gly Tyr Ala Cys Val Val Gly
130 135 140

Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp
145 150 155 160

Val Leu Ala Ala Leu Lys Thr Lys Lys Ala Ser Lys Tyr Asp Leu Glu
 165 170 175

Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr
 180 185 190

His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln
 195 200 205

Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly
 210 215 220

Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile
 225 230 235 240

Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val
 245 250 255

Met Trp Asn Glu Lys Gly Val Thr Val Lys Tyr Thr Pro Glu Asn Cys
 260 265 270

Glu Gln Trp Ser Leu Val Thr Thr Met Cys Leu Leu Ala Asn Val Thr
 275 280 285

Phe Pro Cys Ala Gln Pro Pro Ile Cys Tyr Asp Arg Lys Pro Ala Glu
 290 295 300

Thr Leu Ala Met Leu Ser Val Asn Val Asp Asn Pro Gly Tyr Asp Glu
 305 310 315 320

Leu Leu Glu Ala Ala Val Lys Cys Pro Gly Arg Lys Arg Arg Ser Thr
 325 330 335

Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met Ala Arg
 340 345 350

Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala Ile Glu
 355 360 365

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

Ser Gln Tyr Gly Leu Asp Ser Ser Gly Asn Leu Lys Gly Arg Thr Met
 385 390 395 400

Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His Gln Val
 405 410 415

Ser Leu Tyr Thr Ser Arg Pro Cys His Ile Val Asp Gly His Gly Tyr
 420 425 430

Phe Leu Leu Ala Arg Cys Pro Ala Gly Asp Ser Ile Thr Met Glu Phe
 435 440 445

Lys Lys Asp Ser Val Arg His Ser Cys Ser Val Pro Tyr Glu Val Lys
 450 455 460

Phe Asn Pro Val Gly Arg Glu Leu Tyr Thr His Pro Pro Glu His Gly
 465 470 475 480

Val Glu Gln Ala Cys Gln Val Tyr Ala His Asp Ala Gln Asn Arg Gly
 485 490 495

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

Val Ser Leu Ser Gly Ser Ser Val Thr Val Thr Pro Pro Asp Gly Thr
 515 520 525

Ser Ala Leu Val Glu Cys Glu Cys Gly Gly Thr Lys Ile Ser Glu Thr
 530 535 540

Ile Asn Lys Thr Lys Gln Phe Ser Gln Cys Thr Lys Lys Glu Gln Cys
 545 550 555 560

Arg Ala Tyr Arg Leu Gln Asn Asp Lys Trp Val Tyr Asn Ser Asp Lys
 565 570 575

Leu Pro Lys Ala Ala Gly Ala Thr Leu Lys Gly Lys Leu His Val Pro
 580 585 590

Phe Leu Leu Ala Asp Gly Lys Cys Thr Val Pro Leu Ala Pro Glu Pro
 595 600 605

Met Ile Thr Phe Gly Phe Arg Ser Val Ser Leu Lys Leu His Pro Lys
 610 615 620

Asn Pro Thr Tyr Leu Ile Thr Arg Gln Leu Ala Asp Glu Pro His Tyr
 625 630 635 640

Thr His Glu Leu Ile Ser Glu Pro Ala Val Arg Asn Phe Thr Val Thr
 645 650 655

Glu Lys Gly Trp Glu Phe Val Trp Gly Asn His Pro Pro Lys Arg Phe
 660 665 670

Trp Ala Gln Glu Thr Ala Pro Gly Asn Pro His Gly Leu Pro His Glu

675	680	685
Val Ile Thr His Tyr Tyr His Arg Tyr Pro Met Ser Thr Ile Leu Gly		
690	695	700
Leu Ser Ile Cys Ala Ala Ile Ala Thr Val Ser Val Ala Ala Ser Thr		
705	710	715 720
Trp Leu Phe Cys Arg Ser Arg Val Ala Cys Leu Thr Pro Tyr Arg Leu		
725	730	735
Thr Pro Asn Ala Arg Ile Pro Phe Cys Leu Ala Val Leu Cys Cys Ala		
740	745	750
Arg Thr Ala Arg Ala Glu Thr Thr Trp Glu Ser Leu Asp His Leu Trp		
755	760	765
Asn Asn Asn Gln Gln Met Phe Trp Ile Gln Leu Leu Ile Pro Leu Ala		
770	775	780
Ala Leu Ile Val Val Thr Arg Leu Leu Arg Cys Val Cys Cys Val Val		
785	790	795 800
Pro Phe Leu Val Met Ala Gly Ala Ala Gly Ala Gly Ala Tyr Glu His		
805	810	815
Ala Thr Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr Asn Thr Ile Val		
820	825	830
Asn Arg Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile Thr Pro Thr Lys		
835	840	845
Ile Lys Leu Ile Pro Thr Val Asn Leu Glu Tyr Val Thr Cys His Tyr		
850	855	860
Lys Thr Gly Met Asp Ser Pro Ala Ile Lys Cys Cys Gly Ser Gln Glu		
865	870	875 880
Cys Thr Pro Thr Tyr Arg Pro Asp Glu Gln Cys Lys Val Phe Thr Gly		
885	890	895
Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Thr Glu		
900	905	910
Asn Thr Gln Val Ser Lys Ala Tyr Val Met Lys Ser Asp Asp Cys Leu		
915	920	925
Ala Asp His Ala Glu Ala Tyr Lys Ala His Thr Ala Ser Val Gln Ala		
930	935	940

Phe Leu Asn Ile Thr Val Gly Glu His Ser Ile Val Thr Thr Val Tyr
 945 950 955 960

Val Asn Gly Glu Thr Pro Val Asn Phe Asn Gly Val Lys Ile Thr Ala
 965 970 975

Gly Pro Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg Lys Ile Val Gln
 980 985 990

Tyr Ala Gly Glu Ile Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala Gly
 995 1000 1005

Gln Pro Gly Ala Phe Gly Asp Ile Gln Ser Arg Thr Val Ser Ser
 1010 1015 1020

Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu Gln Arg Pro Lys
 1025 1030 1035

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

Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu Lys Phe Thr Ala
 1055 1060 1065

Pro Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile Arg Ala Glu Asn
 1070 1075 1080

Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp Ile Pro Asp Ala
 1085 1090 1095

Leu Phe Thr Arg Val Ser Glu Thr Pro Thr Leu Ser Ala Ala Glu
 1100 1105 1110

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

Ala Thr Val Lys Tyr Ser Ala Ser Lys Ser Gly Lys Cys Ala Val
 1130 1135 1140

His Val Pro Ser Gly Thr Ala Thr Leu Lys Glu Ala Ala Val Glu
 1145 1150 1155

Leu Thr Glu Gln Gly Ser Ala Thr Ile His Phe Ser Thr Ala Asn
 1160 1165 1170

Ile His Pro Glu Phe Arg Leu Gln Ile Cys Thr Ser Tyr Val Thr
 1175 1180 1185

Cys Lys Gly Asp Cys His Pro Pro Lys Asp His Ile Val Thr His
1190 1195 1200

Pro Gln Tyr His Ala Gln Thr Phe Thr Ala Ala Val Ser Lys Thr
1205 1210 1215

Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly Ser Ala Val Ile
1220 1225 1230

Ile Ile Ile Gly Leu Val Leu Ala Thr Ile Val Ala Met Tyr Val
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Leu Thr Asn Gln Lys His Asn
1250 1255

<210> 4
<211> 2964
<212> DNA
<213> Chikungunya virus

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<211> 2964

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<213> Chikungunya virus

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<213> Chikungunya virus

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Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
50 55 60

Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
65 70 75 80

Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
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Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
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Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
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Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
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Asp Asn Ala Asp Leu Ala Lys Leu Ala Phe Lys Arg Ser Ser Lys Tyr
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Asp Leu Glu Cys Ala Gln Ile Pro Val His Met Lys Ser Asp Ala Ser
165 170 175

Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
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Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
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Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
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Val Ala Ile Val Leu Gly Gly Ala Asn Glu Gly Ala Arg Thr Ala Leu
225 230 235 240

Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
245 250 255

Gly Ala Glu Glu Trp Ser Leu Ala Leu Pro Val Leu Cys Leu Leu Ala
260 265 270

Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
275 280 285

Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met

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His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala		
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Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser		
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Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp		
	355	360 365
Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp		
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Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro		
385	390	395 400
Ala Asp Ala Glu Arg Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys		
	405	410 415
Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys		
	420	425 430
Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His		
	435	440 445
Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu		
	450	455 460
Arg Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr		
465	470	475 480
Tyr Val Gln Ser Thr Ala Ala Thr Ala Glu Glu Ile Glu Val His Met		
	485	490 495
Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Gly		
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Ser Asn Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys		
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Asn Cys Gly Gly Ser Asn Glu Gly Leu Thr Thr Thr Asp Lys Val Ile		
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Asn Asn Cys Lys Ile Asp Gln Cys His Ala Ala Val Thr Asn His Lys		
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Asn Trp Gln Tyr Asn Ser Pro Leu Val Pro Arg Asn Ala Glu Leu Gly
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Asp Arg Lys Gly Lys Ile His Ile Pro Phe Pro Leu Ala Asn Val Thr
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Cys Arg Val Pro Lys Ala Arg Asn Pro Thr Val Thr Tyr Gly Lys Asn
 595 600 605

Gln Val Thr Met Leu Leu Tyr Pro Asp His Pro Thr Leu Leu Ser Tyr
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Arg Asn Met Gly Gln Glu Pro Asn Tyr His Glu Glu Trp Val Thr His
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Lys Lys Glu Val Thr Leu Thr Val Pro Thr Glu Gly Leu Glu Val Thr
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Trp Gly Asn Asn Glu Pro Tyr Lys Tyr Trp Pro Gln Met Ser Thr Asn
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Gly Thr Ala His Gly His Pro His Glu Ile Ile Leu Tyr Tyr Tyr Glu
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Leu Tyr Pro Thr Met Thr Val Val Ile Val Ser Val Ala Ser Phe Val
 690 695 700

Leu Leu Ser Met Val Gly Thr Ala Val Gly Met Cys Val Cys Ala Arg
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Arg Arg Cys Ile Thr Pro Tyr Glu Leu Thr Pro Gly Ala Thr Val Pro
 725 730 735

Phe Leu Leu Ser Leu Leu Cys Cys Val Arg Thr Thr Lys Ala Ala Thr
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Trp Leu Gln Ala Leu Ile Pro Leu Ala Ala Leu Ile Val Leu Cys Asn
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Cys Leu Lys Leu Leu Pro Cys Cys Cys Lys Thr Leu Ala Phe Leu Ala
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Val Met Ser Ile Gly Ala His Thr Val Ser Ala Tyr Glu His Val Thr
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Val Ile Pro Asn Thr Val Gly Val Pro Tyr Lys Thr Leu Val Asn Arg
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Pro Gly Tyr Ser Pro Met Val Leu Glu Met Glu Leu Gln Ser Val Thr
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Leu Glu Pro Thr Leu Ser Leu Asp Tyr Ile Thr Cys Glu Tyr Lys Thr
850 855 860

Val Ile Pro Ser Pro Tyr Val Lys Cys Cys Gly Thr Ala Glu Cys Lys
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Asp Lys Ser Leu Pro Asp Tyr Ser Cys Lys Val Phe Thr Gly Val Tyr
885 890 895

Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Ala Glu Asn Thr
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Gln Leu Ser Glu Ala His Val Glu Lys Ser Glu Ser Cys Lys Thr Glu
915 920 925

Phe Ala Ser Ala Tyr Arg Ala His Thr Ala Ser Ala Ser Ala Lys Leu
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Arg Val Leu Tyr Gln Gly Asn Asn Ile Thr Val Ala Ala Tyr Ala Asn
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Gly Asp His Ala Val Thr Val Lys Asp Ala Lys Phe Val Val Gly Pro
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Met Ser Ser Ala Trp Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys
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Gly Asp Val Tyr Asn Met Asp Tyr Pro Pro Phe Gly Ala Gly Arg Pro
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Gly Gln Phe Gly Asp Ile Gln Ser Arg Thr Pro Glu Ser Lys Asp
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Val Tyr Ala Asn Thr Gln Leu Val Leu Gln Arg Pro Ala Ala Gly
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Thr Val His Val Pro Tyr Ser Gln Ala Pro Ser Gly Phe Lys Tyr
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Trp Leu Lys Glu Arg Gly Ala Ser Leu Gln His Thr Ala Pro Phe
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Gly Cys Gln Ile Ala Thr Asn Pro Val Arg Ala Val Asn Cys Ala

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Gly Asn Ser Gln Leu Gln Ile	Ser Phe Ser Thr Ala	Leu Ala Ser
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Ala Glu Phe Arg Val Gln Val	Cys Ser Thr Gln Val	His Cys Ala
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Ser His Thr Thr Leu Gly Val	Gln Asp Ile Ser Thr	Thr Ala Met
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Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
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Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
 65 70 75 80
 Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
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 Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
 100 105 110
 Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
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 Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
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 145 150 155 160
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 165 170 175
 Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
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 Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
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 Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
 210 215 220
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 225 230 235 240
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 Gly Ala Glu Glu Trp Ser Leu Ala Leu Pro Val Leu Cys Leu Leu Ala
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 Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
 275 280 285
 Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met
 290 295 300
 Arg Pro Gly Tyr Tyr Gln Leu Leu Lys Ala Ser Leu Thr Cys Ser Pro
 305 310 315 320

His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
 325 330 335

Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
 340 345 350

Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp
 355 360 365

Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp
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Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro
 385 390 395 400

Ala Asp Ala Glu Arg Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys
 405 410 415

Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys
 420 425 430

Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His
 435 440 445

Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu
 450 455 460

Arg Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr
 465 470 475 480

Tyr Val Gln Ser Thr Ala Ala Thr Ala Glu Glu Ile Glu Val His Met
 485 490 495

Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Asn
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Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys
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Gly Gly Ser Gly Ser Gly Ser Asn Glu Gly Leu Thr Thr Thr Asp Lys
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Val Ile Asn Asn Cys Lys Ile Asp Gln Cys His Ala Ala Val Thr Asn
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His Lys Asn Trp Gln Tyr Asn Ser Pro Leu Val Pro Arg Asn Ala Glu
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Leu Gly Asp Arg Lys Gly Lys Ile His Ile Pro Phe Pro Leu Ala Asn

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Lys Asn Gln Val Thr Met Leu Leu Tyr Pro Asp His Pro Thr Leu Leu		
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Ser Tyr Arg Asn Met Gly Gln Glu Pro Asn Tyr His Glu Glu Trp Val		
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Thr His Lys Lys Glu Val Thr Leu Thr Val Pro Thr Glu Gly Leu Glu		
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Val Thr Trp Gly Asn Asn Glu Pro Tyr Lys Tyr Trp Pro Gln Met Ser		
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Thr Asn Gly Thr Ala His Gly His Pro His Glu Ile Ile Leu Tyr Tyr		
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Tyr Glu Leu Tyr Pro Thr Met Thr Val Val Ile Val Ser Val Ala Ser		
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Phe Val Leu Leu Ser Met Val Gly Thr Ala Val Gly Met Cys Val Cys		
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Ala Arg Arg Arg Cys Ile Thr Pro Tyr Glu Leu Thr Pro Gly Ala Thr		
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Val Pro Phe Leu Leu Ser Leu Leu Cys Cys Val Arg Thr Thr Lys Ala		
740	745	750
Ala Thr Tyr Tyr Glu Ala Ala Ala Tyr Leu Trp Asn Glu Gln Gln Pro		
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Leu Phe Trp Leu Gln Ala Leu Ile Pro Leu Ala Ala Leu Ile Val Leu		
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Asn Arg Pro Gly Tyr Ser Pro Met Val Leu Glu Met Glu Leu Gln Ser		
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Val Thr Leu Glu Pro Thr Leu Ser Leu Asp Tyr Ile Thr Cys Glu Tyr
850 855 860

Lys Thr Val Ile Pro Ser Pro Tyr Val Lys Cys Cys Gly Thr Ala Glu
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Cys Lys Asp Lys Ser Leu Pro Asp Tyr Ser Cys Lys Val Phe Thr Gly
885 890 895

Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Ala Glu
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Asn Thr Gln Leu Ser Glu Ala His Val Glu Lys Ser Glu Ser Cys Lys
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Thr Glu Phe Ala Ser Ala Tyr Arg Ala His Thr Ala Ser Ala Ser Ala
930 935 940

Lys Leu Arg Val Leu Tyr Gln Gly Asn Asn Ile Thr Val Ala Ala Tyr
945 950 955 960

Ala Asn Gly Asp His Ala Val Thr Val Lys Asp Ala Lys Phe Val Val
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Gly Pro Met Ser Ser Ala Trp Thr Pro Phe Asp Asn Lys Ile Val Val
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Tyr Lys Gly Asp Val Tyr Asn Met Asp Tyr Pro Pro Phe Gly Ala Gly
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Arg Pro Gly Gln Phe Gly Asp Ile Gln Ser Arg Thr Pro Glu Ser
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Lys Asp Val Tyr Ala Asn Thr Gln Leu Val Leu Gln Arg Pro Ala
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Ala Gly Thr Val His Val Pro Tyr Ser Gln Ala Pro Ser Gly Phe
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Pro Phe Gly Cys Gln Ile Ala Thr Asn Pro Val Arg Ala Val Asn
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His Ser Met Thr Asn Ala Val Thr Ile Arg Glu Ala Asp Val Glu
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Val Glu Gly Asn Ser Gln Leu Gln Ile Ser Phe Ser Thr Ala Leu
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Ala Ser Ala Glu Phe Arg Val Gln Val Cys Ser Thr Gln Val His
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Cys Ala Ala Ala Cys His Pro Pro Lys Asp His Ile Val Asn Tyr
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Pro Ala Ser His Thr Thr Leu Gly Val Gln Asp Ile Ser Thr Thr
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Ala Met Ser Trp Val Gln Lys Ile Thr Gly Gly Val Gly Leu Ile
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Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
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Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
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Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro

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Gly Lys Arg Gln Arg Met Val Met Lys Leu Glu Ser Asp Lys Thr Phe		
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Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp		
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Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr		
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His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln		
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Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly		
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Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile		
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Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val		
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260	265	270
Glu Gln Trp Ser Leu Val Thr Thr Met Cys Leu Leu Ala Asn Val Thr		
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Phe Pro Cys Ala Gln Pro Pro Ile Cys Tyr Asp Arg Lys Pro Ala Glu		
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Thr Leu Ala Met Leu Ser Val Asn Val Asp Asn Pro Gly Tyr Asp Glu		
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Leu Leu Glu Ala Ala Val Lys Cys Pro Gly Arg Lys Arg Arg Ser Thr		
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Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met Ala Arg		
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Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala Ile Glu
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Ala Val Lys Ser Asp Gly His Asp Gly Tyr Val Arg Leu Gln Thr Ser
370 375 380

Ser Gln Tyr Gly Leu Asp Ser Ser Gly Asn Leu Lys Gly Arg Thr Met
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Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His Gln Val
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Ser Leu Tyr Thr Ser Arg Pro Cys His Ile Val Asp Gly His Gly Tyr
420 425 430

Phe Leu Leu Ala Arg Cys Pro Ala Gly Asp Ser Ile Thr Met Glu Phe
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Lys Lys Asp Ser Val Arg His Ser Cys Ser Val Pro Tyr Glu Val Lys
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Phe Asn Pro Val Gly Arg Glu Leu Tyr Thr His Pro Pro Glu His Gly
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Val Glu Gln Ala Cys Gln Val Tyr Ala His Asp Ala Gln Asn Arg Gly
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Ala Tyr Val Glu Met His Leu Pro Gly Ser Glu Val Asp Ser Ser Leu
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Val Ser Leu Ser Gly Ser Gly Gly Ser Ser Ser Val Thr Val Thr Pro
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Pro Asp Gly Thr Ser Ala Leu Val Glu Cys Glu Cys Gly Gly Thr Lys
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Lys Glu Gln Cys Arg Ala Tyr Arg Leu Gln Asn Asp Lys Trp Val Tyr
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Asn Ser Asp Lys Leu Pro Lys Ala Ala Gly Ala Thr Leu Lys Gly Lys
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Leu His Val Pro Phe Leu Leu Ala Asp Gly Lys Cys Thr Val Pro Leu
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Ala Pro Glu Pro Met Ile Thr Phe Gly Phe Arg Ser Val Ser Leu Lys
610 615 620

Leu His Pro Lys Asn Pro Thr Tyr Leu Ile Thr Arg Gln Leu Ala Asp
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Glu Pro His Tyr Thr His Glu Leu Ile Ser Glu Pro Ala Val Arg Asn
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Phe Thr Val Thr Glu Lys Gly Trp Glu Phe Val Trp Gly Asn His Pro
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Pro Lys Arg Phe Trp Ala Gln Glu Thr Ala Pro Gly Asn Pro His Gly
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Leu Pro His Glu Val Ile Thr His Tyr Tyr His Arg Tyr Pro Met Ser
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Ala Ala Ser Thr Trp Leu Phe Cys Arg Ser Arg Val Ala Cys Leu Thr
725 730 735

Pro Tyr Arg Leu Thr Pro Asn Ala Arg Ile Pro Phe Cys Leu Ala Val
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Leu Cys Cys Ala Arg Thr Ala Arg Ala Glu Thr Thr Trp Glu Ser Leu
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Asp His Leu Trp Asn Asn Asn Gln Gln Met Phe Trp Ile Gln Leu Leu
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Ile Pro Leu Ala Ala Leu Ile Val Val Thr Arg Leu Leu Arg Cys Val
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Cys Cys Val Val Pro Phe Leu Val Met Ala Gly Ala Ala Gly Ala Gly
805 810 815

Ala Tyr Glu His Ala Thr Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr
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Asn Thr Ile Val Asn Arg Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile
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Cys Asp Thr Glu Asn Thr Gln Val Ser Lys Ala Tyr Val Met Lys Ser			
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Asp Asp Cys Leu Ala Asp His Ala Glu Ala Tyr Lys Ala His Thr Ala			
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Ser Val Gln Ala Phe Leu Asn Ile Thr Val Gly Glu His Ser Ile Val			
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Thr Thr Val Tyr Val Asn Gly Glu Thr Pro Val Asn Phe Asn Gly Val			
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Pro Ser Gly Phe Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu			
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Arg Ala Glu Asn Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp			
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Ser Thr Ala Asn Ile His Pro Glu Phe Arg Leu Gln Ile Cys Thr
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Ser Tyr Val Thr Cys Lys Gly Asp Cys His Pro Pro Lys Asp His
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Val Ser Lys Thr Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly
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 35 40 45

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
 50 55 60

Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
 65 70 75 80

Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro
 85 90 95

Asn Pro Lys Ala Gln Asn Gly Asn Lys Lys Lys Thr Asn Lys Lys Pro
 100 105 110

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

Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp
 145 150 155 160

Val Leu Ala Ala Leu Lys Thr Lys Lys Ala Ser Lys Tyr Asp Leu Glu
 165 170 175

Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr
 180 185 190

His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln
 195 200 205

Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly
 210 215 220

Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile
 225 230 235 240

Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val
 245 250 255

Met Trp Asn Glu Lys Gly Val Thr Val Lys Tyr Thr Pro Glu Asn Cys
 260 265 270

Glu Gln Trp Ser Leu Val Thr Thr Met Cys Leu Leu Ala Asn Val Thr
 275 280 285

Phe Pro Cys Ala Gln Pro Pro Ile Cys Tyr Asp Arg Lys Pro Ala Glu
 290 295 300

Thr Leu Ala Met Leu Ser Val Asn Val Asp Asn Pro Gly Tyr Asp Glu
 305 310 315 320

Leu Leu Glu Ala Ala Val Lys Cys Pro Gly Arg Lys Arg Arg Ser Thr
 325 330 335

Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met Ala Arg
 340 345 350

Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala Ile Glu
 355 360 365

Ala Val Lys Ser Asp Gly His Asp Gly Tyr Val Arg Leu Gln Thr Ser

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

Glu Pro His Tyr Thr His Glu Leu Ile Ser Glu Pro Ala Val Arg Asn
 645 650 655
 Phe Thr Val Thr Glu Lys Gly Trp Glu Phe Val Trp Gly Asn His Pro
 660 665 670
 Pro Lys Arg Phe Trp Ala Gln Glu Thr Ala Pro Gly Asn Pro His Gly
 675 680 685
 Leu Pro His Glu Val Ile Thr His Tyr Tyr His Arg Tyr Pro Met Ser
 690 695 700
 Thr Ile Leu Gly Leu Ser Ile Cys Ala Ala Ile Ala Thr Val Ser Val
 705 710 715 720
 Ala Ala Ser Thr Trp Leu Phe Cys Arg Ser Arg Val Ala Cys Leu Thr
 725 730 735
 Pro Tyr Arg Leu Thr Pro Asn Ala Arg Ile Pro Phe Cys Leu Ala Val
 740 745 750
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 Asp His Leu Trp Asn Asn Asn Gln Gln Met Phe Trp Ile Gln Leu Leu
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 785 790 795 800
 Cys Cys Val Val Pro Phe Leu Val Met Ala Gly Ala Ala Gly Ala Gly
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 Ala Tyr Glu His Ala Thr Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr
 820 825 830
 Asn Thr Ile Val Asn Arg Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile
 835 840 845
 Thr Pro Thr Lys Ile Lys Leu Ile Pro Thr Val Asn Leu Glu Tyr Val
 850 855 860
 Thr Cys His Tyr Lys Thr Gly Met Asp Ser Pro Ala Ile Lys Cys Cys
 865 870 875 880
 Gly Ser Gln Glu Cys Thr Pro Thr Tyr Arg Pro Asp Glu Gln Cys Lys
 885 890 895

Val Phe Thr Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe
 900 905 910

Cys Asp Thr Glu Asn Thr Gln Val Ser Lys Ala Tyr Val Met Lys Ser
 915 920 925

Asp Asp Cys Leu Ala Asp His Ala Glu Ala Tyr Lys Ala His Thr Ala
 930 935 940

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

Thr Thr Val Tyr Val Asn Gly Glu Thr Pro Val Asn Phe Asn Gly Val
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Lys Ile Thr Ala Gly Pro Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg
 980 985 990

Lys Ile Val Gln Tyr Ala Gly Glu Ile Tyr Asn Tyr Asp Phe Pro Glu
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Tyr Gly Ala Gly Gln Pro Gly Ala Phe Gly Asp Ile Gln Ser Arg
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Thr Val Ser Ser Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu
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Gln Arg Pro Lys Ala Gly Ala Ile His Val Pro Tyr Thr Gln Ala
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Pro Ser Gly Phe Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu
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Lys Phe Thr Ala Pro Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile
 1070 1075 1080

Arg Ala Glu Asn Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp
 1085 1090 1095

Ile Pro Asp Ala Leu Phe Thr Arg Val Ser Glu Thr Pro Thr Leu
 1100 1105 1110

Ser Ala Ala Glu Cys Thr Leu Asn Glu Cys Val Tyr Ser Ser Asp
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Phe Gly Gly Ile Ala Thr Val Lys Tyr Ser Ala Ser Lys Ser Gly
 1130 1135 1140

Lys Cys Ala Val His Val Pro Ser Gly Thr Ala Thr Leu Lys Glu

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Ala Ala Val Glu Leu Thr Glu Gln Gly Ser Ala Thr Ile His Phe		
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Ser Thr Ala Asn Ile His Pro Glu Phe Arg Leu Gln Ile Cys Thr		
1175	1180	1185
Ser Tyr Val Thr Cys Lys Gly Asp Cys His Pro Pro Lys Asp His		
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Ile Val Thr His Pro Gln Tyr His Ala Gln Thr Phe Thr Ala Ala		
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Val Ser Lys Thr Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly		
1220	1225	1230
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<400> 22

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35 40 45

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
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Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
65 70 75 80

Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro
85 90 95

Asn Pro Lys Ala Gln Asn Gly Asn Lys Lys Lys Thr Asn Lys Lys Pro
100 105 110

Gly Lys Arg Gln Arg Met Val Met Lys Leu Glu Ser Asp Lys Thr Phe
115 120 125

Pro Ile Met Leu Glu Gly Lys Ile Asn Gly Tyr Ala Cys Val Val Gly
130 135 140

Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp
 145 150 155 160

Val Leu Ala Ala Leu Lys Thr Lys Lys Ala Ser Lys Tyr Asp Leu Glu
 165 170 175

Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr
 180 185 190

His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln
 195 200 205

Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly
 210 215 220

Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile
 225 230 235 240

Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val
 245 250 255

Met Trp Asn Glu Lys Gly Val Thr Val Lys Tyr Thr Pro Glu Asn Cys
 260 265 270

Glu Gln Trp Ser Leu Val Thr Thr Met Cys Leu Leu Ala Asn Val Thr
 275 280 285

Phe Pro Cys Ala Gln Pro Pro Ile Cys Tyr Asp Arg Lys Pro Ala Glu
 290 295 300

Thr Leu Ala Met Leu Ser Val Asn Val Asp Asn Pro Gly Tyr Asp Glu
 305 310 315 320

Leu Leu Glu Ala Ala Val Lys Cys Pro Gly Arg Lys Arg Arg Ser Thr
 325 330 335

Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met Ala Arg
 340 345 350

Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala Ile Glu
 355 360 365

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

Ser Gln Tyr Gly Leu Asp Ser Ser Gly Asn Leu Lys Gly Arg Thr Met
 385 390 395 400

Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His Gln Val
 405 410 415
 Ser Leu Tyr Thr Ser Arg Pro Cys His Ile Val Asp Gly His Gly Tyr
 420 425 430
 Phe Leu Leu Ala Arg Cys Pro Ala Gly Asp Ser Ile Thr Met Glu Phe
 435 440 445
 Lys Lys Asp Ser Val Arg His Ser Cys Ser Val Pro Tyr Glu Val Lys
 450 455 460
 Phe Asn Pro Val Gly Arg Glu Leu Tyr Thr His Pro Pro Glu His Gly
 465 470 475 480
 Val Glu Gln Ala Cys Gln Val Tyr Ala His Asp Ala Gln Asn Arg Gly
 485 490 495
 Ala Tyr Val Glu Met His Leu Pro Gly Ser Glu Val Asp Ser Ser Leu
 500 505 510
 Val Ser Leu Ser Gly Ser Ser Val Thr Val Thr Pro Pro Asp Gly Thr
 515 520 525
 Ser Ala Leu Val Glu Cys Glu Cys Gly Ser Gly Gly Ser Gly Thr Lys
 530 535 540
 Ile Ser Glu Thr Ile Asn Lys Thr Lys Gln Phe Ser Gln Cys Thr Lys
 545 550 555 560
 Lys Glu Gln Cys Arg Ala Tyr Arg Leu Gln Asn Asp Lys Trp Val Tyr
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 Asn Ser Asp Lys Leu Pro Lys Ala Ala Gly Ala Thr Leu Lys Gly Lys
 580 585 590
 Leu His Val Pro Phe Leu Leu Ala Asp Gly Lys Cys Thr Val Pro Leu
 595 600 605
 Ala Pro Glu Pro Met Ile Thr Phe Gly Phe Arg Ser Val Ser Leu Lys
 610 615 620
 Leu His Pro Lys Asn Pro Thr Tyr Leu Ile Thr Arg Gln Leu Ala Asp
 625 630 635 640
 Glu Pro His Tyr Thr His Glu Leu Ile Ser Glu Pro Ala Val Arg Asn
 645 650 655
 Phe Thr Val Thr Glu Lys Gly Trp Glu Phe Val Trp Gly Asn His Pro

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Pro Lys Arg Phe Trp Ala Gln Glu Thr Ala Pro Gly Asn Pro His Gly		
675	680	685
Leu Pro His Glu Val Ile Thr His Tyr Tyr His Arg Tyr Pro Met Ser		
690	695	700
Thr Ile Leu Gly Leu Ser Ile Cys Ala Ala Ile Ala Thr Val Ser Val		
705	710	715
Ala Ala Ser Thr Trp Leu Phe Cys Arg Ser Arg Val Ala Cys Leu Thr		
725	730	735
Pro Tyr Arg Leu Thr Pro Asn Ala Arg Ile Pro Phe Cys Leu Ala Val		
740	745	750
Leu Cys Cys Ala Arg Thr Ala Arg Ala Glu Thr Thr Trp Glu Ser Leu		
755	760	765
Asp His Leu Trp Asn Asn Asn Gln Gln Met Phe Trp Ile Gln Leu Leu		
770	775	780
Ile Pro Leu Ala Ala Leu Ile Val Val Thr Arg Leu Leu Arg Cys Val		
785	790	795
Cys Cys Val Val Pro Phe Leu Val Met Ala Gly Ala Ala Gly Ala Gly		
805	810	815
Ala Tyr Glu His Ala Thr Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr		
820	825	830
Asn Thr Ile Val Asn Arg Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile		
835	840	845
Thr Pro Thr Lys Ile Lys Leu Ile Pro Thr Val Asn Leu Glu Tyr Val		
850	855	860
Thr Cys His Tyr Lys Thr Gly Met Asp Ser Pro Ala Ile Lys Cys Cys		
865	870	875
Gly Ser Gln Glu Cys Thr Pro Thr Tyr Arg Pro Asp Glu Gln Cys Lys		
885	890	895
Val Phe Thr Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe		
900	905	910
Cys Asp Thr Glu Asn Thr Gln Val Ser Lys Ala Tyr Val Met Lys Ser		
915	920	925

Asp Asp Cys Leu Ala Asp His Ala Glu Ala Tyr Lys Ala His Thr Ala
 930 935 940

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

Thr Thr Val Tyr Val Asn Gly Glu Thr Pro Val Asn Phe Asn Gly Val
 965 970 975

Lys Ile Thr Ala Gly Pro Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg
 980 985 990

Lys Ile Val Gln Tyr Ala Gly Glu Ile Tyr Asn Tyr Asp Phe Pro Glu
 995 1000 1005

Tyr Gly Ala Gly Gln Pro Gly Ala Phe Gly Asp Ile Gln Ser Arg
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Thr Val Ser Ser Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu
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Gln Arg Pro Lys Ala Gly Ala Ile His Val Pro Tyr Thr Gln Ala
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Pro Ser Gly Phe Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu
 1055 1060 1065

Lys Phe Thr Ala Pro Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile
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Arg Ala Glu Asn Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp
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Ile Pro Asp Ala Leu Phe Thr Arg Val Ser Glu Thr Pro Thr Leu
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Ser Ala Ala Glu Cys Thr Leu Asn Glu Cys Val Tyr Ser Ser Asp
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Phe Gly Gly Ile Ala Thr Val Lys Tyr Ser Ala Ser Lys Ser Gly
 1130 1135 1140

Lys Cys Ala Val His Val Pro Ser Gly Thr Ala Thr Leu Lys Glu
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Ala Ala Val Glu Leu Thr Glu Gln Gly Ser Ala Thr Ile His Phe
 1160 1165 1170

Ser Thr Ala Asn Ile His Pro Glu Phe Arg Leu Gln Ile Cys Thr
1175 1180 1185

Ser Tyr Val Thr Cys Lys Gly Asp Cys His Pro Pro Lys Asp His
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Ile Val Thr His Pro Gln Tyr His Ala Gln Thr Phe Thr Ala Ala
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Val Ser Lys Thr Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly
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Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
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Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
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Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
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Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
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Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
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Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
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Gly Ala Glu Glu Trp Ser Leu Ala Leu Pro Val Leu Cys Leu Leu Ala
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Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
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Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met
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Arg Pro Gly Tyr Tyr Gln Leu Leu Lys Ala Ser Leu Thr Cys Ser Pro
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His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
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Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
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Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp
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Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp
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Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro
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Ala Asp Ala Glu Arg Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys
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Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys
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Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His
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Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu

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Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Asn		
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Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys		
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Gly Gly Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
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Asn Glu Gly Leu Thr Thr Thr Asp Lys Val Ile Asn Asn Cys Lys Ile		
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Asp Gln Cys His Ala Ala Val Thr Asn His Lys Asn Trp Gln Tyr Asn		
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Glu Pro Asn Tyr His Glu Glu Trp Val Thr His Lys Lys Glu Val Thr		
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Pro Tyr Lys Tyr Trp Pro Gln Met Ser Thr Asn Gly Thr Ala His Gly		
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His Pro His Glu Ile Ile Leu Tyr Tyr Tyr Glu Leu Tyr Pro Thr Met		
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 Ser Leu Asp Tyr Ile Thr Cys Glu Tyr Lys Thr Val Ile Pro Ser Pro
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 Tyr Val Lys Cys Cys Gly Thr Ala Glu Cys Lys Asp Lys Ser Leu Pro
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 His Val Glu Lys Ser Glu Ser Cys Lys Thr Glu Phe Ala Ser Ala Tyr
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 Arg Ala His Thr Ala Ser Ala Ser Ala Lys Leu Arg Val Leu Tyr Gln
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Thr Val Lys Asp Ala Lys Phe Val Val Gly Pro Met Ser Ser Ala Trp
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Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys Gly Asp Val Tyr
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Gly Asp Ile Gln Ser Arg Thr Pro Glu Ser Lys Asp Val Tyr Ala
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Cys Thr His Ser Ser Asp Phe Gly Gly Val Ala Ile Ile Lys Tyr
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Ala Val Thr Ile Arg Glu Ala Asp Val Glu Val Glu Gly Asn Ser
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Gln Leu Gln Ile Ser Phe Ser Thr Ala Leu Ala Ser Ala Glu Phe
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Arg Val Gln Val Cys Ser Thr Gln Val His Cys Ala Ala Ala Cys
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His Pro Pro Lys Asp His Ile Val Asn Tyr Pro Ala Ser His Thr

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Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
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Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
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Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
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Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
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Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
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Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
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Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met
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His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
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Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
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Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp
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Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys
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Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His
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Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu
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Arg Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr
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Ala Asn Pro Asn Ala Asn Pro Asn Ala Gly Gly Ser Asn Glu Gly Leu

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Pro Arg Asn Ala Glu Leu Gly Asp Arg Lys Gly Lys Ile His Ile Pro			
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Phe Pro Leu Ala Asn Val Thr Cys Arg Val Pro Lys Ala Arg Asn Pro			
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Thr Val Thr Tyr Gly Lys Asn Gln Val Thr Met Leu Leu Tyr Pro Asp			
705	710	715	720
His Pro Thr Leu Leu Ser Tyr Arg Asn Met Gly Gln Glu Pro Asn Tyr			
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His Glu Glu Trp Val Thr His Lys Lys Glu Val Thr Leu Thr Val Pro			
	740	745	750
Thr Glu Gly Leu Glu Val Thr Trp Gly Asn Asn Glu Pro Tyr Lys Tyr			
	755	760	765
Trp Pro Gln Met Ser Thr Asn Gly Thr Ala His Gly His Pro His Glu			
	770	775	780
Ile Ile Leu Tyr Tyr Tyr Glu Leu Tyr Pro Thr Met Thr Val Val Ile			
785	790	795	800
Val Ser Val Ala Ser Phe Val Leu Leu Ser Met Val Gly Thr Ala Val			
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Gly Met Cys Val Cys Ala Arg Arg Arg Cys Ile Thr Pro Tyr Glu Leu			
	820	825	830
Thr Pro Gly Ala Thr Val Pro Phe Leu Leu Ser Leu Leu Cys Cys Val			
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Arg Thr Thr Lys Ala Ala Thr Tyr Tyr Glu Ala Ala Ala Tyr Leu Trp			
	850	855	860
Asn Glu Gln Gln Pro Leu Phe Trp Leu Gln Ala Leu Ile Pro Leu Ala			
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Ala Leu Ile Val Leu Cys Asn Cys Leu Lys Leu Leu Pro Cys Cys Cys			
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Lys Thr Leu Ala Phe Leu Ala Val Met Ser Ile Gly Ala His Thr Val
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Ser Ala Tyr Glu His Val Thr Val Ile Pro Asn Thr Val Gly Val Pro
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Tyr Lys Thr Leu Val Asn Arg Pro Gly Tyr Ser Pro Met Val Leu Glu
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Ile Thr Cys Glu Tyr Lys Thr Val Ile Pro Ser Pro Tyr Val Lys Cys
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Cys Gly Thr Ala Glu Cys Lys Asp Lys Ser Leu Pro Asp Tyr Ser Cys
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Phe Cys Asp Ala Glu Asn Thr Gln Leu Ser Glu Ala His Val Glu
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His Thr Ala Ser Ala Ser Ala Lys Leu Arg Val Leu Tyr Gln Gly
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Trp Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys Gly Asp Val
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Tyr Asn Met Asp Tyr Pro Pro Phe Gly Ala Gly Arg Pro Gly Gln
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Tyr Thr Ala Ser Lys Lys Gly Lys Cys Ala Val His Ser Met Thr
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Cys His Pro Pro Lys Asp His Ile Val Asn Tyr Pro Ala Ser His
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<220>

<223> VLP78_21 (VEEV VLP 519 NPNAx25) VEEV-NPNAx25 sequence only

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gttctggccg cgcttaagac gaagaaagca tccaaatacg atcttgagta tgcagatgtg	540
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aattaa

4086

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 <211> 1361
 <212> PRT
 <213> Artificial

<220>

<223> VLP78_21 (VEEV VLP 519 NPNx25) amino acid sequence

<400> 34

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Asn Pro Phe Ala Ala Pro Arg Arg Pro Trp Phe Pro Arg Thr Asp Pro
 20 25 30

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

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
 50 55 60

Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
 65 70 75 80

Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro
 85 90 95

Asn Pro Lys Ala Gln Asn Gly Asn Lys Lys Lys Thr Asn Lys Lys Pro
 100 105 110

Gly Lys Arg Gln Arg Met Val Met Lys Leu Glu Ser Asp Lys Thr Phe
 115 120 125

Pro Ile Met Leu Glu Gly Lys Ile Asn Gly Tyr Ala Cys Val Val Gly
 130 135 140

Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp
 145 150 155 160

Val Leu Ala Ala Leu Lys Thr Lys Lys Ala Ser Lys Tyr Asp Leu Glu
 165 170 175

Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr
 180 185 190

His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln
 195 200 205

Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly
 210 215 220

Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile
 225 230 235 240

Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val
 245 250 255

Met Trp Asn Glu Lys Gly Val Thr Val Lys Tyr Thr Pro Glu Asn Cys
 260 265 270

Glu Gln Trp Ser Leu Val Thr Thr Met Cys Leu Leu Ala Asn Val Thr
 275 280 285

Phe Pro Cys Ala Gln Pro Pro Ile Cys Tyr Asp Arg Lys Pro Ala Glu
 290 295 300

Thr Leu Ala Met Leu Ser Val Asn Val Asp Asn Pro Gly Tyr Asp Glu
 305 310 315 320

Leu Leu Glu Ala Ala Val Lys Cys Pro Gly Arg Lys Arg Arg Ser Thr
 325 330 335

Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met Ala Arg
 340 345 350

Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala Ile Glu
 355 360 365

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

Ser Gln Tyr Gly Leu Asp Ser Ser Gly Asn Leu Lys Gly Arg Thr Met
 385 390 395 400

Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His Gln Val
 405 410 415

Ser Leu Tyr Thr Ser Arg Pro Cys His Ile Val Asp Gly His Gly Tyr
 420 425 430

Phe Leu Leu Ala Arg Cys Pro Ala Gly Asp Ser Ile Thr Met Glu Phe
 435 440 445

Lys Lys Asp Ser Val Arg His Ser Cys Ser Val Pro Tyr Glu Val Lys

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

Arg Ser Val Ser Leu Lys Leu His Pro Lys Asn Pro Thr Tyr Leu Ile
725 730 735

Thr Arg Gln Leu Ala Asp Glu Pro His Tyr Thr His Glu Leu Ile Ser
740 745 750

Glu Pro Ala Val Arg Asn Phe Thr Val Thr Glu Lys Gly Trp Glu Phe
755 760 765

Val Trp Gly Asn His Pro Pro Lys Arg Phe Trp Ala Gln Glu Thr Ala
770 775 780

Pro Gly Asn Pro His Gly Leu Pro His Glu Val Ile Thr His Tyr Tyr
785 790 795 800

His Arg Tyr Pro Met Ser Thr Ile Leu Gly Leu Ser Ile Cys Ala Ala
805 810 815

Ile Ala Thr Val Ser Val Ala Ala Ser Thr Trp Leu Phe Cys Arg Ser
820 825 830

Arg Val Ala Cys Leu Thr Pro Tyr Arg Leu Thr Pro Asn Ala Arg Ile
835 840 845

Pro Phe Cys Leu Ala Val Leu Cys Cys Ala Arg Thr Ala Arg Ala Glu
850 855 860

Thr Thr Trp Glu Ser Leu Asp His Leu Trp Asn Asn Asn Gln Gln Met
865 870 875 880

Phe Trp Ile Gln Leu Leu Ile Pro Leu Ala Ala Leu Ile Val Val Thr
885 890 895

Arg Leu Leu Arg Cys Val Cys Cys Val Val Pro Phe Leu Val Met Ala
900 905 910

Gly Ala Ala Gly Ala Gly Ala Tyr Glu His Ala Thr Thr Met Pro Ser
915 920 925

Gln Ala Gly Ile Ser Tyr Asn Thr Ile Val Asn Arg Ala Gly Tyr Ala
930 935 940

Pro Leu Pro Ile Ser Ile Thr Pro Thr Lys Ile Lys Leu Ile Pro Thr
945 950 955 960

Val Asn Leu Glu Tyr Val Thr Cys His Tyr Lys Thr Gly Met Asp Ser
965 970 975

Pro Ala Ile Lys Cys Cys Gly Ser Gln Glu Cys Thr Pro Thr Tyr Arg
 980 985 990

Pro Asp Glu Gln Cys Lys Val Phe Thr Gly Val Tyr Pro Phe Met Trp
 995 1000 1005

Gly Gly Ala Tyr Cys Phe Cys Asp Thr Glu Asn Thr Gln Val Ser
 1010 1015 1020

Lys Ala Tyr Val Met Lys Ser Asp Asp Cys Leu Ala Asp His Ala
 1025 1030 1035

Glu Ala Tyr Lys Ala His Thr Ala Ser Val Gln Ala Phe Leu Asn
 1040 1045 1050

Ile Thr Val Gly Glu His Ser Ile Val Thr Thr Val Tyr Val Asn
 1055 1060 1065

Gly Glu Thr Pro Val Asn Phe Asn Gly Val Lys Ile Thr Ala Gly
 1070 1075 1080

Pro Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg Lys Ile Val Gln
 1085 1090 1095

Tyr Ala Gly Glu Ile Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
 1100 1105 1110

Gly Gln Pro Gly Ala Phe Gly Asp Ile Gln Ser Arg Thr Val Ser
 1115 1120 1125

Ser Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu Gln Arg Pro
 1130 1135 1140

Lys Ala Gly Ala Ile His Val Pro Tyr Thr Gln Ala Pro Ser Gly
 1145 1150 1155

Phe Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu Lys Phe Thr
 1160 1165 1170

Ala Pro Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile Arg Ala Glu
 1175 1180 1185

Asn Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp Ile Pro Asp
 1190 1195 1200

Ala Leu Phe Thr Arg Val Ser Glu Thr Pro Thr Leu Ser Ala Ala
 1205 1210 1215

Glu Cys Thr Leu Asn Glu Cys Val Tyr Ser Ser Asp Phe Gly Gly

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Ile Ala Thr Val Lys Tyr Ser	Ala Ser Lys Ser Gly	Lys Cys Ala
1235	1240	1245
Val His Val Pro Ser Gly Thr	Ala Thr Leu Lys Glu	Ala Ala Val
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Glu Leu Thr Glu Gln Gly Ser	Ala Thr Ile His Phe	Ser Thr Ala
1265	1270	1275
Asn Ile His Pro Glu Phe Arg	Leu Gln Ile Cys Thr	Ser Tyr Val
1280	1285	1290
Thr Cys Lys Gly Asp Cys His	Pro Pro Lys Asp His	Ile Val Thr
1295	1300	1305
His Pro Gln Tyr His Ala Gln	Thr Phe Thr Ala Ala	Val Ser Lys
1310	1315	1320
Thr Ala Trp Thr Trp Leu Thr	Ser Leu Leu Gly Gly	Ser Ala Val
1325	1330	1335
Ile Ile Ile Ile Gly Leu Val	Leu Ala Thr Ile Val	Ala Met Tyr
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<211> 8509

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<213> Artificial

<220>

<223> VLP74_21 (VEEV VLP 519 NPNAx6) whole sequence

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 35 40 45

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
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Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
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Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro

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Pro Ile Met Leu Glu Gly Lys Ile Asn Gly Tyr Ala Cys Val Val Gly		
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Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp		
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His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln		
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Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His Gln Val
405 410 415

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Lys Lys Asp Ser Val Arg His Ser Cys Ser Val Pro Tyr Glu Val Lys
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Phe Asn Pro Val Gly Arg Glu Leu Tyr Thr His Pro Pro Glu His Gly
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Val Ser Leu Ser Gly Ser Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn
515 520 525

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Glu Leu Ile Ser Glu Pro Ala Val Arg Asn Phe Thr Val Thr Glu Lys
 675 680 685

Gly Trp Glu Phe Val Trp Gly Asn His Pro Pro Lys Arg Phe Trp Ala
 690 695 700

Gln Glu Thr Ala Pro Gly Asn Pro His Gly Leu Pro His Glu Val Ile
 705 710 715 720

Thr His Tyr Tyr His Arg Tyr Pro Met Ser Thr Ile Leu Gly Leu Ser
 725 730 735

Ile Cys Ala Ala Ile Ala Thr Val Ser Val Ala Ala Ser Thr Trp Leu
 740 745 750

Phe Cys Arg Ser Arg Val Ala Cys Leu Thr Pro Tyr Arg Leu Thr Pro
 755 760 765

Asn Ala Arg Ile Pro Phe Cys Leu Ala Val Leu Cys Cys Ala Arg Thr
 770 775 780

Ala Arg Ala Glu Thr Thr Trp Glu Ser Leu Asp His Leu Trp Asn Asn
 785 790 795 800

Asn Gln Gln Met Phe Trp Ile Gln Leu Leu Ile Pro Leu Ala Ala Leu
 805 810 815

Ile Val Val Thr Arg Leu Leu Arg Cys Val Cys Cys Val Val Pro Phe
 820 825 830

Leu Val Met Ala Gly Ala Ala Gly Ala Gly Ala Tyr Glu His Ala Thr
 835 840 845

Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr Asn Thr Ile Val Asn Arg
 850 855 860

Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile Thr Pro Thr Lys Ile Lys

865	870	875	880
Leu Ile Pro Thr Val Asn Leu Glu Tyr Val Thr Cys His Tyr Lys Thr			
885	890	895	
Gly Met Asp Ser Pro Ala Ile Lys Cys Cys Gly Ser Gln Glu Cys Thr			
900	905	910	
Pro Thr Tyr Arg Pro Asp Glu Gln Cys Lys Val Phe Thr Gly Val Tyr			
915	920	925	
Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Thr Glu Asn Thr			
930	935	940	
Gln Val Ser Lys Ala Tyr Val Met Lys Ser Asp Asp Cys Leu Ala Asp			
945	950	955	960
His Ala Glu Ala Tyr Lys Ala His Thr Ala Ser Val Gln Ala Phe Leu			
965	970	975	
Asn Ile Thr Val Gly Glu His Ser Ile Val Thr Thr Val Tyr Val Asn			
980	985	990	
Gly Glu Thr Pro Val Asn Phe Asn Gly Val Lys Ile Thr Ala Gly Pro			
995	1000	1005	
Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg Lys Ile Val Gln Tyr			
1010	1015	1020	
Ala Gly Glu Ile Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala Gly			
1025	1030	1035	
Gln Pro Gly Ala Phe Gly Asp Ile Gln Ser Arg Thr Val Ser Ser			
1040	1045	1050	
Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu Gln Arg Pro Lys			
1055	1060	1065	
Ala Gly Ala Ile His Val Pro Tyr Thr Gln Ala Pro Ser Gly Phe			
1070	1075	1080	
Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu Lys Phe Thr Ala			
1085	1090	1095	
Pro Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile Arg Ala Glu Asn			
1100	1105	1110	
Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp Ile Pro Asp Ala			
1115	1120	1125	

Leu Phe Thr Arg Val Ser Glu Thr Pro Thr Leu Ser Ala Ala Glu
1130 1135 1140

Cys Thr Leu Asn Glu Cys Val Tyr Ser Ser Asp Phe Gly Gly Ile
1145 1150 1155

Ala Thr Val Lys Tyr Ser Ala Ser Lys Ser Gly Lys Cys Ala Val
1160 1165 1170

His Val Pro Ser Gly Thr Ala Thr Leu Lys Glu Ala Ala Val Glu
1175 1180 1185

Leu Thr Glu Gln Gly Ser Ala Thr Ile His Phe Ser Thr Ala Asn
1190 1195 1200

Ile His Pro Glu Phe Arg Leu Gln Ile Cys Thr Ser Tyr Val Thr
1205 1210 1215

Cys Lys Gly Asp Cys His Pro Pro Lys Asp His Ile Val Thr His
1220 1225 1230

Pro Gln Tyr His Ala Gln Thr Phe Thr Ala Ala Val Ser Lys Thr
1235 1240 1245

Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly Ser Ala Val Ile
1250 1255 1260

Ile Ile Ile Gly Leu Val Leu Ala Thr Ile Val Ala Met Tyr Val
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Leu Thr Asn Gln Lys His Asn
1280 1285

<210> 38

<211> 7305

<212> DNA

<213> Artificial

<220>

<223> VLP74_15 (CHI VLP 532 NPNAX6) Whole sequence

<400> 38

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ttggcgggtg tcggggctgg cttaactatg cggcatcaga gcagattgta ctgagagtgc 180

accatatgcg gtgtgaaata ccgcacagat gcgtaaggag aaaataccgc atcaggcgcc	240
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tacgccagct ggcgaaaggg ggatgtgctg caaggcgatt aagtgggta acgccagggt	360
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gttcgcgtt acataactta cegtaaattg cccgcctggc tgaccgcca acgacccccg	540
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<210> 39
 <211> 1277
 <212> PRT
 <213> Artificial

<220>

<223> VLP74_15 (CHI VLP 532 NPNAX6) amino acid sequence

<400> 39

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20 25 30

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

Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
50 55 60

Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
65 70 75 80

Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
85 90 95

Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
100 105 110

Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
115 120 125

Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
130 135 140

Asp Asn Ala Asp Leu Ala Lys Leu Ala Phe Lys Arg Ser Ser Lys Tyr
145 150 155 160

Asp Leu Glu Cys Ala Gln Ile Pro Val His Met Lys Ser Asp Ala Ser
165 170 175

Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
180 185 190

Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
195 200 205

Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
210 215 220

Val Ala Ile Val Leu Gly Gly Ala Asn Glu Gly Ala Arg Thr Ala Leu
225 230 235 240

Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
245 250 255

Gly Ala Glu Glu Trp Ser Leu Ala Leu Pro Val Leu Cys Leu Leu Ala
260 265 270

Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
275 280 285

Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met
290 295 300

Arg Pro Gly Tyr Tyr Gln Leu Leu Lys Ala Ser Leu Thr Cys Ser Pro
305 310 315 320

His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
325 330 335

Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
340 345 350

Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp
355 360 365

Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp
370 375 380

Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro
385 390 395 400

Ala Asp Ala Glu Arg Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys
405 410 415

Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys
420 425 430

Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His
435 440 445

Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu
450 455 460

Arg Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr
465 470 475 480

Tyr Val Gln Ser Thr Ala Ala Thr Ala Glu Glu Ile Glu Val His Met
485 490 495

Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Asn
 500 505 510

Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys
 515 520 525

Gly Gly Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn
 530 535 540

Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Gly Gly Ser
 545 550 555 560

Asn Glu Gly Leu Thr Thr Thr Asp Lys Val Ile Asn Asn Cys Lys Ile
 565 570 575

Asp Gln Cys His Ala Ala Val Thr Asn His Lys Asn Trp Gln Tyr Asn
 580 585 590

Ser Pro Leu Val Pro Arg Asn Ala Glu Leu Gly Asp Arg Lys Gly Lys
 595 600 605

Ile His Ile Pro Phe Pro Leu Ala Asn Val Thr Cys Arg Val Pro Lys
 610 615 620

Ala Arg Asn Pro Thr Val Thr Tyr Gly Lys Asn Gln Val Thr Met Leu
 625 630 635 640

Leu Tyr Pro Asp His Pro Thr Leu Leu Ser Tyr Arg Asn Met Gly Gln
 645 650 655

Glu Pro Asn Tyr His Glu Glu Trp Val Thr His Lys Lys Glu Val Thr
 660 665 670

Leu Thr Val Pro Thr Glu Gly Leu Glu Val Thr Trp Gly Asn Asn Glu
 675 680 685

Pro Tyr Lys Tyr Trp Pro Gln Met Ser Thr Asn Gly Thr Ala His Gly
 690 695 700

His Pro His Glu Ile Ile Leu Tyr Tyr Tyr Glu Leu Tyr Pro Thr Met
 705 710 715 720

Thr Val Val Ile Val Ser Val Ala Ser Phe Val Leu Leu Ser Met Val
 725 730 735

Gly Thr Ala Val Gly Met Cys Val Cys Ala Arg Arg Arg Cys Ile Thr
 740 745 750

Pro Tyr Glu Leu Thr Pro Gly Ala Thr Val Pro Phe Leu Leu Ser Leu

755	760	765
Leu Cys Cys Val Arg Thr Thr Lys Ala Ala Thr Tyr Tyr Glu Ala Ala		
770	775	780
Ala Tyr Leu Trp Asn Glu Gln Gln Pro Leu Phe Trp Leu Gln Ala Leu		
785	790	795 800
Ile Pro Leu Ala Ala Leu Ile Val Leu Cys Asn Cys Leu Lys Leu Leu		
	805	810 815
Pro Cys Cys Cys Lys Thr Leu Ala Phe Leu Ala Val Met Ser Ile Gly		
	820	825 830
Ala His Thr Val Ser Ala Tyr Glu His Val Thr Val Ile Pro Asn Thr		
	835	840 845
Val Gly Val Pro Tyr Lys Thr Leu Val Asn Arg Pro Gly Tyr Ser Pro		
	850	855 860
Met Val Leu Glu Met Glu Leu Gln Ser Val Thr Leu Glu Pro Thr Leu		
	865	870 875 880
Ser Leu Asp Tyr Ile Thr Cys Glu Tyr Lys Thr Val Ile Pro Ser Pro		
	885	890 895
Tyr Val Lys Cys Cys Gly Thr Ala Glu Cys Lys Asp Lys Ser Leu Pro		
	900	905 910
Asp Tyr Ser Cys Lys Val Phe Thr Gly Val Tyr Pro Phe Met Trp Gly		
	915	920 925
Gly Ala Tyr Cys Phe Cys Asp Ala Glu Asn Thr Gln Leu Ser Glu Ala		
	930	935 940
His Val Glu Lys Ser Glu Ser Cys Lys Thr Glu Phe Ala Ser Ala Tyr		
	945	950 955 960
Arg Ala His Thr Ala Ser Ala Ser Ala Lys Leu Arg Val Leu Tyr Gln		
	965	970 975
Gly Asn Asn Ile Thr Val Ala Ala Tyr Ala Asn Gly Asp His Ala Val		
	980	985 990
Thr Val Lys Asp Ala Lys Phe Val Val Gly Pro Met Ser Ser Ala Trp		
	995	1000 1005
Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys Gly Asp Val Tyr		
	1010	1015 1020

Asn Met	Asp Tyr	Pro Pro	Phe	Gly Ala	Gly Arg	Pro	Gly Gln	Phe	1025	1030	1035
Gly Asp	Ile Gln	Ser Arg	Thr	Pro Glu	Ser Lys	Asp	Val Tyr	Ala	1040	1045	1050
Asn Thr	Gln Leu	Val Leu	Gln	Arg Pro	Ala Ala	Gly	Thr Val	His	1055	1060	1065
Val Pro	Tyr Ser	Gln Ala	Pro	Ser Gly	Phe Lys	Tyr	Trp Leu	Lys	1070	1075	1080
Glu Arg	Gly Ala	Ser Leu	Gln	His Thr	Ala Pro	Phe	Gly Cys	Gln	1085	1090	1095
Ile Ala	Thr Asn	Pro Val	Arg	Ala Val	Asn Cys	Ala	Val Gly	Asn	1100	1105	1110
Ile Pro	Ile Ser	Ile Asp	Ile	Pro Asp	Ala Ala	Phe	Thr Arg	Val	1115	1120	1125
Val Asp	Ala Pro	Ser Val	Thr	Asp Met	Ser Cys	Glu	Val Pro	Ala	1130	1135	1140
Cys Thr	His Ser	Ser Asp	Phe	Gly Gly	Val Ala	Ile	Ile Lys	Tyr	1145	1150	1155
Thr Ala	Ser Lys	Lys Gly	Lys	Cys Ala	Val His	Ser	Met Thr	Asn	1160	1165	1170
Ala Val	Thr Ile	Arg Glu	Ala	Asp Val	Glu Val	Glu	Gly Asn	Ser	1175	1180	1185
Gln Leu	Gln Ile	Ser Phe	Ser	Thr Ala	Leu Ala	Ser	Ala Glu	Phe	1190	1195	1200
Arg Val	Gln Val	Cys Ser	Thr	Gln Val	His Cys	Ala	Ala Ala	Cys	1205	1210	1215
His Pro	Pro Lys	Asp His	Ile	Val Asn	Tyr Pro	Ala	Ser His	Thr	1220	1225	1230
Thr Leu	Gly Val	Gln Asp	Ile	Ser Thr	Thr Ala	Met	Ser Trp	Val	1235	1240	1245
Gln Lys	Ile Thr	Gly Gly	Val	Gly Leu	Ile Val	Ala	Val Ala	Ala	1250	1255	1260

Leu Ile Leu Ile Val Val Leu Cys Val Ser Phe Ser Arg His
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 <212> DNA
 <213> Artificial

<220>
 <223> VLP78_15 (CHI VLP 532 NPNAX25) Whole sequence

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 gttccgcgtt acataactta cggtaaattg cccgcctggc tgaccgcca acgacccccg 540
 cccattgacg tcaataatga cgtatgttc catagtaacg ccaataggga ctttcattg 600
 acgtcaatgg gtggagtatt tacggtaaac tgcccattg gcagtacatc aagtgtatca 660
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 ccagtacatg accttatggg acttcctac ttggcagtac atctacgtat tagtcatcgc 780
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gaaggtacca accccgaccc tgggccccac gccctacaat tcaagtaatt agacctagac	1140
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<210> 41
 <211> 1353
 <212> PRT
 <213> Artificial

<220>
 <223> VLP78_15 (CHI VLP 532 NPNx25) amino acid sequence

<400> 41

Met Glu Phe Ile Pro Thr Gln Thr Phe Tyr Asn Arg Arg Tyr Gln Pro
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Arg Pro Trp Ala Pro Arg Pro Thr Ile Gln Val Ile Arg Pro Arg Pro
 20 25 30

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

Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
 50 55 60

Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
 65 70 75 80

Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
 85 90 95

Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
 100 105 110

Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
 115 120 125

Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
 130 135 140

Asp Asn Ala Asp Leu Ala Lys Leu Ala Phe Lys Arg Ser Ser Lys Tyr
 145 150 155 160

Asp Leu Glu Cys Ala Gln Ile Pro Val His Met Lys Ser Asp Ala Ser
 165 170 175

Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
 180 185 190

Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
 195 200 205

Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
 210 215 220

Val Ala Ile Val Leu Gly Gly Ala Asn Glu Gly Ala Arg Thr Ala Leu
 225 230 235 240

Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
 245 250 255

Gly Ala Glu Glu Trp Ser Leu Ala Leu Pro Val Leu Cys Leu Leu Ala
 260 265 270

Asn Thr Thr Phe Pro Cys Ser Gln Pro Pro Cys Thr Pro Cys Cys Tyr
 275 280 285

Glu Lys Glu Pro Glu Ser Thr Leu Arg Met Leu Glu Asp Asn Val Met
 290 295 300

Arg Pro Gly Tyr Tyr Gln Leu Leu Lys Ala Ser Leu Thr Cys Ser Pro
 305 310 315 320

His Arg Gln Arg Arg Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala
 325 330 335

Thr Arg Pro Tyr Leu Ala His Cys Pro Asp Cys Gly Glu Gly His Ser
 340 345 350

Cys His Ser Pro Ile Ala Leu Glu Arg Ile Arg Asn Glu Ala Thr Asp

355	360	365
Gly Thr Leu Lys Ile Gln Val Ser Leu Gln Ile Gly Ile Lys Thr Asp		
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Asp Ser His Asp Trp Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro		
385	390	395 400
Ala Asp Ala Glu Arg Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys		
405	410	415
Thr Ile Thr Gly Thr Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys		
420	425	430
Gly Glu Thr Leu Thr Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His		
435	440	445
Thr Cys Thr His Pro Phe His His Glu Pro Pro Val Ile Gly Arg Glu		
450	455	460
Arg Phe His Ser Arg Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr		
465	470	475 480
Tyr Val Gln Ser Thr Ala Ala Thr Ala Glu Glu Ile Glu Val His Met		
485	490	495
Pro Pro Asp Thr Pro Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Asn		
500	505	510
Val Lys Ile Thr Val Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys		
515	520	525
Gly Gly Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
530	535	540
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Val Asp Pro Asn		
545	550	555 560
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
565	570	575
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
580	585	590
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
595	600	605
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
610	615	620

Ala Asn Pro Asn Ala Asn Pro Asn Ala Gly Gly Ser Asn Glu Gly Leu
625 630 635 640

Thr Thr Thr Asp Lys Val Ile Asn Asn Cys Lys Ile Asp Gln Cys His
 645 650 655

Ala Ala Val Thr Asn His Lys Asn Trp Gln Tyr Asn Ser Pro Leu Val
 660 665 670

Pro Arg Asn Ala Glu Leu Gly Asp Arg Lys Gly Lys Ile His Ile Pro
 675 680 685

Phe Pro Leu Ala Asn Val Thr Cys Arg Val Pro Lys Ala Arg Asn Pro
 690 695 700

Thr Val Thr Tyr Gly Lys Asn Gln Val Thr Met Leu Leu Tyr Pro Asp
705 710 715 720

His Pro Thr Leu Leu Ser Tyr Arg Asn Met Gly Gln Glu Pro Asn Tyr
 725 730 735

His Glu Glu Trp Val Thr His Lys Lys Glu Val Thr Leu Thr Val Pro
 740 745 750

Thr Glu Gly Leu Glu Val Thr Trp Gly Asn Asn Glu Pro Tyr Lys Tyr
 755 760 765

Trp Pro Gln Met Ser Thr Asn Gly Thr Ala His Gly His Pro His Glu
 770 775 780

Ile Ile Leu Tyr Tyr Tyr Glu Leu Tyr Pro Thr Met Thr Val Val Ile
785 790 795 800

Val Ser Val Ala Ser Phe Val Leu Leu Ser Met Val Gly Thr Ala Val
 805 810 815

Gly Met Cys Val Cys Ala Arg Arg Arg Cys Ile Thr Pro Tyr Glu Leu
 820 825 830

Thr Pro Gly Ala Thr Val Pro Phe Leu Leu Ser Leu Leu Cys Cys Val
 835 840 845

Arg Thr Thr Lys Ala Ala Thr Tyr Tyr Glu Ala Ala Ala Tyr Leu Trp
 850 855 860

Asn Glu Gln Gln Pro Leu Phe Trp Leu Gln Ala Leu Ile Pro Leu Ala
865 870 875 880

Ala Leu Ile Val Leu Cys Asn Cys Leu Lys Leu Leu Pro Cys Cys Cys
 885 890 895

Lys Thr Leu Ala Phe Leu Ala Val Met Ser Ile Gly Ala His Thr Val
 900 905 910

Ser Ala Tyr Glu His Val Thr Val Ile Pro Asn Thr Val Gly Val Pro
 915 920 925

Tyr Lys Thr Leu Val Asn Arg Pro Gly Tyr Ser Pro Met Val Leu Glu
 930 935 940

Met Glu Leu Gln Ser Val Thr Leu Glu Pro Thr Leu Ser Leu Asp Tyr
 945 950 955 960

Ile Thr Cys Glu Tyr Lys Thr Val Ile Pro Ser Pro Tyr Val Lys Cys
 965 970 975

Cys Gly Thr Ala Glu Cys Lys Asp Lys Ser Leu Pro Asp Tyr Ser Cys
 980 985 990

Lys Val Phe Thr Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys
 995 1000 1005

Phe Cys Asp Ala Glu Asn Thr Gln Leu Ser Glu Ala His Val Glu
 1010 1015 1020

Lys Ser Glu Ser Cys Lys Thr Glu Phe Ala Ser Ala Tyr Arg Ala
 1025 1030 1035

His Thr Ala Ser Ala Ser Ala Lys Leu Arg Val Leu Tyr Gln Gly
 1040 1045 1050

Asn Asn Ile Thr Val Ala Ala Tyr Ala Asn Gly Asp His Ala Val
 1055 1060 1065

Thr Val Lys Asp Ala Lys Phe Val Val Gly Pro Met Ser Ser Ala
 1070 1075 1080

Trp Thr Pro Phe Asp Asn Lys Ile Val Val Tyr Lys Gly Asp Val
 1085 1090 1095

Tyr Asn Met Asp Tyr Pro Pro Phe Gly Ala Gly Arg Pro Gly Gln
 1100 1105 1110

Phe Gly Asp Ile Gln Ser Arg Thr Pro Glu Ser Lys Asp Val Tyr
 1115 1120 1125

Ala Asn Thr Gln Leu Val Leu Gln Arg Pro Ala Ala Gly Thr Val

1130	1135	1140
His Val Pro Tyr Ser Gln Ala	Pro Ser Gly Phe Lys	Tyr Trp Leu
1145	1150	1155
Lys Glu Arg Gly Ala Ser Leu	Gln His Thr Ala Pro	Phe Gly Cys
1160	1165	1170
Gln Ile Ala Thr Asn Pro Val	Arg Ala Val Asn Cys	Ala Val Gly
1175	1180	1185
Asn Ile Pro Ile Ser Ile Asp	Ile Pro Asp Ala Ala	Phe Thr Arg
1190	1195	1200
Val Val Asp Ala Pro Ser Val	Thr Asp Met Ser Cys	Glu Val Pro
1205	1210	1215
Ala Cys Thr His Ser Ser Asp	Phe Gly Gly Val Ala	Ile Ile Lys
1220	1225	1230
Tyr Thr Ala Ser Lys Lys Gly	Lys Cys Ala Val His	Ser Met Thr
1235	1240	1245
Asn Ala Val Thr Ile Arg Glu	Ala Asp Val Glu Val	Glu Gly Asn
1250	1255	1260
Ser Gln Leu Gln Ile Ser Phe	Ser Thr Ala Leu Ala	Ser Ala Glu
1265	1270	1275
Phe Arg Val Gln Val Cys Ser	Thr Gln Val His Cys	Ala Ala Ala
1280	1285	1290
Cys His Pro Pro Lys Asp His	Ile Val Asn Tyr Pro	Ala Ser His
1295	1300	1305
Thr Thr Leu Gly Val Gln Asp	Ile Ser Thr Thr Ala	Met Ser Trp
1310	1315	1320
Val Gln Lys Ile Thr Gly Gly	Val Gly Leu Ile Val	Ala Val Ala
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Ala Leu Ile Leu Ile Val Val	Leu Cys Val Ser Phe	Ser Arg His
1340	1345	1350

<210> 42
 <211> 7329
 <212> DNA
 <213> Artificial

<220>

<223> VLP74_25 (VEEV VLP 519 NPNAx6) Whole sequence

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tatgccaagt acgcccccta ttgacgtcaa tgacggtaaa tggccgcct ggcatatgc	720
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<210> 43

<211> 1285

<212> PRT

<213> Artificial

<220>

<223> VLP74_25 (VEEV VLP 519 NPNAx6) amino acid sequence

<400> 43

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Asn Pro Phe Ala Ala Pro Arg Arg Pro Trp Phe Pro Arg Thr Asp Pro
20 25 30

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

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
50 55 60

Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
65 70 75 80

Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro
85 90 95

Asn Pro Lys Ala Gln Asn Gly Asn Lys Lys Lys Thr Asn Lys Lys Pro
100 105 110

Gly Lys Arg Gln Arg Met Val Met Lys Leu Glu Ser Asp Lys Thr Phe
115 120 125

Pro Ile Met Leu Glu Gly Lys Ile Asn Gly Tyr Ala Cys Val Val Gly
130 135 140

Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp
145 150 155 160

Val Leu Ala Ala Leu Lys Thr Lys Lys Ala Ser Lys Tyr Asp Leu Glu
165 170 175

Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr
 180 185 190

His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln
 195 200 205

Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly
 210 215 220

Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile
 225 230 235 240

Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val
 245 250 255

Met Trp Asn Glu Lys Gly Val Thr Val Lys Tyr Thr Pro Glu Asn Cys
 260 265 270

Glu Gln Trp Ser Leu Val Thr Thr Met Cys Leu Leu Ala Asn Val Thr
 275 280 285

Phe Pro Cys Ala Gln Pro Pro Ile Cys Tyr Asp Arg Lys Pro Ala Glu
 290 295 300

Thr Leu Ala Met Leu Ser Val Asn Val Asp Asn Pro Gly Tyr Asp Glu
 305 310 315 320

Leu Leu Glu Ala Ala Val Lys Cys Pro Gly Arg Lys Arg Arg Ser Thr
 325 330 335

Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met Ala Arg
 340 345 350

Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala Ile Glu
 355 360 365

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

Ser Gln Tyr Gly Leu Asp Ser Ser Gly Asn Leu Lys Gly Arg Thr Met
 385 390 395 400

Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His Gln Val
 405 410 415

Ser Leu Tyr Thr Ser Arg Pro Cys His Ile Val Asp Gly His Gly Tyr
 420 425 430

Phe Leu Leu Ala Arg Cys Pro Ala Gly Asp Ser Ile Thr Met Glu Phe
435 440 445

Lys Lys Asp Ser Val Arg His Ser Cys Ser Val Pro Tyr Glu Val Lys
450 455 460

Phe Asn Pro Val Gly Arg Glu Leu Tyr Thr His Pro Pro Glu His Gly
465 470 475 480

Val Glu Gln Ala Cys Gln Val Tyr Ala His Asp Ala Gln Asn Arg Gly
485 490 495

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

Val Ser Leu Ser Gly Ser Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn
515 520 525

Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn
530 535 540

Ala Gly Gly Ser Ser Val Thr Val Thr Pro Pro Asp Gly Thr Ser Ala
545 550 555 560

Leu Val Glu Cys Glu Cys Gly Gly Thr Lys Ile Ser Glu Thr Ile Asn
565 570 575

Lys Thr Lys Gln Phe Ser Gln Cys Thr Lys Lys Glu Gln Cys Arg Ala
580 585 590

Tyr Arg Leu Gln Asn Asp Lys Trp Val Tyr Asn Ser Asp Lys Leu Pro
595 600 605

Lys Ala Ala Gly Ala Thr Leu Lys Gly Lys Leu His Val Pro Phe Leu
610 615 620

Leu Ala Asp Gly Lys Cys Thr Val Pro Leu Ala Pro Glu Pro Met Ile
625 630 635 640

Thr Phe Gly Phe Arg Ser Val Ser Leu Lys Leu His Pro Lys Asn Pro
645 650 655

Thr Tyr Leu Ile Thr Arg Gln Leu Ala Asp Glu Pro His Tyr Thr His
660 665 670

Glu Leu Ile Ser Glu Pro Ala Val Arg Asn Phe Thr Val Thr Glu Lys
675 680 685

Gly Trp Glu Phe Val Trp Gly Asn His Pro Pro Lys Arg Phe Trp Ala

690	695	700
Gln Glu Thr Ala Pro Gly Asn Pro His Gly Leu Pro His Glu Val Ile		
705	710	715 720
Thr His Tyr Tyr His Arg Tyr Pro Met Ser Thr Ile Leu Gly Leu Ser		
	725	730 735
Ile Cys Ala Ala Ile Ala Thr Val Ser Val Ala Ala Ser Thr Trp Leu		
	740	745 750
Phe Cys Arg Ser Arg Val Ala Cys Leu Thr Pro Tyr Arg Leu Thr Pro		
	755	760 765
Asn Ala Arg Ile Pro Phe Cys Leu Ala Val Leu Cys Cys Ala Arg Thr		
	770	775 780
Ala Arg Ala Glu Thr Thr Trp Glu Ser Leu Asp His Leu Trp Asn Asn		
785	790	795 800
Asn Gln Gln Met Phe Trp Ile Gln Leu Leu Ile Pro Leu Ala Ala Leu		
	805	810 815
Ile Val Val Thr Arg Leu Leu Arg Cys Val Cys Cys Val Val Pro Phe		
	820	825 830
Leu Val Met Ala Gly Ala Ala Gly Ala Gly Ala Tyr Glu His Ala Thr		
	835	840 845
Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr Asn Thr Ile Val Asn Arg		
	850	855 860
Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile Thr Pro Thr Lys Ile Lys		
865	870	875 880
Leu Ile Pro Thr Val Asn Leu Glu Tyr Val Thr Cys His Tyr Lys Thr		
	885	890 895
Gly Met Asp Ser Pro Ala Ile Lys Cys Cys Gly Ser Gln Glu Cys Thr		
	900	905 910
Pro Thr Tyr Arg Pro Asp Glu Gln Cys Lys Val Phe Thr Gly Val Tyr		
	915	920 925
Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys Asp Thr Glu Asn Thr		
	930	935 940
Gln Val Ser Lys Ala Tyr Val Met Lys Ser Asp Asp Cys Leu Ala Asp		
945	950	955 960

His Ala Glu Ala Tyr Lys Ala His Thr Ala Ser Val Gln Ala Phe Leu
 965 970 975

Asn Ile Thr Val Gly Glu His Ser Ile Val Thr Thr Val Tyr Val Asn
 980 985 990

Gly Glu Thr Pro Val Asn Phe Asn Gly Val Lys Ile Thr Ala Gly Pro
 995 1000 1005

Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg Lys Ile Val Gln Tyr
 1010 1015 1020

Ala Gly Glu Ile Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala Gly
 1025 1030 1035

Gln Pro Gly Ala Phe Gly Asp Ile Gln Ser Arg Thr Val Ser Ser
 1040 1045 1050

Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu Gln Arg Pro Lys
 1055 1060 1065

Ala Gly Ala Ile His Val Pro Tyr Thr Gln Ala Pro Ser Gly Phe
 1070 1075 1080

Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu Lys Phe Thr Ala
 1085 1090 1095

Pro Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile Arg Ala Glu Asn
 1100 1105 1110

Cys Ala Val Gly Ser Ile Pro Leu Ala Phe Asp Ile Pro Asp Ala
 1115 1120 1125

Leu Phe Thr Arg Val Ser Glu Thr Pro Thr Leu Ser Ala Ala Glu
 1130 1135 1140

Cys Thr Leu Asn Glu Cys Val Tyr Ser Ser Asp Phe Gly Gly Ile
 1145 1150 1155

Ala Thr Val Lys Tyr Ser Ala Ser Lys Ser Gly Lys Cys Ala Val
 1160 1165 1170

His Val Pro Ser Gly Thr Ala Thr Leu Lys Glu Ala Ala Val Glu
 1175 1180 1185

Leu Thr Glu Gln Gly Ser Ala Thr Ile His Phe Ser Thr Ala Asn
 1190 1195 1200

Ile His Pro Glu Phe Arg Leu Gln Ile Cys Thr Ser Tyr Val Thr
 1205 1210 1215

Cys Lys Gly Asp Cys His Pro Pro Lys Asp His Ile Val Thr His
 1220 1225 1230

Pro Gln Tyr His Ala Gln Thr Phe Thr Ala Ala Val Ser Lys Thr
 1235 1240 1245

Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly Ser Ala Val Ile
 1250 1255 1260

Ile Ile Ile Gly Leu Val Leu Ala Thr Ile Val Ala Met Tyr Val
 1265 1270 1275

Leu Thr Asn Gln Lys His Asn
 1280 1285

<210> 44

<211> 20

<212> PRT

<213> Plasmodium falciparum

<400> 44

Glu Tyr Leu Asn Lys Ile Gln Asn Ser Leu Ser Thr Glu Trp Ser Pro
 1 5 10 15

Cys Ser Val Thr
 20

<210> 45

<211> 20

<212> PRT

<213> Plasmodium yoelii

<400> 45

Tyr Asn Arg Asn Ile Val Asn Arg Leu Leu Gly Asp Ala Leu Asn Gly
 1 5 10 15

Pro Glu Glu Lys
 20

<210> 46

<211> 30

<212> PRT
 <213> Artificial

<220>
 <223> VLP74 insert

<400> 46

Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn
 1 5 10 15

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Gly Gly Ser
 20 25 30

<210> 47
 <211> 90
 <212> DNA
 <213> Artificial

<220>
 <223> VLP74 insert

<400> 47
 tccggaggaa acccgaatgc caatcccaac gcgaacccca atgctaacc aaatgccaac 60
 ccaaacgcca accccaacgc tggatgatcc 90

<210> 48
 <211> 106
 <212> PRT
 <213> Artificial

<220>
 <223> VLP78 insert

<400> 48

Ser Gly Gly Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn
 1 5 10 15

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Val Asp Pro Asn Ala Asn
 20 25 30

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn
 35 40 45

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn

50

55

60

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn
65 70 75 80

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn
85 90 95

Pro Asn Ala Asn Pro Asn Ala Gly Gly Ser
100 105

<210> 49

<211> 318

<212> DNA

<213> Artificial

<220>

<223> VLP74 insert

<400> 49

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ccgaatgcaa acccgaacgt tgaccctaac gccaacccga atgccaatcc caacgcgaac 120

cccaatgcta acccaaatgc caaccctaac gccaacccca acgctaattcc aaacgccaac 180

cctaacgcc aatcccaacgc gaatcctaac gctaattcca acgcaaatcc caatgctaatt 240

ccgaacgcga accctaattgc aaacccctaac gccaacccga acgctaaccc gaacgctaatt 300

cccaacgccg gtggatcc 318

<210> 50

<211> 452

<212> PRT

<213> Artificial

<220>

<223> CHIKV E2-74 fusion protein

<400> 50

Ser Thr Lys Asp Asn Phe Asn Val Tyr Lys Ala Thr Arg Pro Tyr Leu
1 5 10 15

Ala His Cys Pro Asp Cys Gly Glu Gly His Ser Cys His Ser Pro Ile
20 25 30

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

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

Thr Lys Leu Arg Tyr Met Asp Ser His Thr Pro Ala Asp Ala Glu Arg
 65 70 75 80

Ala Gly Leu Leu Val Arg Thr Ser Ala Pro Cys Thr Ile Thr Gly Thr
 85 90 95

Met Gly His Phe Ile Leu Ala Arg Cys Pro Lys Gly Glu Thr Leu Thr
 100 105 110

Val Gly Phe Thr Asp Ser Arg Lys Ile Ser His Thr Cys Thr His Pro
 115 120 125

Phe His His Glu Pro Pro Val Ile Gly Arg Glu Arg Phe His Ser Arg
 130 135 140

Pro Gln His Gly Lys Glu Leu Pro Cys Ser Thr Tyr Val Gln Ser Thr
 145 150 155 160

Ala Ala Thr Ala Glu Glu Ile Glu Val His Met Pro Pro Asp Thr Pro
 165 170 175

Asp Arg Thr Leu Met Thr Gln Gln Ser Gly Asn Val Lys Ile Thr Val
 180 185 190

Asn Gly Gln Thr Val Arg Tyr Lys Cys Asn Cys Gly Gly Ser Gly Gly
 195 200 205

Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala
 210 215 220

Asn Pro Asn Ala Asn Pro Asn Ala Gly Gly Ser Asn Glu Gly Leu Thr
 225 230 235 240

Thr Thr Asp Lys Val Ile Asn Asn Cys Lys Ile Asp Gln Cys His Ala
 245 250 255

Ala Val Thr Asn His Lys Asn Trp Gln Tyr Asn Ser Pro Leu Val Pro
 260 265 270

Arg Asn Ala Glu Leu Gly Asp Arg Lys Gly Lys Ile His Ile Pro Phe
 275 280 285

Pro Leu Ala Asn Val Thr Cys Arg Val Pro Lys Ala Arg Asn Pro Thr
 290 295 300

Val Thr Tyr Gly Lys Asn Gln Val Thr Met Leu Leu Tyr Pro Asp His
 305 310 315 320

Pro Thr Leu Leu Ser Tyr Arg Asn Met Gly Gln Glu Pro Asn Tyr His
 325 330 335

Glu Glu Trp Val Thr His Lys Lys Glu Val Thr Leu Thr Val Pro Thr
 340 345 350

Glu Gly Leu Glu Val Thr Trp Gly Asn Asn Glu Pro Tyr Lys Tyr Trp
 355 360 365

Pro Gln Met Ser Thr Asn Gly Thr Ala His Gly His Pro His Glu Ile
 370 375 380

Ile Leu Tyr Tyr Tyr Glu Leu Tyr Pro Thr Met Thr Val Val Ile Val
 385 390 395 400

Ser Val Ala Ser Phe Val Leu Leu Ser Met Val Gly Thr Ala Val Gly
 405 410 415

Met Cys Val Cys Ala Arg Arg Arg Cys Ile Thr Pro Tyr Glu Leu Thr
 420 425 430

Pro Gly Ala Thr Val Pro Phe Leu Leu Ser Leu Leu Cys Cys Val Arg
 435 440 445

Thr Thr Lys Ala
 450

<210> 51
 <211> 439
 <212> PRT
 <213> Artificial

<220>
 <223> CHIKV E1

<400> 51

Tyr Glu His Val Thr Val Ile Pro Asn Thr Val Gly Val Pro Tyr Lys
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Thr Leu Val Asn Arg Pro Gly Tyr Ser Pro Met Val Leu Glu Met Glu
 20 25 30

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

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

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

Phe Thr Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys
 85 90 95

Asp Ala Glu Asn Thr Gln Leu Ser Glu Ala His Val Glu Lys Ser Glu
 100 105 110

Ser Cys Lys Thr Glu Phe Ala Ser Ala Tyr Arg Ala His Thr Ala Ser
 115 120 125

Ala Ser Ala Lys Leu Arg Val Leu Tyr Gln Gly Asn Asn Ile Thr Val
 130 135 140

Ala Ala Tyr Ala Asn Gly Asp His Ala Val Thr Val Lys Asp Ala Lys
 145 150 155 160

Phe Val Val Gly Pro Met Ser Ser Ala Trp Thr Pro Phe Asp Asn Lys
 165 170 175

Ile Val Val Tyr Lys Gly Asp Val Tyr Asn Met Asp Tyr Pro Pro Phe
 180 185 190

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

Glu Ser Lys Asp Val Tyr Ala Asn Thr Gln Leu Val Leu Gln Arg Pro
 210 215 220

Ala Ala Gly Thr Val His Val Pro Tyr Ser Gln Ala Pro Ser Gly Phe
 225 230 235 240

Lys Tyr Trp Leu Lys Glu Arg Gly Ala Ser Leu Gln His Thr Ala Pro
 245 250 255

Phe Gly Cys Gln Ile Ala Thr Asn Pro Val Arg Ala Val Asn Cys Ala
 260 265 270

Val Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asp Ala Ala Phe Thr
 275 280 285

Arg Val Val Asp Ala Pro Ser Val Thr Asp Met Ser Cys Glu Val Pro
 290 295 300

Ala Cys Thr His Ser Ser Asp Phe Gly Gly Val Ala Ile Ile Lys Tyr
 305 310 315 320

Thr Ala Ser Lys Lys Gly Lys Cys Ala Val His Ser Met Thr Asn Ala
 325 330 335

Val Thr Ile Arg Glu Ala Asp Val Glu Val Glu Gly Asn Ser Gln Leu
 340 345 350

Gln Ile Ser Phe Ser Thr Ala Leu Ala Ser Ala Glu Phe Arg Val Gln
 355 360 365

Val Cys Ser Thr Gln Val His Cys Ala Ala Ala Cys His Pro Pro Lys
 370 375 380

Asp His Ile Val Asn Tyr Pro Ala Ser His Thr Thr Leu Gly Val Gln
 385 390 395 400

Asp Ile Ser Thr Thr Ala Met Ser Trp Val Gln Lys Ile Thr Gly Gly
 405 410 415

Val Gly Leu Ile Val Ala Val Ala Ala Leu Ile Leu Ile Val Val Leu
 420 425 430

Cys Val Ser Phe Ser Arg His
 435

<210> 52

<211> 261

<212> PRT

<213> Artificial

<220>

<223> CHIKV capsid

<400> 52

Met Glu Phe Ile Pro Thr Gln Thr Phe Tyr Asn Arg Arg Tyr Gln Pro
 1 5 10 15

Arg Pro Trp Ala Pro Arg Pro Thr Ile Gln Val Ile Arg Pro Arg Pro
 20 25 30

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

Asn Lys Leu Thr Met Arg Ala Val Pro Gln Gln Lys Pro Arg Arg Asn
 50 55 60

Arg Lys Asn Lys Lys Gln Arg Gln Lys Lys Gln Ala Pro Gln Asn Asp
 65 70 75 80

Pro Lys Gln Lys Lys Gln Pro Pro Gln Lys Lys Pro Ala Gln Lys Lys
 85 90 95

Lys Lys Pro Gly Arg Arg Glu Arg Met Cys Met Lys Ile Glu Asn Asp
 100 105 110

Cys Ile Phe Glu Val Lys His Glu Gly Lys Val Met Gly Tyr Ala Cys
 115 120 125

Leu Val Gly Asp Lys Val Met Lys Pro Ala His Val Lys Gly Thr Ile
 130 135 140

Asp Asn Ala Asp Leu Ala Lys Leu Ala Phe Lys Arg Ser Ser Lys Tyr
 145 150 155 160

Asp Leu Glu Cys Ala Gln Ile Pro Val His Met Lys Ser Asp Ala Ser
 165 170 175

Lys Phe Thr His Glu Lys Pro Glu Gly Tyr Tyr Asn Trp His His Gly
 180 185 190

Ala Val Gln Tyr Ser Gly Gly Arg Phe Thr Ile Pro Thr Gly Ala Gly
 195 200 205

Lys Pro Gly Asp Ser Gly Arg Pro Ile Phe Asp Asn Lys Gly Arg Val
 210 215 220

Val Ala Ile Val Leu Gly Gly Ala Asn Glu Gly Ala Arg Thr Ala Leu
 225 230 235 240

Ser Val Val Thr Trp Asn Lys Asp Ile Val Thr Lys Ile Thr Pro Glu
 245 250 255

Gly Ala Glu Glu Trp
 260

<210> 53

<211> 453

<212> PRT

<213> Artificial

<220>

<223> VEEV E2-74 fusion protein

<400> 53

Ser Thr Glu Glu Leu Phe Asn Glu Tyr Lys Leu Thr Arg Pro Tyr Met
1 5 10 15

Ala Arg Cys Ile Arg Cys Ala Val Gly Ser Cys His Ser Pro Ile Ala
20 25 30

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

Thr Ser Ser Gln Tyr Gly Leu Asp Ser Ser Gly Asn Leu Lys Gly Arg
50 55 60

Thr Met Arg Tyr Asp Met His Gly Thr Ile Lys Glu Ile Pro Leu His
65 70 75 80

Gln Val Ser Leu Tyr Thr Ser Arg Pro Cys His Ile Val Asp Gly His
85 90 95

Gly Tyr Phe Leu Leu Ala Arg Cys Pro Ala Gly Asp Ser Ile Thr Met
100 105 110

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

Val Lys Phe Asn Pro Val Gly Arg Glu Leu Tyr Thr His Pro Pro Glu
130 135 140

His Gly Val Glu Gln Ala Cys Gln Val Tyr Ala His Asp Ala Gln Asn
145 150 155 160

Arg Gly Ala Tyr Val Glu Met His Leu Pro Gly Ser Glu Val Asp Ser
165 170 175

Ser Leu Val Ser Leu Ser Gly Ser Ser Gly Gly Asn Pro Asn Ala Asn
180 185 190

Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn
195 200 205

Pro Asn Ala Gly Gly Ser Ser Val Thr Val Thr Pro Pro Asp Gly Thr
210 215 220

Ser Ala Leu Val Glu Cys Glu Cys Gly Gly Thr Lys Ile Ser Glu Thr
225 230 235 240

Ile Asn Lys Thr Lys Gln Phe Ser Gln Cys Thr Lys Lys Glu Gln Cys
 245 250 255

Arg Ala Tyr Arg Leu Gln Asn Asp Lys Trp Val Tyr Asn Ser Asp Lys
 260 265 270

Leu Pro Lys Ala Ala Gly Ala Thr Leu Lys Gly Lys Leu His Val Pro
 275 280 285

Phe Leu Leu Ala Asp Gly Lys Cys Thr Val Pro Leu Ala Pro Glu Pro
 290 295 300

Met Ile Thr Phe Gly Phe Arg Ser Val Ser Leu Lys Leu His Pro Lys
 305 310 315 320

Asn Pro Thr Tyr Leu Ile Thr Arg Gln Leu Ala Asp Glu Pro His Tyr
 325 330 335

Thr His Glu Leu Ile Ser Glu Pro Ala Val Arg Asn Phe Thr Val Thr
 340 345 350

Glu Lys Gly Trp Glu Phe Val Trp Gly Asn His Pro Pro Lys Arg Phe
 355 360 365

Trp Ala Gln Glu Thr Ala Pro Gly Asn Pro His Gly Leu Pro His Glu
 370 375 380

Val Ile Thr His Tyr Tyr His Arg Tyr Pro Met Ser Thr Ile Leu Gly
 385 390 395 400

Leu Ser Ile Cys Ala Ala Ile Ala Thr Val Ser Val Ala Ala Ser Thr
 405 410 415

Trp Leu Phe Cys Arg Ser Arg Val Ala Cys Leu Thr Pro Tyr Arg Leu
 420 425 430

Thr Pro Asn Ala Arg Ile Pro Phe Cys Leu Ala Val Leu Cys Cys Ala
 435 440 445

Arg Thr Ala Arg Ala
 450

<210> 54
 <211> 442
 <212> PRT
 <213> Artificial

<220>

<223> VEEV E1

<400> 54

Tyr Glu His Ala Thr Thr Met Pro Ser Gln Ala Gly Ile Ser Tyr Asn
1 5 10 15

Thr Ile Val Asn Arg Ala Gly Tyr Ala Pro Leu Pro Ile Ser Ile Thr
20 25 30

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

Cys His Tyr Lys Thr Gly Met Asp Ser Pro Ala Ile Lys Cys Cys Gly
50 55 60

Ser Gln Glu Cys Thr Pro Thr Tyr Arg Pro Asp Glu Gln Cys Lys Val
65 70 75 80

Phe Thr Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Tyr Cys Phe Cys
85 90 95

Asp Thr Glu Asn Thr Gln Val Ser Lys Ala Tyr Val Met Lys Ser Asp
100 105 110

Asp Cys Leu Ala Asp His Ala Glu Ala Tyr Lys Ala His Thr Ala Ser
115 120 125

Val Gln Ala Phe Leu Asn Ile Thr Val Gly Glu His Ser Ile Val Thr
130 135 140

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

Ile Thr Ala Gly Pro Leu Ser Thr Ala Trp Thr Pro Phe Asp Arg Lys
165 170 175

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

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

Ser Ser Ser Asp Leu Tyr Ala Asn Thr Asn Leu Val Leu Gln Arg Pro
210 215 220

Lys Ala Gly Ala Ile His Val Pro Tyr Thr Gln Ala Pro Ser Gly Phe
225 230 235 240

Glu Gln Trp Lys Lys Asp Lys Ala Pro Ser Leu Lys Phe Thr Ala Pro
 245 250 255

Phe Gly Cys Glu Ile Tyr Thr Asn Pro Ile Arg Ala Glu Asn Cys Ala
 260 265 270

Val Gly Ser Ile Pro Leu Ala Phe Asp Ile Pro Asp Ala Leu Phe Thr
 275 280 285

Arg Val Ser Glu Thr Pro Thr Leu Ser Ala Ala Glu Cys Thr Leu Asn
 290 295 300

Glu Cys Val Tyr Ser Ser Asp Phe Gly Gly Ile Ala Thr Val Lys Tyr
 305 310 315 320

Ser Ala Ser Lys Ser Gly Lys Cys Ala Val His Val Pro Ser Gly Thr
 325 330 335

Ala Thr Leu Lys Glu Ala Ala Val Glu Leu Thr Glu Gln Gly Ser Ala
 340 345 350

Thr Ile His Phe Ser Thr Ala Asn Ile His Pro Glu Phe Arg Leu Gln
 355 360 365

Ile Cys Thr Ser Tyr Val Thr Cys Lys Gly Asp Cys His Pro Pro Lys
 370 375 380

Asp His Ile Val Thr His Pro Gln Tyr His Ala Gln Thr Phe Thr Ala
 385 390 395 400

Ala Val Ser Lys Thr Ala Trp Thr Trp Leu Thr Ser Leu Leu Gly Gly
 405 410 415

Ser Ala Val Ile Ile Ile Ile Gly Leu Val Leu Ala Thr Ile Val Ala
 420 425 430

Met Tyr Val Leu Thr Asn Gln Lys His Asn
 435 440

<210> 55
 <211> 275
 <212> PRT
 <213> Artificial

<220>
 <223> VEEV Capsid

<400> 55

Met Phe Pro Phe Gln Pro Met Tyr Pro Met Gln Pro Met Pro Tyr Arg
 1 5 10 15

Asn Pro Phe Ala Ala Pro Arg Arg Pro Trp Phe Pro Arg Thr Asp Pro
 20 25 30

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

Thr Phe Lys Gln Arg Arg Asp Ala Pro Pro Glu Gly Pro Ser Ala Asn
 50 55 60

Lys Pro Lys Lys Glu Ala Ser Gln Lys Gln Lys Gly Gly Gly Gln Gly
 65 70 75 80

Lys Lys Lys Lys Asn Gln Gly Lys Lys Lys Ala Lys Thr Gly Pro Pro
 85 90 95

Asn Pro Lys Ala Gln Asn Gly Asn Lys Lys Lys Thr Asn Lys Lys Pro
 100 105 110

Gly Lys Arg Gln Arg Met Val Met Lys Leu Glu Ser Asp Lys Thr Phe
 115 120 125

Pro Ile Met Leu Glu Gly Lys Ile Asn Gly Tyr Ala Cys Val Val Gly
 130 135 140

Gly Lys Leu Phe Arg Pro Met His Val Glu Gly Lys Ile Asp Asn Asp
 145 150 155 160

Val Leu Ala Ala Leu Lys Thr Lys Lys Ala Ser Lys Tyr Asp Leu Glu
 165 170 175

Tyr Ala Asp Val Pro Gln Asn Met Arg Ala Asp Thr Phe Lys Tyr Thr
 180 185 190

His Glu Lys Pro Gln Gly Tyr Tyr Ser Trp His His Gly Ala Val Gln
 195 200 205

Tyr Glu Asn Gly Arg Phe Thr Val Pro Lys Gly Val Gly Ala Lys Gly
 210 215 220

Asp Ser Gly Arg Pro Ile Leu Asp Asn Gln Gly Arg Val Val Ala Ile
 225 230 235 240

Val Leu Gly Gly Val Asn Glu Gly Ser Arg Thr Ala Leu Ser Val Val
 245 250 255

Met Trp Asn Glu Lys Gly Val Thr Val Lys Tyr Thr Pro Glu Asn Cys
 260 265 270

Glu Gln Trp
 275

<210> 56
 <211> 414
 <212> PRT
 <213> Plasmodium falciparum

<400> 56

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

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

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

Asn Glu Leu Glu Met Asn Tyr Tyr Gly Lys Gln Glu Asn Trp Tyr Ser
 50 55 60

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

Asn Asn Gly Asp Asn Gly Arg Glu Gly Lys Asp Glu Asp Lys Arg Asp
 85 90 95

Gly Asn Asn Glu Asp Asn Glu Lys Leu Arg Lys Pro Lys His Lys Lys
 100 105 110

Leu Lys Gln Pro Gly Asp Gly Asn Pro Asp Pro Asn Ala Asn Pro Asn
 115 120 125

Val Asp Pro Asn Ala Asn Pro Asn Val Asp Pro Asn Ala Asn Pro Asn
 130 135 140

Val Asp Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn
 145 150 155 160

Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn
 165 170 175

Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn

180	185	190
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
195	200	205
Val Asp Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
210	215	220
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
225	230	235 240
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
245	250	255
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
260	265	270
Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn Ala Asn Pro Asn		
275	280	285
Lys Asn Asn Gln Gly Asn Gly Gln Gly His Asn Met Pro Asn Asp Pro		
290	295	300
Asn Arg Asn Val Asp Glu Asn Ala Asn Ala Asn Asn Ala Val Lys Asn		
305	310	315 320
Asn Asn Asn Glu Glu Pro Ser Asp Lys His Ile Glu Gln Tyr Leu Lys		
325	330	335
Lys Ile Lys Asn Ser Ile Ser Thr Glu Trp Ser Pro Cys Ser Val Thr		
340	345	350
Cys Gly Asn Gly Ile Gln Val Arg Ile Lys Pro Gly Ser Ala Asn Lys		
355	360	365
Pro Lys Asp Glu Leu Asp Tyr Glu Asn Asp Ile Glu Lys Lys Ile Cys		
370	375	380
Lys Met Glu Lys Cys Ser Ser Val Phe Asn Val Val Asn Ser Ser Ile		
385	390	395 400
Gly Leu Ile Met Val Leu Ser Phe Leu Phe Leu Asn Thr Arg		
405	410	