

SEQUENCE LISTING

<110> Virolutions Biotech GmbH
 <120> Method for producing an antitumoral arenavirus as well as
 arenavirus mutants
 <130> VIR16633PCT
 <150> DE 10 2018 215 551.8
 <151> 2018-09-12
 <160> 64
 <170> PatentIn version 3.5
 <210> 1
 <211> 498
 <212> PRT
 <213> Lymphocytic choriomeningitis virus

 <220>
 <221> MISC_FEATURE
 <223> Lymphocytic choriomeningitis virus Mutant p52 Glycoprotein; ssrna
 ambisense-strand viruses; arenaviridae; arenavirus; old world
 arenaviruses

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

 Phe Leu Phe Leu Ala Gly Arg Ser Cys Gly Met Tyr Gly Leu Asn Gly
 50 55 60

 Pro Asp Ile Tyr Lys Gly Val Tyr Gln Phe Lys Ser Val Glu Phe Asp
 65 70 75 80

 Met Ser His Leu Asn Leu Thr Met Pro Asn Ala Cys Ser Ala Asn Asn
 85 90 95

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Met Ser Gln Cys Trp Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
325 330 335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
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Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
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Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
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Arg Arg

<210> 2
<211> 1497
<212> DNA
<213> Lymphocytic choriomeningitis virus

<220>

<221> MISC_FEATURE

<223> Lymphocytic choriomeningitis virus Mutant p52 Glycoprotein; ssrna
ambisense-strand viruses; arenaviridae; arenavirus; old world
arenaviruses

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<211> 498

<212> PRT

<213> Lymphocytic choriomeningitis virus

<220>

<221> MISC_FEATURE

<223> Lymphocytic choriomeningitis virus Mutant p42 Glycoprotein; ssrna
ambisense-strand viruses; arenaviridae; arenavirus; old world
arenaviruses

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Glu Val Ile Asn Ile Val Ile Ile Val Leu Ile Ile Ile Thr Ser Ile
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Lys Ala Val Tyr Asn Phe Ala Thr Cys Gly Ile Leu Ala Leu Val Ser
35 40 45

Phe Leu Phe Leu Ala Gly Arg Ser Cys Gly Met Tyr Gly Leu Asn Gly
50 55 60

Pro Asp Ile Tyr Lys Gly Val Tyr Gln Phe Lys Ser Val Glu Phe Asp
65 70 75 80

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Met Ser Gln Cys Arg Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
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Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
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Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
325 330 335

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

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

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
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Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
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Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
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Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
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Arg Arg

<210> 4
<211> 1497
<212> DNA
<213> Lymphocytic choriomeningitis virus

<220>
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<223> Lymphocytic choriomeningitis virus Mutant p42 Glycoprotein; ssrna
ambisense-strand viruses; arenaviridae; arenavirus; old world
arenaviruses

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<212> PRT

<213> Lymphocytic choriomeningitis virus

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<223> Lymphocytic choriomeningitis virus Mutant L-Protein; ssrna
ambisense-strand viruses; arenaviridae; arenavirus; old world
arenaviruses

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Glu Gln Asp Glu Arg Leu Ser Arg Gln Lys Leu Asn Phe Leu Gly Gln
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Arg Glu Pro Arg Met Val Leu Ile Glu Gly Leu Lys Leu Leu Ser Arg
35 40 45

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

Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
1025 1030 1035

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1070						1075					1080			
Ala	Leu	Lys	Asn	Leu	Cys	Phe	Tyr	Ser	Glu	Glu	Ser	Pro	Thr	Ser
1085						1090					1095			
Tyr	Thr	Ser	Val	Gly	Pro	Asp	Ser	Gly	Arg	Leu	Lys	Phe	Ala	Leu
1100						1105					1110			
Ser	Tyr	Lys	Glu	Gln	Val	Gly	Gly	Asn	Arg	Glu	Leu	Tyr	Ile	Gly
1115						1120					1125			
Asp	Leu	Arg	Thr	Lys	Met	Phe	Thr	Arg	Leu	Val	Glu	Asp	Tyr	Phe
1130						1135					1140			
Glu	Ser	Phe	Ser	Ser	Phe	Phe	Ser	Gly	Ser	Cys	Leu	Asn	Asn	Asp
1145						1150					1155			
Lys	Glu	Phe	Glu	Asn	Ala	Ile	Leu	Ser	Met	Thr	Ile	Asn	Val	Arg
1160						1165					1170			
Glu	Gly	Leu	Leu	Asn	Tyr	Ser	Met	Asp	His	Ser	Lys	Trp	Gly	Pro
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Leu	Gly	Asp	Asp	Gln	Tyr	Val	Arg	Ser	Gly	Lys	Asp	His	Val	Ser
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Thr	Leu	Leu	Thr	Trp	His	Met	His	Lys	Leu	Val	Glu	Val	Pro	Phe
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Pro	Val	Val	Asn	Ala	Met	Met	Lys	Ser	Tyr	Val	Lys	Ser	Lys	Leu
1235						1240					1245			

Lys Leu Leu Lys Gly Ser Gly Thr Thr Val Thr Glu Arg Ile Phe
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Arg Glu Tyr Phe Glu Met Gly Val Val Pro Ser His Ile Ser Ser
1265 1270 1275

Leu Ile Asp Met Gly Gln Gly Ile Leu His Asn Ala Ser Asp Phe
1280 1285 1290

Tyr Gly Leu Ile Ser Glu Arg Phe Ile Asn Tyr Cys Ile Gly Val
1295 1300 1305

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

Pro Glu Glu Val Leu Val Leu Leu Glu Phe His Ser His Leu Ser
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Gly Leu Leu Asn Lys Phe Ile Ser Pro Lys Ser Val Val Gly Arg
1355 1360 1365

Phe Ala Ala Glu Phe Lys Ser Arg Phe Tyr Val Trp Gly Glu Glu
1370 1375 1380

Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
1385 1390 1395

Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile
1400 1405 1410

Ala Asp Gln Ala Ile Ala Asn Gly Val Pro Val Phe Leu Val Asn
1415 1420 1425

Cys Ile Gln Arg Arg Thr Leu Asp Leu Leu Lys Tyr Ala Asn Phe
1430 1435 1440

Pro	Leu	Asp	Pro	Phe	Leu	Leu	Asn	Thr	His	Thr	Asp	Val	Lys	Asp
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Trp	Leu	Asp	Gly	Ser	Arg	Gly	Tyr	Arg	Ile	Gln	Arg	Leu	Ile	Glu
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Glu	Leu	Cys	Pro	Ser	Glu	Thr	Lys	Ile	Met	Arg	Lys	Leu	Val	Arg
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Arg	Leu	His	His	Lys	Leu	Lys	Asn	Gly	Glu	Cys	Asn	Glu	Glu	Phe
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Phe	Leu	Asp	Leu	Phe	Asn	Arg	Glu	Lys	Glu	Glu	Ala	Ile	Leu	Gln
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Leu	Gly	Glu	Ile	Leu	Gly	Leu	Glu	Asp	Asp	Leu	Asn	Glu	Leu	Ala
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Ser	Ile	Asn	Trp	Leu	Asn	Leu	Asn	Glu	Met	Phe	Pro	Leu	Arg	Met
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Val	Leu	Arg	Gln	Lys	Val	Val	Tyr	Pro	Ser	Val	Met	Thr	Phe	Gln
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Glu	Glu	Lys	Ile	Pro	Ser	Leu	Ile	Lys	Thr	Leu	Gln	Asn	Lys	Leu
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Cys	Ser	Lys	Phe	Thr	Arg	Gly	Ala	Gln	Lys	Leu	Leu	Ser	Glu	Ala
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Gly	Leu	Cys	Lys	Thr	Leu	Gly	Ser	Arg	Cys	Val	Arg	Asn	Lys	Asn
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Arg	Glu	Asn	Met	Tyr	Ile	Arg	Lys	Val	Leu	Glu	Asp	Leu	Thr	Met
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Asp	Glu	His	Val	Thr	Arg	Val	His	Lys	Gln	Asp	Gly	Val	Met	Leu
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Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
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Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
1670 1675 1680

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
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Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
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Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg
1730 1735 1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Ser
1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
1835 1840 1845

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1865						1870					1875			
Phe	Gln	Ser	Phe	Ile	Leu	Lys	Val	Val	Asn	Lys	Lys	Ile	Glu	Arg
1880						1885					1890			
Pro	Met	Phe	Arg	Asn	Asp	Leu	Gln	Phe	Gly	Phe	Gly	Trp	Phe	Ser
1895						1900					1905			
Tyr	Arg	Val	Gly	Asp	Val	Val	Cys	Asn	Ala	Ala	Met	Leu	Ile	Lys
1910						1915					1920			
Gln	Gly	Leu	Thr	Asp	Pro	Lys	Ala	Phe	Lys	Ser	Leu	Arg	Asp	Leu
1925						1930					1935			
Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser
1940						1945					1950			
Ile	Thr	Val	Asp	Phe	Thr	His	Asn	Gln	Asn	Asn	Thr	Asp	Cys	Leu
1955						1960					1965			
Arg	Lys	Phe	Ser	Leu	Ile	Phe	Val	Val	Lys	Cys	Gln	Leu	Gln	Ser
1970						1975					1980			
Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Ser	Phe	Lys	Gly
1985						1990					1995			
Glu	Val	Asp	Arg	Arg	Leu	Leu	Asp	Glu	Cys	Leu	Asn	Leu	Leu	Arg
2000						2005					2010			
Thr	Asp	Pro	Ile	Phe	Lys	Ala	Asn	Asp	Gly	Val	Phe	Asp	Ile	Arg
2015						2020					2025			
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2030						2035					2040			
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Glu Ile Lys Ser Thr Asp Phe Glu Arg Ile Gly Pro Glu Trp Glu
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Pro Val Pro Leu Thr Ile Arg Lys Gly Ala Leu Phe Glu Gly Arg
2075 2080 2085

Asn Phe Val Gln Asn Ile Ser Val Lys Leu Glu Thr Lys Asp Met
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2105 2110 2115

Val Leu Gly Ser Leu Leu Leu His Arg Phe Arg Thr Gly Glu His
2120 2125 2130

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Asp Arg Ser Val Met Leu Thr Pro Leu Ser Phe Val Pro Asp Trp
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Phe Thr Phe Arg Asp Cys Arg Leu Cys Phe Ser Lys Ser Lys Asn
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<213> Lymphocytic choriomeningitis virus

<220>
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<223> Lymphocytic choriomeningitis virus Mutant L-Protein; ssrna
ambisense-strand viruses; arenaviridae; arenavirus; old world
arenaviruses

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<223> Lymphocytic choriomeningitis virus Wildtype L-Protein; ssrna
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      arenaviruses

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

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
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Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
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Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
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His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
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Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
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His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
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Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
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Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
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Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
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His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
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Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
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Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
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Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
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Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile
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Cys Ile Gln Arg Arg Thr Leu Asp Leu Leu Lys Tyr Ala Asn Phe
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Pro Leu Asp Pro Phe Leu Leu Asn Thr His Thr Asp Val Lys Asp
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Trp Leu Asp Gly Ser Arg Gly Tyr Arg Ile Gln Arg Leu Ile Glu
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Glu Leu Cys Pro Ser Glu Thr Lys Ile Met Arg Lys Leu Val Arg
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Arg Leu His His Lys Leu Lys Asn Gly Glu Cys Asn Glu Glu Phe
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Leu Gly Glu Ile Leu Gly Leu Glu Asp Asp Leu Asn Glu Leu Ala
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Ser Ile Asn Trp Leu Asn Leu Asn Glu Met Phe Pro Leu Arg Met
1535 1540 1545

Val Leu Arg Gln Lys Val Val Tyr Pro Ser Val Met Thr Phe Gln
1550 1555 1560

Glu Glu Lys Ile Pro Ser Leu Ile Lys Thr Leu Gln Asn Lys Leu
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Cys Ser Lys Phe Thr Arg Gly Ala Gln Lys Leu Leu Ser Glu Ala
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Ile Asn Lys Ser Ala Phe Gln Ser Cys Val Ser Ser Gly Phe Ile
1595 1600 1605

Gly Leu Cys Lys Thr Leu Gly Ser Arg Cys Val Arg Asn Lys Asn
1610 1615 1620

Arg Glu Asn Met Tyr Ile Arg Lys Val Leu Glu Asp Leu Thr Met
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Asp Glu His Val Thr Arg Val His Lys Gln Asp Gly Val Met Leu
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Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
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Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
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Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
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Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Phe
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Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
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1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
1835 1840 1845

Val Ala Thr Ala Arg Thr Leu Gly Asn Phe Ser Trp Phe Pro His
1850 1855 1860

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1865 1870 1875

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1880 1885 1890

Pro Met Phe Arg Asn Asp Leu Gln Phe Gly Phe Gly Trp Phe Ser
1895 1900 1905

Tyr Arg Val Gly Asp Val Val Cys Asn Ala Ala Met Leu Ile Lys
1910 1915 1920

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1925 1930 1935

Trp Asp Tyr Met Leu Ser Ser Thr Glu Gly Ile Leu Glu Phe Ser
1940 1945 1950

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1955 1960 1965

Arg Lys Phe Ser Leu Ile Phe Val Val Lys Cys Gln Leu Gln Ser
1970 1975 1980

Pro Gly Val Ala Asp Tyr Leu Ser Cys Ser His Phe Phe Lys Gly
1985 1990 1995

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

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<220>
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 arenaviruses

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<212> DNA

<213> Lymphocytic choriomeningitis virus (strain WE)

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
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Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
485 490 495

Arg Arg

<210> 11
<211> 1677
<212> DNA
<213> Lymphocytic choriomeningitis virus (strain WE)

<400> 11
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gggttgact tttctgaagt cagcaacgtt cagaggatca tgagaaagga aaggagggat 180
gataaagact tgcagagact caggagtctt aaccagactg tgcattctct tgttgatctg 240
aagtctacat caaagaaaaa tgttctgaaa gtgggaagac ttagtgcaga ggaattgatg 300
acccttgacg ctgatcttga gaagctgaag gccaaaatta tgagaactga gaggcctcaa 360
gcttctggag tctacatggg aaatttgaca gcacaacaac ttgatcaaag atcccaaata 420
ctgcaaatgg ttgggatgag aagacctcag cagggtgcaa gtggtgtagt aagggtttgg 480
gatgtgaagg actcatcact tctgaacaat cagttcggca caatgccaaag cctgacaatg 540
gcttgcatgg caaaacagtc acagaccca ctcaatgatg ttgtgcaggc actcacagac 600
cttggttac tttacacagt caaatacccg aatctcagtg atcttgaaag gctaaaggat 660
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tcagttatag gtgctctccc acaagggatg gttttgagct gtcaaggttc tgatgacatc	1380
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aaggaggcct caagagaata tgaagataaa gtgtgggaca aatatggctg gctatgcaaa	1500
atgcacactg gggtagtgag agacaaaaag aagaaagaga tcaccccaca ctgtgcactc	1560
atggactgca tcatttttga gagtgccttc aaggcaagac tccctgatct aaaaaccgtt	1620
cacaacatcc tgccacatga tttaatcttc agaggaccca atgttgtgac actctaa	1677

<210> 12
 <211> 558
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (strain WE)

<400> 12

Met Ser Leu Ser Lys Glu Val Lys Ser Phe Gln Trp Thr Gln Ala Leu	
1 5 10 15	

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

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

Asn Val Gln Arg Ile Met Arg Lys Glu Arg Arg Asp Asp Lys Asp Leu	
50 55 60	

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu	
65 70 75 80	

Lys Ser Thr Ser Lys Lys Asn Val Leu Lys Val Gly Arg Leu Ser Ala	
85 90 95	

Glu Glu Leu Met Thr Leu Ala Ala Asp Leu Glu Lys Leu Lys Ala Lys	
100 105 110	

Ile Met Arg Thr Glu Arg Pro Gln Ala Ser Gly Val Tyr Met Gly Asn	
115 120 125	

Leu Thr Ala Gln Gln Leu Asp Gln Arg Ser Gln Ile Leu Gln Met Val	
130 135 140	

Gly Met Arg Arg Pro Gln Gln Gly Ala Ser Gly Val Val Arg Val Trp
145 150 155 160

Asp Val Lys Asp Ser Ser Leu Leu Asn Asn Gln Phe Gly Thr Met Pro
165 170 175

Ser Leu Thr Met Ala Cys Met Ala Lys Gln Ser Gln Thr Pro Leu Asn
180 185 190

Asp Val Val Gln Ala Leu Thr Asp Leu Gly Leu Leu Tyr Thr Val Lys
195 200 205

Tyr Pro Asn Leu Ser Asp Leu Glu Arg Leu Lys Asp Lys His Pro Val
210 215 220

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

Asn Phe Ser Leu Gly Ala Ala Val Lys Ala Gly Ala Ala Leu Leu Asp
245 250 255

Gly Gly Asn Met Leu Glu Ser Ile Leu Ile Lys Pro Ser Asn Ser Glu
260 265 270

Asp Leu Leu Lys Ala Val Leu Gly Ala Lys Lys Lys Leu Asn Met Phe
275 280 285

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu
450 455 460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys
500 505 510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu
530 535 540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
545 550 555

<210> 13

<211> 273

<212> DNA
<213> Lymphocytic choriomeningitis virus (strain WE)

<400> 13
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agcttggtta gatgccatga ccactatctt tgcagacact gtctgaatct cctgctgtca 180
gtttccgaca gatgtcctct ctgtaagtat ccactgccaa ccaaactgaa ggtgtcaaca 240
gtcccaagct cccacacctcc ctatgaggag tga 273

<210> 14
<211> 90
<212> PRT
<213> Lymphocytic choriomeningitis virus (strain WE)

<400> 14
Met Gly Gln Gly Lys Ser Lys Glu Glu Arg Asp Thr Ser Asn Thr Gly
1 5 10 15
Arg Ala Glu Leu Leu Pro Asp Thr Thr Tyr Leu Gly Pro Leu Asn Cys
20 25 30
Lys Ser Cys Trp Gln Lys Phe Asp Ser Leu Val Arg Cys His Asp His
35 40 45
Tyr Leu Cys Arg His Cys Leu Asn Leu Leu Leu Ser Val Ser Asp Arg
50 55 60
Cys Pro Leu Cys Lys Tyr Pro Leu Pro Thr Lys Leu Lys Val Ser Thr
65 70 75 80
Val Pro Ser Ser Pro Pro Pro Tyr Glu Glu
85 90

<210> 15
<211> 6630
<212> DNA
<213> Lymphocytic choriomeningitis virus (strain WE)

<400> 15
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gagggactca aattgttatc acgctgtata gagatagaca gtgcagacaa aagtggttgc	180
atacacaacc acgatgacaa atctgttgaa acaatcctaa tagactctgg gatttgtgtg	240
ccaggactgc cactcatcat ccctgatggg tataagttga ttgacaattc ctttattctt	300
cttgaatgtt ttgttagaag cacaccagct agttttgaaa agaagttcat tgaggacacc	360
aacaaactag catgcatcaa agaagatctt gctgttgagc gcatcacact ggttccaata	420
gtggatgggc gttgtgatta tgataacagt ttcattgccg aatgggtgaa ttttaagttc	480
agagacctcc tatttaaact cctggagtat tctagtcaag atgagaaagt ttttgaggag	540
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<210> 16
<211> 2209
<212> PRT
<213> Lymphocytic choriomeningitis virus (strain WE)

<400> 16

Met Asp Glu Thr Ile Ala Asp Leu Arg Glu Leu Cys Leu Asn Tyr Ile
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Glu Gln Asp Glu Arg Leu Ser Arg Gln Lys Leu Asn Phe Leu Gly Gln
20 25 30

Arg Glu Pro Arg Met Val Leu Ile Glu Gly Leu Lys Leu Leu Ser Arg
35 40 45

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

Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
1025 1030 1035

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

Pro	Val	Val	Asn	Ala	Met	Met	Lys	Ser	Tyr	Val	Lys	Ser	Lys	Leu
	1235					1240					1245			
Lys	Leu	Leu	Lys	Gly	Ser	Gly	Thr	Thr	Val	Thr	Glu	Arg	Ile	Phe
	1250					1255					1260			
Arg	Glu	Tyr	Phe	Glu	Met	Gly	Val	Val	Pro	Ser	His	Ile	Ser	Ser
	1265					1270					1275			
Leu	Ile	Asp	Met	Gly	Gln	Gly	Ile	Leu	His	Asn	Ala	Ser	Asp	Phe
	1280					1285					1290			
Tyr	Gly	Leu	Ile	Ser	Glu	Arg	Phe	Ile	Asn	Tyr	Cys	Ile	Gly	Val
	1295					1300					1305			
Ile	Phe	Gly	Glu	Arg	Pro	Glu	Ala	Tyr	Thr	Ser	Ser	Asp	Asp	Gln
	1310					1315					1320			
Ile	Thr	Leu	Phe	Asp	Lys	Arg	Leu	Ser	Asp	Leu	Val	Asp	Ser	Asp
	1325					1330					1335			
Pro	Glu	Glu	Val	Leu	Val	Leu	Leu	Glu	Phe	His	Ser	His	Leu	Ser
	1340					1345					1350			
Gly	Leu	Leu	Asn	Lys	Phe	Ile	Ser	Pro	Lys	Ser	Val	Val	Gly	Arg
	1355					1360					1365			
Phe	Ala	Ala	Glu	Phe	Lys	Ser	Arg	Phe	Tyr	Val	Trp	Gly	Glu	Glu
	1370					1375					1380			
Val	Pro	Leu	Leu	Thr	Lys	Phe	Val	Ser	Ala	Ala	Leu	His	Asn	Val
	1385					1390					1395			
Lys	Cys	Lys	Glu	Pro	His	Gln	Leu	Cys	Glu	Thr	Ile	Asp	Thr	Ile
	1400					1405					1410			
Ala	Asp	Gln	Ala	Ile	Ala	Asn	Gly	Val	Pro	Val	Phe	Leu	Val	Asn
	1415					1420					1425			
Cys	Ile	Gln	Arg	Arg	Thr	Leu	Asp	Leu	Leu	Lys	Tyr	Ala	Asn	Phe
	1430					1435					1440			

Pro	Leu	Asp	Pro	Phe	Leu	Leu	Asn	Thr	His	Thr	Asp	Val	Lys	Asp
	1445					1450					1455			
Trp	Leu	Asp	Gly	Ser	Arg	Gly	Tyr	Arg	Ile	Gln	Arg	Leu	Ile	Glu
	1460					1465					1470			
Glu	Leu	Cys	Pro	Ser	Glu	Thr	Lys	Ile	Met	Arg	Lys	Leu	Val	Arg
	1475					1480					1485			
Arg	Leu	His	His	Lys	Leu	Lys	Asn	Gly	Glu	Cys	Asn	Glu	Glu	Phe
	1490					1495					1500			
Phe	Leu	Asp	Leu	Phe	Asn	Arg	Glu	Lys	Lys	Glu	Ala	Ile	Leu	Gln
	1505					1510					1515			
Leu	Gly	Glu	Ile	Leu	Gly	Leu	Glu	Asp	Asp	Leu	Asn	Glu	Leu	Ala
	1520					1525					1530			
Ser	Ile	Asn	Trp	Leu	Asn	Leu	Asn	Glu	Met	Phe	Pro	Leu	Arg	Met
	1535					1540					1545			
Val	Leu	Arg	Gln	Lys	Val	Val	Tyr	Pro	Ser	Val	Met	Thr	Phe	Gln
	1550					1555					1560			
Glu	Glu	Lys	Ile	Pro	Ser	Leu	Ile	Lys	Thr	Leu	Gln	Asn	Lys	Leu
	1565					1570					1575			
Cys	Ser	Lys	Phe	Thr	Arg	Gly	Ala	Gln	Lys	Leu	Leu	Ser	Glu	Ala
	1580					1585					1590			
Ile	Asn	Lys	Ser	Ala	Phe	Gln	Ser	Cys	Val	Ser	Ser	Gly	Phe	Ile
	1595					1600					1605			
Gly	Leu	Cys	Lys	Thr	Leu	Gly	Ser	Arg	Cys	Val	Arg	Asn	Lys	Asn
	1610					1615					1620			
Arg	Glu	Asn	Met	Tyr	Ile	Arg	Lys	Val	Leu	Glu	Asp	Leu	Thr	Met
	1625					1630					1635			

Asp Glu His Val Thr Arg Val His Lys Gln Asp Gly Val Met Leu
1640 1645 1650

Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
1655 1660 1665

Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
1670 1675 1680

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
1700 1705 1710

Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
1715 1720 1725

Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg
1730 1735 1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Ser
1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
1835 1840 1845

Val	Ala	Thr	Ala	Arg	Thr	Leu	Gly	Asn	Phe	Ser	Trp	Phe	Pro	His
1850						1855					1860			
Lys	Asp	Met	Met	Pro	Ser	Glu	Asp	Gly	Ala	Glu	Ala	Leu	Gly	Pro
1865						1870					1875			
Phe	Gln	Ser	Phe	Ile	Leu	Lys	Val	Val	Asn	Lys	Lys	Ile	Glu	Arg
1880						1885					1890			
Pro	Met	Phe	Arg	Asn	Asp	Leu	Gln	Phe	Gly	Phe	Gly	Trp	Phe	Ser
1895						1900					1905			
Tyr	Arg	Val	Gly	Asp	Val	Val	Cys	Asn	Ala	Ala	Met	Leu	Ile	Lys
1910						1915					1920			
Gln	Gly	Leu	Thr	Asp	Pro	Lys	Ala	Phe	Lys	Ser	Leu	Arg	Asp	Leu
1925						1930					1935			
Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser
1940						1945					1950			
Ile	Thr	Val	Asp	Phe	Thr	His	Asn	Gln	Asn	Asn	Thr	Asp	Cys	Leu
1955						1960					1965			
Arg	Lys	Phe	Ser	Leu	Ile	Phe	Val	Val	Lys	Cys	Gln	Leu	Gln	Ser
1970						1975					1980			
Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Phe	Phe	Lys	Gly
1985						1990					1995			
Glu	Val	Asp	Arg	Arg	Leu	Leu	Asp	Glu	Cys	Leu	Asn	Leu	Leu	Arg
2000						2005					2010			
Thr	Asp	Pro	Ile	Phe	Lys	Ala	Asn	Asp	Gly	Val	Phe	Asp	Ile	Arg
2015						2020					2025			
Ser	Glu	Glu	Phe	Glu	Asp	Tyr	Met	Glu	Asp	Pro	Leu	Thr	Leu	Gly
2030						2035					2040			

Asp Ser Leu Glu Leu Glu Leu Ile Gly Ser Arg Arg Ile Leu Asn
2045 2050 2055

Glu Ile Lys Ser Thr Asp Phe Glu Arg Ile Gly Pro Glu Trp Glu
2060 2065 2070

Pro Val Pro Leu Thr Ile Arg Lys Gly Ala Leu Phe Glu Gly Arg
2075 2080 2085

Asn Phe Val Gln Asn Ile Ser Val Lys Leu Glu Thr Lys Asp Met
2090 2095 2100

Arg Val Phe Leu Ala Glu Leu Glu Gly Cys Gly Lys Ile Gly Asp
2105 2110 2115

Val Leu Gly Ser Leu Leu Leu His Arg Phe Arg Thr Gly Glu His
2120 2125 2130

Leu Met Glu Ser Glu Ile Ser Thr Val Leu Gln Glu Leu Cys Met
2135 2140 2145

Asp Arg Ser Val Met Leu Thr Pro Leu Ser Phe Val Pro Asp Trp
2150 2155 2160

Phe Thr Phe Arg Asp Cys Arg Leu Cys Phe Ser Arg Ser Lys Asn
2165 2170 2175

Thr Val Met Tyr Glu Thr Thr Gly Gly Arg Phe Arg Leu Lys Gly
2180 2185 2190

Lys Ser Cys Asp Asp Trp Leu Ala Glu Arg Val Ala Glu Glu Ile
2195 2200 2205

Asp

<210> 17

<211> 1497

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P42)

<400> 17

atgggtcaga ttgtgacaat gtttgaggct ttgcctcaca tcattgatga ggtcatcaac	60
attgtcatta ttgtgctcat tataatcacg agcatcaaag ctgtgtacaa tttcgccacc	120
tgtgggatat tagcactggg cagcttcctt tttttggctg gtaggtcctg tggcatgtac	180
ggccttaatg gtcccgacat ctataaaggg gtttaccagt tcaaatacagt ggagtttgat	240
atgtctcact taaatctgac gatgcccaat gcgtgctcag ccaacaactc tcatcactac	300
atcagtatgg gaagctctgg actggagcta actttcacta acgactccat ccttaatcac	360
aatttttgca acttaacctc cgctttcaac aaaaagactt ttgaccatac actcatgagt	420
atagtctcga gtctgcacct cagtattaga gggaattcca accacaaagc agtgtcttgt	480
gattttaaca atggcatcac cattcaatac aacttgtcat tttcggaccc acagagcgct	540
atgagccagt gtaggacttt cagaggtaga gtcttggaca tgtttagaac tgcctttgga	600
ggaaaataca tgagaagtgg ctggggctgg gcaggttcag atggcaagac cacttggtgc	660
agccaaacaa gctatcagta cctaatacata caaaacagga cttgggaaaa cactgtaga	720
tatgcaggcc cttttgggat gtctagaatc ctctttgctc aggaaaagac aaagtttctc	780
actaggagac ttgcaggcac attcacctgg accctgtcag actcctcagg agtagaaaat	840
ccaggtgggtt attgcctgac caaatggatg atccttgctg cagagctcaa atgttttggg	900
aatacagctg ttgcaaaatg taatgtcaat catgatgaag agttctgtga catgctacga	960
ctaattgatt acaacaaggc cgccctgagt aagttcaagc aagatgtaga gtctgccttg	1020
catgtattca aaacaacagt aaattctctg atttccgac agctgttgat gaggaatcat	1080
ctaagagatc taatgggggt accatactgt aattactcaa agttctggta tctggaacat	1140
gctaagactg gtgagactag tgtaccaag tgctggcttg tcactaatgg ctctacttg	1200
aatgagaccc actttagtga tcaaatacga caagaagcag ataacatgat cacagagatg	1260
ttgaggaagg actacataaa aagacaaggg agtactcctt tagccttaat ggatcttttg	1320
atgttttcaa catcagcata tctaatacgc atctttctgc atcttgtgaa gataccaaca	1380
catagacaca taaagggcgg ttcatgtcca aagccacacc gcttgaccaa caaggggatc	1440
tgtagtgtg gtgcattcaa ggtgcctggg gtaaaaacta tctggaaaag acgctga	1497

<210> 18
 <211> 498
 <212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P42)

<400> 18

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

Glu Val Ile Asn Ile Val Ile Ile Val Leu Ile Ile Ile Thr Ser Ile
20 25 30

Lys Ala Val Tyr Asn Phe Ala Thr Cys Gly Ile Leu Ala Leu Val Ser
35 40 45

Phe Leu Phe Leu Ala Gly Arg Ser Cys Gly Met Tyr Gly Leu Asn Gly
50 55 60

Pro Asp Ile Tyr Lys Gly Val Tyr Gln Phe Lys Ser Val Glu Phe Asp
65 70 75 80

Met Ser His Leu Asn Leu Thr Met Pro Asn Ala Cys Ser Ala Asn Asn
85 90 95

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Met Ser Gln Cys Arg Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
325 330 335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
485 490 495

Arg Arg

<210> 19
<211> 1677
<212> DNA
<213> Lymphocytic choriomeningitis virus (mutant P42)

<400> 19
atgtctttgt ccaaagaagt caaaagcttt cagtggacac aggcgttgag gagggagttg 60
cagagtttta catcagatgt aaaggctgcc gtcacaaagg acgcaaccag tcttctaaat 120
gggttggact tttctgaagt cagcaacgtt cagaggatca tgagaaagga aaggagggat 180
gataaagact tgcagagact caggagtctt aaccagactg tgcattctct tgttgatctg 240
aagtctacat caaagaaaaa tgttctgaaa gtgggaagac ttagtgcaga ggaattgatg 300
acccttgacg ctgatcttga gaagctgaag gccaaaatta tgagaactga gaggcctcaa 360
gcttctggag tctacatggg aaatttgaca gcacaacaac ttgatcaaag atcccaaata 420
ctgcaaatgg ttgggatgag aagacctcag cagggtgcaa gtggtgtagt aagggtttgg 480
gatgtgaagg actcatcact tctgaacaat cagttcggca caatgccaag cctgacaatg 540
gcttgcatgg caaacagtc acagacccca ctcaatgatg ttgtgcaggc actcacagac 600
cttggttac tttacacagt caaatacccg aatctcagtg atcttgaaag gctaaaggat 660
aaacacccag ttctgggggt cattactgaa cagcaatcta gtatcaatat ctctggttat 720

aatttcagtc ttggtgcagc tgtgaaagcg ggggcagctc tgctagatgg aggggaacatg	780
ctggaatcta tcttgatcaa accgagcaac agtgaggatc tcctaaaagc agtcctcggg	840
gccaagaaga aactcaacat gtttgtctca gatcaagttg gagatagaaa tccctatgaa	900
aacatccttt ataaagtctg tctttcaggt gaaggatggc catacatagc ctgtagaacg	960
tcagttgtgg ggagagcatg ggagaacaca acaattgatc tcacaaatga aaaacttggt	1020
gccaactcat ctaggccagt gcctggagca gcaggccac ctcaggtggg cttgagttac	1080
agtcagacaa tgctgttgaa agacttgatg ggagggattg atcccaatgc tcccacatgg	1140
attgacattg agggcaggtt caatgatcca gtggagatag caatattcca accacaaaat	1200
gggcaattca tacattttta cagggaacct acggaccaga agcaattcaa gcaggactca	1260
aagtattcac acggcatgga tcttgctgat ctcttcaatg cacagcctgg gctgacctca	1320
tcagttatag gtgctctccc acaagggatg gttttgagct gtcaaggttc tgatgacatc	1380
agaaagcttc tggactcaca aaatagaagg gacataaaac tcattgatgt tgagatgacc	1440
aaggaggcct caagagaata tgaagataaa gtgtgggaca aatatggctg gctatgcaaa	1500
atgcacactg gggtagtgag agacaaaaag aagaaagaga tcaccccaca ctgtgcactc	1560
atggactgca tcatttttga gagtgcttcc aaggcaagac tccctgatct aaaaaccgtt	1620
cacaacatcc tgccacatga tttaatcttc agaggacca atgttgtgac actctaa	1677

<210> 20
 <211> 558
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P42)

<400> 20

Met	Ser	Leu	Ser	Lys	Glu	Val	Lys	Ser	Phe	Gln	Trp	Thr	Gln	Ala	Leu
1				5					10					15	

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

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

Asn	Val	Gln	Arg	Ile	Met	Arg	Lys	Glu	Arg	Arg	Asp	Asp	Lys	Asp	Leu
	50					55					60				

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu
65 70 75 80

Lys Ser Thr Ser Lys Lys Asn Val Leu Lys Val Gly Arg Leu Ser Ala
85 90 95

Glu Glu Leu Met Thr Leu Ala Ala Asp Leu Glu Lys Leu Lys Ala Lys
100 105 110

Ile Met Arg Thr Glu Arg Pro Gln Ala Ser Gly Val Tyr Met Gly Asn
115 120 125

Leu Thr Ala Gln Gln Leu Asp Gln Arg Ser Gln Ile Leu Gln Met Val
130 135 140

Gly Met Arg Arg Pro Gln Gln Gly Ala Ser Gly Val Val Arg Val Trp
145 150 155 160

Asp Val Lys Asp Ser Ser Leu Leu Asn Asn Gln Phe Gly Thr Met Pro
165 170 175

Ser Leu Thr Met Ala Cys Met Ala Lys Gln Ser Gln Thr Pro Leu Asn
180 185 190

Asp Val Val Gln Ala Leu Thr Asp Leu Gly Leu Leu Tyr Thr Val Lys
195 200 205

Tyr Pro Asn Leu Ser Asp Leu Glu Arg Leu Lys Asp Lys His Pro Val
210 215 220

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

Asn Phe Ser Leu Gly Ala Ala Val Lys Ala Gly Ala Ala Leu Leu Asp
245 250 255

Gly Gly Asn Met Leu Glu Ser Ile Leu Ile Lys Pro Ser Asn Ser Glu
260 265 270

Asp Leu Leu Lys Ala Val Leu Gly Ala Lys Lys Lys Leu Asn Met Phe
275 280 285

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu
450 455 460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys
500 505 510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu
530 535 540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
545 550 555

<210> 21
<211> 273
<212> DNA
<213> Lymphocytic choriomeningitis virus (mutant P42)

<400> 21
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ttgccagaca ccacctatct tggctcctcta aattgtaaat catgttggca gaaatttgac 120
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<211> 90
<212> PRT
<213> Lymphocytic choriomeningitis virus (mutant P42)

<400> 22

Met Gly Gln Gly Lys Ser Lys Glu Glu Arg Asp Thr Ser Asn Thr Gly
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Arg Ala Glu Leu Leu Pro Asp Thr Thr Tyr Leu Gly Pro Leu Asn Cys
20 25 30

Lys Ser Cys Trp Gln Lys Phe Asp Ser Leu Val Arg Cys His Asp His
35 40 45

Tyr Leu Cys Arg His Cys Leu Asn Leu Leu Leu Ser Val Ser Asp Arg
50 55 60

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

Val Pro Ser Ser Pro Pro Pro Tyr Glu Glu
85 90

<210> 23
<211> 6630
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<213> Lymphocytic choriomeningitis virus (mutant P42)

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<210> 24
 <211> 2209
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P42)
 <400> 24

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			20					25					30		

Arg	Glu	Pro	Arg	Met	Val	Leu	Ile	Glu	Gly	Leu	Lys	Leu	Leu	Ser	Arg
		35					40					45			

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

Asp	Asp	Lys	Ser	Val	Glu	Thr	Ile	Leu	Ile	Asp	Ser	Gly	Ile	Val	Cys
65					70					75					80

Pro	Gly	Leu	Pro	Leu	Ile	Ile	Pro	Asp	Gly	Tyr	Lys	Leu	Ile	Asp	Asn
				85					90					95	

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
1025 1030 1035

Arg His Met Gln Arg Gln Ser Leu Asn Phe Lys Phe Asp Trp Asp
1040 1045 1050

Lys Leu Glu Glu Asp Val Arg Ile Ser Glu Arg Glu Ser Asn Ser
1055 1060 1065

Glu Ser Leu Ser Lys Ala Leu Ser Leu Thr Lys Cys Met Ser Ala
1070 1075 1080

Ala Leu Lys Asn Leu Cys Phe Tyr Ser Glu Glu Ser Pro Thr Ser
1085 1090 1095

Tyr Thr Ser Val Gly Pro Asp Ser Gly Arg Leu Lys Phe Ala Leu
1100 1105 1110

Ser Tyr Lys Glu Gln Val Gly Gly Asn Arg Glu Leu Tyr Ile Gly
1115 1120 1125

Asp Leu Arg Thr Lys Met Phe Thr Arg Leu Val Glu Asp Tyr Phe
1130 1135 1140

Glu Ser Phe Ser Ser Phe Phe Ser Gly Ser Cys Leu Asn Asn Asp
1145 1150 1155

Lys Glu Phe Glu Asn Ala Ile Leu Ser Met Thr Ile Asn Val Arg
1160 1165 1170

Glu Gly Leu Leu Asn Tyr Ser Met Asp His Ser Lys Trp Gly Pro
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Met Met Cys Pro Phe Leu Phe Leu Met Leu Leu Gln Asn Leu Lys
1190 1195 1200

Leu Gly Asp Asp Gln Tyr Val Arg Ser Gly Lys Asp His Val Ser
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Thr Leu Leu Thr Trp His Met His Lys Leu Val Glu Val Pro Phe
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Pro Val Val Asn Ala Met Met Lys Ser Tyr Val Lys Ser Lys Leu
1235 1240 1245

Lys Leu Leu Lys Gly Ser Gly Thr Thr Val Thr Glu Arg Ile Phe
1250 1255 1260

Arg Glu Tyr Phe Glu Met Gly Val Val Pro Ser His Ile Ser Ser
1265 1270 1275

Leu Ile Asp Met Gly Gln Gly Ile Leu His Asn Ala Ser Asp Phe
1280 1285 1290

Tyr Gly Leu Ile Ser Glu Arg Phe Ile Asn Tyr Cys Ile Gly Val
1295 1300 1305

Ile Phe Gly Glu Arg Pro Glu Ala Tyr Thr Ser Ser Asp Asp Gln
1310 1315 1320

Ile Thr Leu Phe Asp Lys Arg Leu Ser Asp Leu Val Asp Ser Asp
1325 1330 1335

Pro Glu Glu Val Leu Val Leu Leu Glu Phe His Ser His Leu Ser
1340 1345 1350

Gly Leu Leu Asn Lys Phe Ile Ser Pro Lys Ser Val Val Gly Arg
1355 1360 1365

Phe Ala Ala Glu Phe Lys Ser Arg Phe Tyr Val Trp Gly Glu Glu
1370 1375 1380

Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
1385 1390 1395

Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile
1400 1405 1410

Ala Asp Gln Ala Ile Ala Asn Gly Val Pro Val Phe Leu Val Asn
1415 1420 1425

Cys Ile Gln Arg Arg Thr Leu Asp Leu Leu Lys Tyr Ala Asn Phe
1430 1435 1440

Pro Leu Asp Pro Phe Leu Leu Asn Thr His Thr Asp Val Lys Asp
1445 1450 1455

Trp Leu Asp Gly Ser Arg Gly Tyr Arg Ile Gln Arg Leu Ile Glu
1460 1465 1470

Glu Leu Cys Pro Ser Glu Thr Lys Ile Met Arg Lys Leu Val Arg
1475 1480 1485

Arg Leu His His Lys Leu Lys Asn Gly Glu Cys Asn Glu Glu Phe
1490 1495 1500

Phe Leu Asp Leu Phe Asn Arg Glu Lys Lys Glu Ala Ile Leu Gln
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Leu Gly Glu Ile Leu Gly Leu Glu Asp Asp Leu Asn Glu Leu Ala
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Ser Ile Asn Trp Leu Asn Leu Asn Glu Met Phe Pro Leu Arg Met
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Val Leu Arg Gln Lys Val Val Tyr Pro Ser Val Met Thr Phe Gln
1550 1555 1560

Glu Glu Lys Ile Pro Ser Leu Ile Lys Thr Leu Gln Asn Lys Leu
1565 1570 1575

Cys Ser Lys Phe Thr Arg Gly Ala Gln Lys Leu Leu Ser Glu Ala
1580 1585 1590

Ile Asn Lys Ser Ala Phe Gln Ser Cys Val Ser Ser Gly Phe Ile
1595 1600 1605

Gly Leu Cys Lys Thr Leu Gly Ser Arg Cys Val Arg Asn Lys Asn
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Arg Glu Asn Met Tyr Ile Arg Lys Val Leu Glu Asp Leu Thr Met
1625 1630 1635

Asp Glu His Val Thr Arg Val His Lys Gln Asp Gly Val Met Leu
1640 1645 1650

Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
1655 1660 1665

Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
1670 1675 1680

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
1700 1705 1710

Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
1715 1720 1725

Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg
1730 1735 1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Phe
1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
1835 1840 1845

Val Ala Thr Ala Arg Thr Leu Gly Asn Phe Ser Trp Phe Pro His
1850 1855 1860

Lys Asp Met Met Pro Ser Glu Asp Gly Ala Glu Ala Leu Gly Pro
1865 1870 1875

Phe Gln Ser Phe Ile Leu Lys Val Val Asn Lys Lys Ile Glu Arg
1880 1885 1890

Pro Met Phe Arg Asn Asp Leu Gln Phe Gly Phe Gly Trp Phe Ser
1895 1900 1905

Tyr Arg Val Gly Asp Val Val Cys Asn Ala Ala Met Leu Ile Lys
1910 1915 1920

Gln Gly Leu Thr Asp Pro Lys Ala Phe Lys Ser Leu Arg Asp Leu
1925 1930 1935

Trp Asp Tyr Met Leu Ser Ser Thr Glu Gly Ile Leu Glu Phe Ser
1940 1945 1950

Ile Thr Val Asp Phe Thr His Asn Gln Asn Asn Thr Asp Cys Leu
1955 1960 1965

Arg	Lys	Phe	Ser	Leu	Ile	Phe	Val	Val	Lys	Cys	Gln	Leu	Gln	Ser
1970						1975					1980			
Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Phe	Phe	Lys	Gly
1985						1990					1995			
Glu	Val	Asp	Arg	Arg	Leu	Leu	Asp	Glu	Cys	Leu	Asn	Leu	Leu	Arg
2000						2005					2010			
Thr	Asp	Pro	Ile	Phe	Lys	Ala	Asn	Asp	Gly	Val	Phe	Asp	Ile	Arg
2015						2020					2025			
Ser	Glu	Glu	Phe	Glu	Asp	Tyr	Met	Glu	Asp	Pro	Leu	Thr	Leu	Gly
2030						2035					2040			
Asp	Ser	Leu	Glu	Leu	Glu	Leu	Ile	Gly	Ser	Arg	Arg	Ile	Leu	Asn
2045						2050					2055			
Glu	Ile	Lys	Ser	Thr	Asp	Phe	Glu	Arg	Ile	Gly	Pro	Glu	Trp	Glu
2060						2065					2070			
Pro	Val	Pro	Leu	Thr	Ile	Arg	Lys	Gly	Ala	Leu	Phe	Glu	Gly	Arg
2075						2080					2085			
Asn	Phe	Val	Gln	Asn	Ile	Ser	Val	Lys	Leu	Glu	Thr	Lys	Asp	Met
2090						2095					2100			
Arg	Val	Phe	Leu	Ala	Glu	Leu	Glu	Gly	Cys	Gly	Lys	Ile	Gly	Asp
2105						2110					2115			
Val	Leu	Gly	Ser	Leu	Leu	Leu	His	Arg	Phe	Arg	Thr	Gly	Glu	His
2120						2125					2130			
Leu	Met	Glu	Ser	Glu	Ile	Ser	Thr	Val	Leu	Gln	Glu	Leu	Cys	Met
2135						2140					2145			
Asp	Arg	Ser	Val	Met	Leu	Thr	Pro	Leu	Ser	Phe	Val	Pro	Asp	Trp
2150						2155					2160			
Phe	Thr	Phe	Arg	Asp	Cys	Arg	Leu	Cys	Phe	Ser	Arg	Ser	Lys	Asn
2165						2170					2175			

Thr	Val	Met	Tyr	Glu	Thr	Thr	Gly	Gly	Arg	Phe	Arg	Leu	Lys	Gly
2180						2185					2190			

Lys	Ser	Cys	Asp	Asp	Trp	Leu	Ala	Glu	Arg	Val	Ala	Glu	Glu	Ile
2195						2200					2205			

Asp

<210> 25
 <211> 1497
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 25	
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attgtcatta ttgtgctcat tataatcacg agcatcaaag ctgtgtacaa tttcgccacc	120
tgtgggatat tagcactggg cagcttcctt tttttggctg gtaggtcctg tggcatgtac	180
ggccttaatg gtcccgacat ctataaaggg gtttaccagt tcaaatacagt ggagtttgat	240
atgtctcact taaatctgac gatgcccaat gcgtgctcag ccaacaactc tcatcactac	300
atcagtatgg gaagctctgg actggagcta actttcacta acgactccat ccttaatcac	360
aattttttgca acttaacctc cgctttcaac aaaaagactt ttgaccatac actcatgagt	420
atagtctcga gtctgcacct cagtattaga gggaattcca accacaaagc agtgtcttgt	480
gattttaaca atggcatcac cattcaatac aacttgtcat tttcggaccc acagagcgct	540
atgagccagt gttggacttt cagaggtaga gtcttggaca tgtttagaac tgcctttgga	600
ggaaaataca tgagaagtgg ctggggctgg gcaggttcag atggcaagac cacttggtgc	660
agccaaacaa gctatcagta cctaatacata caaaacagga cttgggaaaa ccactgtaga	720
tatgcaggcc cttttgggat gtctagaatc ctctttgctc aggaaaagac aaagtttctc	780
actaggagac ttgcaggcac attcacctgg accctgtcag actcctcagg agtagaaaat	840
ccaggtgggtt attgcctgac caaatggatg atccttgctg cagagctcaa atgttttggg	900
aatacagctg ttgcaaaatg taatgtcaat catgatgaag agttctgtga catgctacga	960
ctaattgatt acaacaaggc cgccctgagt aagttcaagc aagatgtaga gtctgccttg	1020

catgtattca aaacaacagt aaattctctg atttccgata agctgttgat gaggaatcat	1080
ctaagagatc taatgggggt accatactgt aattactcaa agttctggta tctggaacat	1140
gctaagactg gtgagactag tgtaccaag tgctggcttg tcactaatgg ctcctacttg	1200
aatgagaccc actttagtga tcaaatacga caagaagcag ataacatgat cacagagatg	1260
ttgaggaagg actacataaa aagacaagg agtactcctt tagccttaat ggatcttttg	1320
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catagacaca taaagggcgg ttcattgtcca aagccacacc gcttgaccaa caaggggatc	1440
tgtagtgtg gtgcattcaa ggtgcctggg gtaaaaacta tctggaaaag acgctga	1497

<210> 26
 <211> 498
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 26

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

Lys	Ala	Val	Tyr	Asn	Phe	Ala	Thr	Cys	Gly	Ile	Leu	Ala	Leu	Val	Ser
		35					40					45			

Phe	Leu	Phe	Leu	Ala	Gly	Arg	Ser	Cys	Gly	Met	Tyr	Gly	Leu	Asn	Gly
	50					55					60				

Pro	Asp	Ile	Tyr	Lys	Gly	Val	Tyr	Gln	Phe	Lys	Ser	Val	Glu	Phe	Asp
65					70					75					80

Met	Ser	His	Leu	Asn	Leu	Thr	Met	Pro	Asn	Ala	Cys	Ser	Ala	Asn	Asn
			85						90					95	

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

Thr	Asn	Asp	Ser	Ile	Leu	Asn	His	Asn	Phe	Cys	Asn	Leu	Thr	Ser	Ala
		115					120					125			

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Met Ser Gln Cys Trp Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
325 330 335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
485 490 495

Arg Arg

<210> 27
<211> 1677
<212> DNA
<213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 27
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cagagtttta catcagatgt aaaggctgcc gtcacaaagg acgcaaccag tcttctaaat 120

gggttgact tttctgaagt cagcaacgtt cagaggatca tgagaaagga aaggagggat	180
gataaagact tgcagagact caggagtctt aaccagactg tgcattctct tgttgatctg	240
aagtctacat caaagaaaaa tgttctgaaa gtgggaagac ttagtgcaga ggaattgatg	300
acccttgacg ctgatcttga gaagctgaag gccaaaatta tgagaactga gaggcctcaa	360
gcttctggag tctacatggg aaatttgaca gcacaacaac ttgatcaaag atcccaaata	420
ctgcaaattg ttgggatgag aagacctcag cagggtgcaa gtggtgtagt aagggtttgg	480
gatgtgaagg actcatcact tctgaacaat cagttcggca caatgccaa cctgacaatg	540
gcttgcatgg caaaacagtc acagaccca ctcaatgatg ttgtgcaggc actcacagac	600
cttggtttac tttacacagt caaatacccg aatctcagtg atcttgaaag gctaaaggat	660
aaacacccag ttctgggggt cattactgaa cagcaatcta gtatcaatat ctctggttat	720
aatttcagtc ttggtgcagc tgtgaaagcg ggggcagctc tgctagatgg agggaaacatg	780
ctggaatcta tcttgatcaa accgagcaac agtgaggatc tcctaaaagc agtcctcggg	840
gccaagaaga aactcaacat gtttgtctca gatcaagttg gagatagaaa tccctatgaa	900
aacatccttt ataaagtctg tctttcaggt gaaggatggc catacatagc ctgtagaacg	960
tcagttgtgg ggagagcatg ggagaacaca acaattgatc tcacaaatga aaaacttggt	1020
gccaactcat ctaggccagt gcctggagca gcaggccac ctgaggtggg cttgagttac	1080
agtcagacaa tgctgttgaa agacttgatg ggagggttg atcccaatgc tcccacatgg	1140
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tcagttatag gtgctctccc acaagggatg gttttgagct gtcaaggttc tgatgacatc	1380
agaaagcttc tggactcaca aaayagaagg gacataaaac tcattgatgt tgagatgacc	1440
aaggaggcct caagagaata tgaagataaa gtgtgggaca aatatggctg gctatgcaaa	1500
atgcacactg gggtagtgag agacaaaaag aagaaagaga tcaccccaca ctgtgcactc	1560
atggactgca tcatttttga gagtgttcc aaggcaagac tccctgatct aaaaaccgtt	1620
cacaacatcc tgccacatga tttaatcttc agaggacca atgttgtgac actctaa	1677

<211> 558
<212> PRT
<213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 28

Met Ser Leu Ser Lys Glu Val Lys Ser Phe Gln Trp Thr Gln Ala Leu
1 5 10 15

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

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

Asn Val Gln Arg Ile Met Arg Lys Glu Arg Arg Asp Asp Lys Asp Leu
50 55 60

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu
65 70 75 80

Lys Ser Thr Ser Lys Lys Asn Val Leu Lys Val Gly Arg Leu Ser Ala
85 90 95

Glu Glu Leu Met Thr Leu Ala Ala Asp Leu Glu Lys Leu Lys Ala Lys
100 105 110

Ile Met Arg Thr Glu Arg Pro Gln Ala Ser Gly Val Tyr Met Gly Asn
115 120 125

Leu Thr Ala Gln Gln Leu Asp Gln Arg Ser Gln Ile Leu Gln Met Val
130 135 140

Gly Met Arg Arg Pro Gln Gln Gly Ala Ser Gly Val Val Arg Val Trp
145 150 155 160

Asp Val Lys Asp Ser Ser Leu Leu Asn Asn Gln Phe Gly Thr Met Pro
165 170 175

Ser Leu Thr Met Ala Cys Met Ala Lys Gln Ser Gln Thr Pro Leu Asn
180 185 190

Asp Val Val Gln Ala Leu Thr Asp Leu Gly Leu Leu Tyr Thr Val Lys
195 200 205

Tyr Pro Asn Leu Ser Asp Leu Glu Arg Leu Lys Asp Lys His Pro Val
210 215 220

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

Asn Phe Ser Leu Gly Ala Ala Val Lys Ala Gly Ala Ala Leu Leu Asp
245 250 255

Gly Gly Asn Met Leu Glu Ser Ile Leu Ile Lys Pro Ser Asn Ser Glu
260 265 270

Asp Leu Leu Lys Ala Val Leu Gly Ala Lys Lys Lys Leu Asn Met Phe
275 280 285

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu
450 455 460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys
500 505 510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu
530 535 540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
545 550 555

<210> 29
<211> 273
<212> DNA
<213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 29
atgggccaag gcaagtccaa agaagaaagg gacaccagca atacaggcag agcagagctt 60
ttgccagaca ccacctatct tggctcctcta aattgtaaat catgttggca gaaatttgac 120
agcttgggta gatgccatga ccactatctt tgcagacact gtctgaatct cctgctgtca 180
gtttccgaca gatgtcctct ctgtaagtat ccactgccaa ccaaactgaa ggtgtcaaca 240
gtcccaagct cccacactcc ctatgaggag tga 273

<210> 30
 <211> 90
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 30

Met Gly Gln Gly Lys Ser Lys Glu Glu Arg Asp Thr Ser Asn Thr Gly
 1 5 10 15

Arg Ala Glu Leu Leu Pro Asp Thr Thr Tyr Leu Gly Pro Leu Asn Cys
 20 25 30

Lys Ser Cys Trp Gln Lys Phe Asp Ser Leu Val Arg Cys His Asp His
 35 40 45

Tyr Leu Cys Arg His Cys Leu Asn Leu Leu Leu Ser Val Ser Asp Arg
 50 55 60

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

Val Pro Ser Ser Pro Pro Pro Tyr Glu Glu
 85 90

<210> 31
 <211> 6630
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P52)

<400> 31

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aggctgtcaa ggcaaaaact caacttcctg ggacaaagag aaccagaat ggtgctaatt	120
gagggactca aattgttatc acgctgtata gagatagaca gtgcagacaa aagtggttgc	180
atacacaacc acgatgacaa atctgttgaa acaatcctaa tagactctgg gattgtgtgt	240
ccaggactgc cactcatcat ccctgatggg tataagttga ttgacaattc ctttattctt	300
cttgaatgtt ttgttagaag cacaccagct agttttgaaa agaagttcat tgaggacacc	360
aacaaactag catgcatcaa agaagatctt gctgttgcag gcatcacact ggttccaata	420
gtggatggtc gttgtgatta tgataacagt ttcatgccag aatgggtgaa ttttaagttc	480

agagacctcc tatttaaact cctggagtat tctagtcaag atgagaaagt ttttgaggag	540
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gactcaatga aaattttgaa agacgcaaga tcatttcata acgatgagat tatgaaaatg	660
tgccacgatg gtgtcaaccc caacatgagt tgcgatgatg tggctcttgg cataaattcc	720
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gtcagccctg ggggcttaat caaggaattc tctgaacttt atgaaaccct tactgataat	840
gatgacatat taatgttgag caaagaggca gttgaatcct gcccttaat gaggttcatt	900
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gattctctta ttgacattga gactgcacta aggacattga tcctactgat gctcaccaac	1860
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gctaatttcc ctttagatcc attcttggtt aacactcaca ctgatgtaaa ggattgggtt	4380
gatggttcta gaggttatag aatccaaaga ctcatgaag aattgtgtcc cagtgaacaa	4440
aagatcatga gaaaacttgt aagaagacta catcacaaac tcaagaacgg tgaatgtaac	4500
gaggaattht ttctagacct cttcaacagg gaaaagaaag aggccatcct tcaattggga	4560
gagattcttg gtcttgagga tgatcttaac gagttggcaa gcatcaattg gttgaatctg	4620
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acctttcaag aggaaaagat cccctcattg attaaaacac tccaaaataa gctttgtagt	4740
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agttgtgtct catccggctt tataggcttc tgtaagactt taggaagtag gtgtgtgaga	4860
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ggaaagaacg agagtaattc ggctgttagg cacttaaadc catgtgatta tgtagcaaga	5160
aaacctgaga gttcgagact actagaggat aaagtgagtt tgaatcatgt aattcaatct	5220
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agctcaaaaa atatgagatg gagtcccagg attaaattcc ttgaccttg tgtgctgatt	5340

gacatcaact cagagtcttt gtcactcatt tctcatgttg tcaaattggaa gagggacgaa	5400
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ccagattggg tcaccttcag agattgtagg ctctgcttca gcagggtcaaa gaacactgta	6540
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gcggagcggg tggccgagga gatcgactag	6630

<210> 32
 <211> 2209
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P52)

<220>
 <221> MISC_FEATURE
 <222> (2094)..(2094)

<223> Xaa can be Ile or Val

<220>

<221> MISC_FEATURE

<222> (2141)..(2141)

<223> Xaa can be Thr or Ala

<400> 32

Met Asp Glu Thr Ile Ala Asp Leu Arg Glu Leu Cys Leu Asn Tyr Ile
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Glu Gln Asp Glu Arg Leu Ser Arg Gln Lys Leu Asn Phe Leu Gly Gln
20 25 30

Arg Glu Pro Arg Met Val Leu Ile Glu Gly Leu Lys Leu Leu Ser Arg
35 40 45

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

Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr

180

185

190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
 195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
 210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
 225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
 245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
 260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
 275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
 290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
 305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
 325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
 340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
 355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
 370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
 385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg

610

615

620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
 625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
 645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
 660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
 690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
 705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
 725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
 740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
 755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
 770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
 785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
 805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
 820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
1025 1030 1035

Arg His Met Gln Arg Gln Ser Leu Asn Phe Lys Phe Asp Trp Asp

1040

1045

1050

Lys Leu Glu Glu Asp Val Arg Ile Ser Glu Arg Glu Ser Asn Ser
1055 1060 1065

Glu Ser Leu Ser Lys Ala Leu Ser Leu Thr Lys Cys Met Ser Ala
1070 1075 1080

Ala Leu Lys Asn Leu Cys Phe Tyr Ser Glu Glu Ser Pro Thr Ser
1085 1090 1095

Tyr Thr Ser Val Gly Pro Asp Ser Gly Arg Leu Lys Phe Ala Leu
1100 1105 1110

Ser Tyr Lys Glu Gln Val Gly Gly Asn Arg Glu Leu Tyr Ile Gly
1115 1120 1125

Asp Leu Arg Thr Lys Met Phe Thr Arg Leu Val Glu Asp Tyr Phe
1130 1135 1140

Glu Ser Phe Ser Ser Phe Phe Ser Gly Ser Cys Leu Asn Asn Asp
1145 1150 1155

Lys Glu Phe Glu Asn Ala Ile Leu Ser Met Thr Ile Asn Val Arg
1160 1165 1170

Glu Gly Leu Leu Asn Tyr Ser Met Asp His Ser Lys Trp Gly Pro
1175 1180 1185

Met Met Cys Pro Phe Leu Phe Leu Met Leu Leu Gln Asn Leu Lys
1190 1195 1200

Leu Gly Asp Asp Gln Tyr Val Arg Ser Gly Lys Asp His Val Ser
1205 1210 1215

Thr Leu Leu Thr Trp His Met His Lys Leu Val Glu Val Pro Phe
1220 1225 1230

Pro Val Val Asn Ala Met Met Lys Ser Tyr Val Lys Ser Lys Leu
1235 1240 1245

Lys	Leu	Leu	Lys	Gly	Ser	Gly	Thr	Thr	Val	Thr	Glu	Arg	Ile	Phe
1250						1255					1260			
Arg	Glu	Tyr	Phe	Glu	Met	Gly	Val	Val	Pro	Ser	His	Ile	Ser	Ser
1265						1270					1275			
Leu	Ile	Asp	Met	Gly	Gln	Gly	Ile	Leu	His	Asn	Ala	Ser	Asp	Phe
1280						1285					1290			
Tyr	Gly	Leu	Ile	Ser	Glu	Arg	Phe	Ile	Asn	Tyr	Cys	Ile	Gly	Val
1295						1300					1305			
Ile	Phe	Gly	Glu	Arg	Pro	Glu	Ala	Tyr	Thr	Ser	Ser	Asp	Asp	Gln
1310						1315					1320			
Ile	Thr	Leu	Phe	Asp	Lys	Arg	Leu	Ser	Asp	Leu	Val	Asp	Ser	Asp
1325						1330					1335			
Pro	Glu	Glu	Val	Leu	Val	Leu	Leu	Glu	Phe	His	Ser	His	Leu	Ser
1340						1345					1350			
Gly	Leu	Leu	Asn	Lys	Phe	Ile	Ser	Pro	Lys	Ser	Val	Val	Gly	Arg
1355						1360					1365			
Phe	Ala	Ala	Glu	Phe	Lys	Ser	Arg	Phe	Tyr	Val	Trp	Gly	Glu	Glu
1370						1375					1380			
Val	Pro	Leu	Leu	Thr	Lys	Phe	Val	Ser	Ala	Ala	Leu	His	Asn	Val
1385						1390					1395			
Lys	Cys	Lys	Glu	Pro	His	Gln	Leu	Cys	Glu	Thr	Ile	Asp	Thr	Ile
1400						1405					1410			
Ala	Asp	Gln	Ala	Ile	Ala	Asn	Gly	Val	Pro	Val	Phe	Leu	Val	Asn
1415						1420					1425			
Cys	Ile	Gln	Arg	Arg	Thr	Leu	Asp	Leu	Leu	Lys	Tyr	Ala	Asn	Phe
1430						1435					1440			
Pro	Leu	Asp	Pro	Phe	Leu	Leu	Asn	Thr	His	Thr	Asp	Val	Lys	Asp

1445		1450		1455
Trp Leu Asp Gly Ser Arg Gly Tyr Arg Ile Gln Arg Leu Ile Glu	1460	1465	1470	
Glu Leu Cys Pro Ser Glu Thr Lys Ile Met Arg Lys Leu Val Arg	1475	1480	1485	
Arg Leu His His Lys Leu Lys Asn Gly Glu Cys Asn Glu Glu Phe	1490	1495	1500	
Phe Leu Asp Leu Phe Asn Arg Glu Lys Lys Glu Ala Ile Leu Gln	1505	1510	1515	
Leu Gly Glu Ile Leu Gly Leu Glu Asp Asp Leu Asn Glu Leu Ala	1520	1525	1530	
Ser Ile Asn Trp Leu Asn Leu Asn Glu Met Phe Pro Leu Arg Met	1535	1540	1545	
Val Leu Arg Gln Lys Val Val Tyr Pro Ser Val Met Thr Phe Gln	1550	1555	1560	
Glu Glu Lys Ile Pro Ser Leu Ile Lys Thr Leu Gln Asn Lys Leu	1565	1570	1575	
Cys Ser Lys Phe Thr Arg Gly Ala Gln Lys Leu Leu Ser Glu Ala	1580	1585	1590	
Ile Asn Lys Ser Ala Phe Gln Ser Cys Val Ser Ser Gly Phe Ile	1595	1600	1605	
Gly Leu Cys Lys Thr Leu Gly Ser Arg Cys Val Arg Asn Lys Asn	1610	1615	1620	
Arg Glu Asn Met Tyr Ile Arg Lys Val Leu Glu Asp Leu Thr Met	1625	1630	1635	
Asp Glu His Val Thr Arg Val His Lys Gln Asp Gly Val Met Leu	1640	1645	1650	

Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
1655 1660 1665

Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
1670 1675 1680

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
1700 1705 1710

Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
1715 1720 1725

Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg
1730 1735 1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Ser
1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
1835 1840 1845

Val Ala Thr Ala Arg Thr Leu Gly Asn Phe Ser Trp Phe Pro His

1850						1855						1860			
Lys	Asp	Met	Met	Pro	Ser	Glu	Asp	Gly	Ala	Glu	Ala	Leu	Gly	Pro	
1865						1870					1875				
Phe	Gln	Ser	Phe	Ile	Leu	Lys	Val	Val	Asn	Lys	Lys	Ile	Glu	Arg	
1880						1885					1890				
Pro	Met	Phe	Arg	Asn	Asp	Leu	Gln	Phe	Gly	Phe	Gly	Trp	Phe	Ser	
1895						1900					1905				
Tyr	Arg	Val	Gly	Asp	Val	Val	Cys	Asn	Ala	Ala	Met	Leu	Ile	Lys	
1910						1915					1920				
Gln	Gly	Leu	Thr	Asp	Pro	Lys	Ala	Phe	Lys	Ser	Leu	Arg	Asp	Leu	
1925						1930					1935				
Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser	
1940						1945					1950				
Ile	Thr	Val	Asp	Phe	Thr	His	Asn	Gln	Asn	Asn	Thr	Asp	Cys	Leu	
1955						1960					1965				
Arg	Lys	Phe	Ser	Leu	Ile	Phe	Val	Val	Lys	Cys	Gln	Leu	Gln	Ser	
1970						1975					1980				
Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Ser	Phe	Lys	Gly	
1985						1990					1995				
Glu	Val	Asp	Arg	Arg	Leu	Leu	Asp	Glu	Cys	Leu	Asn	Leu	Leu	Arg	
2000						2005					2010				
Thr	Asp	Pro	Ile	Phe	Lys	Ala	Asn	Asp	Gly	Val	Phe	Asp	Ile	Arg	
2015						2020					2025				
Ser	Glu	Glu	Phe	Glu	Asp	Tyr	Met	Glu	Asp	Pro	Leu	Thr	Leu	Gly	
2030						2035					2040				
Asp	Ser	Leu	Glu	Leu	Glu	Leu	Ile	Gly	Ser	Arg	Arg	Ile	Leu	Asn	
2045						2050					2055				

Glu Ile Lys Ser Thr Asp Phe Glu Arg Ile Gly Pro Glu Trp Glu
 2060 2065 2070

Pro Val Pro Leu Thr Ile Arg Lys Gly Ala Leu Phe Glu Gly Arg
 2075 2080 2085

Asn Phe Val Gln Asn Xaa Ser Val Lys Leu Glu Thr Lys Asp Met
 2090 2095 2100

Arg Val Phe Leu Ala Glu Leu Glu Gly Cys Gly Lys Ile Gly Asp
 2105 2110 2115

Val Leu Gly Ser Leu Leu Leu His Arg Phe Arg Thr Gly Glu His
 2120 2125 2130

Leu Met Glu Ser Glu Ile Ser Xaa Val Leu Gln Glu Leu Cys Met
 2135 2140 2145

Asp Arg Ser Val Met Leu Thr Pro Leu Ser Phe Val Pro Asp Trp
 2150 2155 2160

Phe Thr Phe Arg Asp Cys Arg Leu Cys Phe Ser Arg Ser Lys Asn
 2165 2170 2175

Thr Val Met Tyr Glu Thr Thr Gly Gly Arg Phe Arg Leu Lys Gly
 2180 2185 2190

Lys Ser Cys Asp Asp Trp Leu Ala Glu Arg Val Ala Glu Glu Ile
 2195 2200 2205

Asp

<210> 33
 <211> 1497
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 33
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 attgtcatta ttgtgctcat tataatcacg agcatcaaag ctgtgtacaa tttcgccacc 120

tgtgggatat tagcactggc cagcttcctt tttttggctg gtaggtcctg tggcatgtac	180
ggccttaatg gtcccgacat ctataaaggg gtttaccagt tcaaatacagt ggagttttagt	240
atgtctcact taaatctgac gatgcccaat gcgtgctcag ccaacaactc tcatcactac	300
atcagtatgg gaagctctgg actggagcta acttttacta acgactccat ccttaatcac	360
aatttttgca acttaacctc cgctttcaac aaaaagactt ttgaccatac actcatgagt	420
atagtctcga gtctgcacct cagtattaga gggaattcca accacaaagc agtgtcttgt	480
gattttaaca atggcatcac cattcaatac aacttgtcat tttcggaccc acagagcgct	540
atgagccagt gttggacttt cagaggtaga gtcttggaca tgttttagaac tgcctttgga	600
ggaaaataca tgagaagtgg ctggggctgg gcaggttcag atggcaagac cacttggtgc	660
agccaaacaa gctatcagta cctaatacata caaaacagga cttgggaaaa ccactgtaga	720
tatgcaggcc cttttgggat gtctagaatc ctctttgctc aggaaaagac aaagtttctc	780
actaggagac ttgcaggcac attcacctgg accctgtcag actcctcagg agtagaaaat	840
ccaggtgggtt attgcctgac caaatggatg atccttgctg cagagctcaa atgttttggg	900
aatacagctg ttgcaaaatg taatgtcaat catgatgaag agttctgtga catgctacga	960
ctaattgatt acaacaaggc cgccctgagt aagttcaagc aagatgtaga gtctgccttg	1020
catgtattca aaacaacagt aaattctctg atttccgac agctgttgat gaggaatcat	1080
ctaagagatc taatgggggt accatactgt aattactcaa agttctggta tctggaacat	1140
gctaagactg gtgagactag tgtaccaag tgctggcttg tcactaatgg ctctacttg	1200
aatgagaccc acttttagtga tcaaatacga caagaagcag ataacatgat cacagagatg	1260
ttgaggaagg actacataaa aagacaaggg agtactcctt tagccttaat ggatcttttg	1320
atgttttcaa catcagcata tctaatacagc atctttctgc atcttgtgaa gataccaaca	1380
catagacaca taaagggcgg ttcatgtcca aagccacacc gcttgaccaa caaggggatc	1440
tgtagttgtg gtgcattcaa ggtgcctggg gtaaaaacta tctggaaaag acgctga	1497

<210> 34

<211> 498

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 34

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

Glu Val Ile Asn Ile Val Ile Ile Val Leu Ile Ile Ile Thr Ser Ile
20 25 30

Lys Ala Val Tyr Asn Phe Ala Thr Cys Gly Ile Leu Ala Leu Val Ser
35 40 45

Phe Leu Phe Leu Ala Gly Arg Ser Cys Gly Met Tyr Gly Leu Asn Gly
50 55 60

Pro Asp Ile Tyr Lys Gly Val Tyr Gln Phe Lys Ser Val Glu Phe Asp
65 70 75 80

Met Ser His Leu Asn Leu Thr Met Pro Asn Ala Cys Ser Ala Asn Asn
85 90 95

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Met Ser Gln Cys Trp Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser

210

215

220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
 225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
 245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
 260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
 275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
 290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
 305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
 325 330 335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
 355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
 370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
 385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
 405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
 420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
485 490 495

Arg Arg

<210> 35
<211> 1677
<212> DNA
<213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 35
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gggttggaact tttctgaagt cagcaacgtt cagaggatca tgagaaagga aaggagggat 180
gataaagact tgcagagact caggagtctt aaccagactg tgcattctct tgttgatctg 240
aagtctacat caaagaaaaa tgttctgaaa gtgggaagac ttagtgcaga ggaattgatg 300
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gcttctggag tctacatggg aaatttgaca gcacaacaac ttgatcaaag atcccaaata 420
ctgcaaatgg ttgggatgag aagacctcag cagggtgcaa gtggtgtagt aagggtttgg 480
gatgtgaagg actcatcact tctgaacaat cagttcggca caatgccaag cctgacaatg 540
gcttgcatgg caaaacagtc acagaccca ctcaatgatg ttgtgcaggc actcacagac 600
cttggttac tttacacagt caaatacccg aatctcagtg atcttgaaag gctaaaggat 660
aaacaccag ttctgggggt cattactgaa cagcaatcta gtatcaatat ctctggttat 720
aatttcagtc ttggtgcagc tgtgaaagcg ggggcagctc tgctagatgg aggggaacatg 780
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atggactgca tcatttttga gagtgcttcc aaggcaagac tccctgatct aaaaaccgtt 1620
cacaacatcc tgccacatga tttaatcttc agaggaccca atgttgtgac actctaa 1677

<210> 36
<211> 558
<212> PRT
<213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 36

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

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

Asn Val Gln Arg Ile Met Arg Lys Glu Arg Arg Asp Asp Lys Asp Leu
50 55 60

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu

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

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu
450 455 460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys

500

505

510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
 515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu
 530 535 540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
 545 550 555

<210> 37

<211> 273

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 37

atgggccaag gcaagtcmaa agaagaaagg gacaccagca atacaggcag agcagagctt 60

ttgccagaca ccacatatct tggctctcta aattgtaaat catgttggca gaaatttgac 120

agcttggtta gatgccatga ccactatctt tgcagacact gtctgaatct cctgctgtca 180

gtttccgaca gatgtcctct ctgtaagtat ccactgcaa ccaaactgaa ggtgtcaaca 240

gtcccaagct cccacactcc ctatgaggag tga 273

<210> 38

<211> 90

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 38

Met Gly Gln Gly Lys Ser Lys Glu Glu Arg Asp Thr Ser Asn Thr Gly
 1 5 10 15

Arg Ala Glu Leu Leu Pro Asp Thr Thr Tyr Leu Gly Pro Leu Asn Cys
 20 25 30

Lys Ser Cys Trp Gln Lys Phe Asp Ser Leu Val Arg Cys His Asp His
 35 40 45

Tyr Leu Cys Arg His Cys Leu Asn Leu Leu Leu Ser Val Ser Asp Arg
 50 55 60

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

Val	Pro	Ser	Ser	Pro	Pro	Pro	Tyr	Glu	Glu
				85				90	

<210> 39
 <211> 6630
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P91)

<400> 39	
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gagggactca aattgttatc acgctgtata gagatagaca gtgcagacaa aagtggttgc	180
atacacaacc acgatgacaa atctgttgaa acaatcctaa tagactctgg gattgtgtgt	240
ccaggactgc cactcatcat ccctgatggg tataagttga ttgacaattc ctttattctt	300
cttgaatgtt ttgttagaag cacaccagct agttttgaaa agaagttcat tgaggacacc	360
aacaaactag catgcatcaa agaagatctt gctgttgagc gcatcacact ggttccaata	420
gtggatgggc gttgtgatta tgataacagt ttcatgccag aatgggtgaa ttttaagttc	480
agagacctcc tatttaaact cctggagtat tctagtcaag atgagaaagt ttttgaggag	540
tctgaatact tcaggctctg tgagtctctt aagaccactg ttgacaaacg ttccggcatg	600
gactcaatga aaattttgaa agacgcaaga tcatttcata acgatgagat tatgaaaatg	660
tgccacgatg gtgtcaaccc caacatgagt tgcgatgatg tggctctttg cataaattcc	720
ttttttggca ggtttaggag ggacctgtta aatgggaaac tcaaaaggaa tttccaaaag	780
gtcagccctg ggggcttaat caaggaattc tctgaacttt atgaaaccct tactgataat	840
gatgacatat taatgttgag caaagaggca gttgaatcct gccccttaat gaggttcatt	900
acagcagaga cccatgggca tgagagagga agcgatgcta acactgagta tgaaaggcta	960
ctctctatgt tgaacaaggt gaaaagttaa aaattattaa acactagaag gagacagctg	1020
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gaaaatgata aacattgggt tggttgctgc tacagtagtg tgaatgatag gcttgtgagc	1140
cttcaaagta ccaaagaaga attcatgaga cttttgaaga acagaagaaa atcaagagtg	1200

cacaaaaagg catctcttga tgagcttttt agggatatcca taaatgagtt catagcaaaa	1260
atccagaaat gcctatcaac agtgggactt agttttgagc attacggact atcagaatgc	1320
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catcctgtaa tgcattacac aaaatttgaa gattacactt tccagcctaa catagagcaa	1440
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<210> 40
 <211> 2209
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P91)

<220>
 <221> MISC_FEATURE
 <222> (2175)..(2175)
 <223> Xaa can be Arg or Lys

<400> 40

Met Asp Glu Thr Ile Ala Asp Leu Arg Glu Leu Cys Leu Asn Tyr Ile
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Glu Gln Asp Glu Arg Leu Ser Arg Gln Lys Leu Asn Phe Leu Gly Gln
 20 25 30

Arg Glu Pro Arg Met Val Leu Ile Glu Gly Leu Lys Leu Leu Ser Arg
 35 40 45

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

Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
 65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr

290

295

300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
 305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
 325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
 340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
 355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
 370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
 385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
 405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
 420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
 435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
 450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
 465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
 485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
 500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile

725

730

735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
1025 1030 1035

Arg His Met Gln Arg Gln Ser Leu Asn Phe Lys Phe Asp Trp Asp
1040 1045 1050

Lys Leu Glu Glu Asp Val Arg Ile Ser Glu Arg Glu Ser Asn Ser
1055 1060 1065

Glu Ser Leu Ser Lys Ala Leu Ser Leu Thr Lys Cys Met Ser Ala
1070 1075 1080

Ala Leu Lys Asn Leu Cys Phe Tyr Ser Glu Glu Ser Pro Thr Ser
1085 1090 1095

Tyr Thr Ser Val Gly Pro Asp Ser Gly Arg Leu Lys Phe Ala Leu
1100 1105 1110

Ser Tyr Lys Glu Gln Val Gly Gly Asn Arg Glu Leu Tyr Ile Gly
1115 1120 1125

Asp Leu Arg Thr Lys Met Phe Thr Arg Leu Val Glu Asp Tyr Phe
1130 1135 1140

Glu Ser Phe Ser Ser Phe Phe Ser Gly Ser Cys Leu Asn Asn Asp

1145						1150						1155			
Lys	Glu	Phe	Glu	Asn	Ala	Ile	Leu	Ser	Met	Thr	Ile	Asn	Val	Arg	
1160						1165					1170				
Glu	Gly	Leu	Leu	Asn	Tyr	Ser	Met	Asp	His	Ser	Lys	Trp	Gly	Pro	
1175						1180					1185				
Met	Met	Cys	Pro	Phe	Leu	Phe	Leu	Met	Leu	Leu	Gln	Asn	Leu	Lys	
1190						1195					1200				
Leu	Gly	Asp	Asp	Gln	Tyr	Val	Arg	Ser	Gly	Lys	Asp	His	Val	Ser	
1205						1210					1215				
Thr	Leu	Leu	Thr	Trp	His	Met	His	Lys	Leu	Val	Glu	Val	Pro	Phe	
1220						1225					1230				
Pro	Val	Val	Asn	Ala	Met	Met	Lys	Ser	Tyr	Val	Lys	Ser	Lys	Leu	
1235						1240					1245				
Lys	Leu	Leu	Lys	Gly	Ser	Gly	Thr	Thr	Val	Thr	Glu	Arg	Ile	Phe	
1250						1255					1260				
Arg	Glu	Tyr	Phe	Glu	Met	Gly	Val	Val	Pro	Ser	His	Ile	Ser	Ser	
1265						1270					1275				
Leu	Ile	Asp	Met	Gly	Gln	Gly	Ile	Leu	His	Asn	Ala	Ser	Asp	Phe	
1280						1285					1290				
Tyr	Gly	Leu	Ile	Ser	Glu	Arg	Phe	Ile	Asn	Tyr	Cys	Ile	Gly	Val	
1295						1300					1305				
Ile	Phe	Gly	Glu	Arg	Pro	Glu	Ala	Tyr	Thr	Ser	Ser	Asp	Asp	Gln	
1310						1315					1320				
Ile	Thr	Leu	Phe	Asp	Lys	Arg	Leu	Ser	Asp	Leu	Val	Asp	Ser	Asp	
1325						1330					1335				
Pro	Glu	Glu	Val	Leu	Val	Leu	Leu	Glu	Phe	His	Ser	His	Leu	Ser	
1340						1345					1350				

Gly Leu Leu Asn Lys Phe Ile Ser Pro Lys Ser Val Val Gly Arg
1355 1360 1365

Phe Ala Ala Glu Phe Lys Ser Arg Phe Tyr Val Trp Gly Glu Glu
1370 1375 1380

Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
1385 1390 1395

Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile
1400 1405 1410

Ala Asp Gln Ala Ile Ala Asn Gly Val Pro Val Phe Leu Val Asn
1415 1420 1425

Cys Ile Gln Arg Arg Thr Leu Asp Leu Leu Lys Tyr Ala Asn Phe
1430 1435 1440

Pro Leu Asp Pro Phe Leu Leu Asn Thr His Thr Asp Val Lys Asp
1445 1450 1455

Trp Leu Asp Gly Ser Arg Gly Tyr Arg Ile Gln Arg Leu Ile Glu
1460 1465 1470

Glu Leu Cys Pro Ser Glu Thr Lys Ile Met Arg Lys Leu Val Arg
1475 1480 1485

Arg Leu His His Lys Leu Lys Asn Gly Glu Cys Asn Glu Glu Phe
1490 1495 1500

Phe Leu Asp Leu Phe Asn Arg Glu Lys Glu Glu Ala Ile Leu Gln
1505 1510 1515

Leu Gly Glu Ile Leu Gly Leu Glu Asp Asp Leu Asn Glu Leu Ala
1520 1525 1530

Ser Ile Asn Trp Leu Asn Leu Asn Glu Met Phe Pro Leu Arg Met
1535 1540 1545

Val Leu Arg Gln Lys Val Val Tyr Pro Ser Val Met Thr Phe Gln

1550						1555					1560			
Glu	Glu	Lys	Ile	Pro	Ser	Leu	Ile	Lys	Thr	Leu	Gln	Asn	Lys	Leu
1565						1570					1575			
Cys	Ser	Lys	Phe	Thr	Arg	Gly	Ala	Gln	Lys	Leu	Leu	Ser	Glu	Ala
1580						1585					1590			
Ile	Asn	Lys	Ser	Ala	Phe	Gln	Ser	Cys	Val	Ser	Ser	Gly	Phe	Ile
1595						1600					1605			
Gly	Leu	Cys	Lys	Thr	Leu	Gly	Ser	Arg	Cys	Val	Arg	Asn	Lys	Asn
1610						1615					1620			
Arg	Glu	Asn	Met	Tyr	Ile	Arg	Lys	Val	Leu	Glu	Asp	Leu	Thr	Met
1625						1630					1635			
Asp	Glu	His	Val	Thr	Arg	Val	His	Lys	Gln	Asp	Gly	Val	Met	Leu
1640						1645					1650			
Tyr	Ile	Cys	Asp	Lys	Gln	Arg	His	Pro	Glu	Ala	His	Arg	Asp	His
1655						1660					1665			
Ile	Asn	Leu	Leu	Arg	Pro	Leu	Leu	Trp	Asp	Tyr	Ile	Cys	Ile	Ser
1670						1675					1680			
Leu	Ser	Asn	Ser	Phe	Glu	Leu	Gly	Val	Trp	Val	Leu	Ala	Glu	Pro
1685						1690					1695			
Val	Lys	Gly	Lys	Asn	Glu	Ser	Asn	Ser	Ala	Val	Arg	His	Leu	Asn
1700						1705					1710			
Pro	Cys	Asp	Tyr	Val	Ala	Arg	Lys	Pro	Glu	Ser	Ser	Arg	Leu	Leu
1715						1720					1725			
Glu	Asp	Lys	Val	Ser	Leu	Asn	His	Val	Ile	Gln	Ser	Val	Arg	Arg
1730						1735					1740			
Leu	Tyr	Pro	Lys	Ile	Phe	Glu	Asp	Gln	Leu	Leu	Pro	Phe	Met	Ser
1745						1750					1755			

Asp	Val	Ser	Ser	Lys	Asn	Met	Arg	Trp	Ser	Pro	Arg	Ile	Lys	Phe
1760						1765					1770			
Leu	Asp	Leu	Cys	Val	Leu	Ile	Asp	Ile	Asn	Ser	Glu	Ser	Leu	Ser
1775						1780					1785			
Leu	Ile	Ser	His	Val	Val	Lys	Trp	Lys	Arg	Asp	Glu	His	Tyr	Thr
1790						1795					1800			
Val	Leu	Phe	Ser	Asp	Leu	Val	Asn	Ser	His	Gln	Arg	Ser	Asp	Ser
1805						1810					1815			
Ser	Leu	Val	Asp	Glu	Phe	Val	Val	Ser	Thr	Arg	Asp	Val	Cys	Lys
1820						1825					1830			
Asn	Phe	Leu	Lys	Gln	Val	Tyr	Phe	Glu	Ser	Phe	Val	Arg	Glu	Phe
1835						1840					1845			
Val	Ala	Thr	Ala	Arg	Thr	Leu	Gly	Asn	Phe	Ser	Trp	Phe	Pro	His
1850						1855					1860			
Lys	Asp	Met	Met	Pro	Ser	Glu	Asp	Gly	Ala	Glu	Ala	Leu	Gly	Pro
1865						1870					1875			
Phe	Gln	Ser	Phe	Ile	Leu	Lys	Val	Val	Asn	Lys	Lys	Ile	Glu	Arg
1880						1885					1890			
Pro	Met	Phe	Arg	Asn	Asp	Leu	Gln	Phe	Gly	Phe	Gly	Trp	Phe	Ser
1895						1900					1905			
Tyr	Arg	Val	Gly	Asp	Val	Val	Cys	Asn	Ala	Ala	Met	Leu	Ile	Lys
1910						1915					1920			
Gln	Gly	Leu	Thr	Asp	Pro	Lys	Ala	Phe	Lys	Ser	Leu	Arg	Asp	Leu
1925						1930					1935			
Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser
1940						1945					1950			
Ile	Thr	Val	Asp	Phe	Thr	His	Asn	Gln	Asn	Asn	Thr	Asp	Cys	Leu

1955	1960	1965
Arg Lys Phe Ser Leu Ile 1970	Phe Val Val Lys Cys 1975	Gln Leu Gln Ser 1980
Pro Gly Val Ala Asp Tyr 1985	Leu Ser Cys Ser His 1990	Ser Phe Lys Gly 1995
Glu Val Asp Arg Arg Leu 2000	Leu Asp Glu Cys Leu 2005	Asn Leu Leu Arg 2010
Thr Asp Pro Ile Phe Lys 2015	Ala Asn Asp Gly Val 2020	Phe Asp Ile Arg 2025
Ser Glu Glu Phe Glu Asp 2030	Tyr Met Glu Asp Pro 2035	Leu Thr Leu Gly 2040
Asp Ser Leu Glu Leu Glu 2045	Leu Ile Gly Ser Arg 2050	Arg Ile Leu Asn 2055
Glu Ile Lys Ser Thr Asp 2060	Phe Glu Arg Ile Gly 2065	Pro Glu Trp Glu 2070
Pro Val Pro Leu Thr Ile 2075	Arg Lys Gly Ala Leu 2080	Phe Glu Gly Arg 2085
Asn Phe Val Gln Asn Ile 2090	Ser Val Lys Leu Glu 2095	Thr Lys Asp Met 2100
Arg Val Phe Leu Ala Glu 2105	Leu Glu Gly Cys Gly 2110	Lys Ile Gly Asp 2115
Val Leu Gly Ser Leu Leu 2120	Leu His Arg Phe Arg 2125	Thr Gly Glu His 2130
Leu Met Glu Ser Glu Ile 2135	Ser Thr Val Leu Gln 2140	Glu Leu Cys Met 2145
Asp Arg Ser Val Met Leu 2150	Thr Pro Leu Ser Phe 2155	Val Pro Asp Trp 2160

Phe	Thr	Phe	Arg	Asp	Cys	Arg	Leu	Cys	Phe	Ser	Xaa	Ser	Lys	Asn
2165						2170					2175			

Thr	Val	Met	Tyr	Glu	Thr	Thr	Gly	Gly	Arg	Phe	Arg	Leu	Lys	Gly
2180						2185					2190			

Lys	Ser	Cys	Asp	Asp	Trp	Leu	Ala	Glu	Arg	Val	Ala	Glu	Glu	Ile
2195						2200					2205			

Asp

<210> 41
 <211> 1497
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 41	
atgggtcaga ttgtgacaat gtttgaggct ttgcctcaca tcattgatga ggtcatcaac	60
attgtcatta ttgtgctcat tataatcacg agcatcaaag ctgtgtacaa tttcgccacc	120
tgtgggatat tagcactggg cagcttcctt tttttggctg gtaggtcctg tggcatgtac	180
ggcctcaatg gtcccgacat ctataaaggg gtttaccagt tcaaatacgt ggagtttgat	240
atgtctcact taaatctgac gatgcccaat gcgtgctcag ccaacaactc tcactactac	300
atcagtatgg gaagctctgg actggagcta actttcacta acgactccat ccttaatcac	360
aatttttgca acttaacctc cgctttcaac aaaaagactt ttgaccatac actcatgagt	420
atagtctcga gtctgcacct cagtattaga gggaattcca accacaaagc agtgtcttgt	480
gattttaaca atggcatcac cattcaatac aacttgtcat tttcggaccc acagagcgct	540
atgagccagt gttggacttt cagaggtaga gtcttggaca tgtttagaac tgcctttgga	600
ggaaaataca tgagaagtgg ctggggctgg gcaggttcag atggcaagac cacttggtgc	660
agccaaacaa gctatcagta cctaatacata caaacagga cttgggaaaa cactgtaga	720
tatgcaggcc cttttgggat gtctagaatc ctctttgctc aggaaaagac aaagtttctc	780
actaggagac ttgcaggcac attcacctgg accctgtcag actcctcagg agtagaaaat	840
ccagggtggtt attgcctgac caaatggatg atccttgctg cagagctcaa atgttttggg	900
aatacagctg ttgcaaatg taatgtcaat catgatgaag agttctgtga catgctacga	960

ctaattgatt acaacaaggc cgccctgagt aagttcaagc aagatgtaga gtctgccttg	1020
catgtattca aaacaacagt aaattctctg atttccgatac agctgttgat gaggaatcat	1080
ctaagagatac taatgggggt accatactgt aattactcaa agttctggta tctggaacat	1140
gctaagactg gtgagactag tgtaccaag tgctggcttg tcactaatgg ctctacttg	1200
aatgagaccc actttagtga tcaaatacga caagaagcag ataacatgat cacagagatg	1260
ttgaggaagg actacataaa aagacaaggg agtactcctt tagccttaat ggatcttttg	1320
atgttttcaa catcagcata tctaatacgc atctttctgc atcttgtgaa gataccaaca	1380
catagacaca taaagggcgg ttcatgtcca aagccacacc gcttgaccaa caaggggatac	1440
tgtagttgtg gtgcattcaa ggtgcctggt gtaaaaacta tctggaaaag acgctga	1497

<210> 42
 <211> 498
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 42

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

Glu	Val	Ile	Asn	Ile	Val	Ile	Ile	Val	Leu	Ile	Ile	Ile	Thr	Ser	Ile
			20					25					30		

Lys	Ala	Val	Tyr	Asn	Phe	Ala	Thr	Cys	Gly	Ile	Leu	Ala	Leu	Val	Ser
		35					40					45			

Phe	Leu	Phe	Leu	Ala	Gly	Arg	Ser	Cys	Gly	Met	Tyr	Gly	Leu	Asn	Gly
	50					55					60				

Pro	Asp	Ile	Tyr	Lys	Gly	Val	Tyr	Gln	Phe	Lys	Ser	Val	Glu	Phe	Asp
65					70					75					80

Met	Ser	His	Leu	Asn	Leu	Thr	Met	Pro	Asn	Ala	Cys	Ser	Ala	Asn	Asn
				85					90					95	

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Met Ser Gln Cys Trp Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val

325

330

335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
 355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
 370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
 385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
 405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
 420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
 435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
 450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
 465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
 485 490 495

Arg Arg

<210> 43

<211> 1677

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 43

atgtctttgt ccaaagaagt caaaagcttt cagtggacac aggcgttgag gagggagttg

60

cagagtttta catcagatgt aaaggctgcc gtcacatcaagg acgcaaccag tcttctaaat	120
gggttgact tttctgaagt cagcaacgtt cagaggatca tgagaaagga aaggagggat	180
gataaagact tgcagagact caggagtctt aaccagactg tgcattctct tgttgatctg	240
aagtctacat caaagaaaaa tgttctgaaa gtgggaagac ttagtgcaga ggaattgatg	300
acccttgacg ctgatcttga gaagctgaag gccaaaatta tgagaactga gaggcctcaa	360
gcttctggag tctacatggg aaatttgaca gcacaacaac ttgatcaaag atcccaaata	420
ctgcaaatgg ttgggatgag aagacctcag cagggtgcaa gtggtgtagt aagggtttgg	480
gatgtgaagg actcatcact tctgaacaat cagttcggca caatgccaaag cctgacaatg	540
gcttgcatgg caaacagtc acagaccca ctcaatgatg ttgtgcaggc actcacagac	600
cttggttac tttacacagt caaatacccg aatctcagt atcttgaaag gctaaaggat	660
aaacacccag ttctgggggt cattactgaa cagcaatcta gtatcaatat ctctggttat	720
aatttcagtc ttggtgcagc tgtgaaagcg ggggcagctc tgctagatgg agggaacatg	780
ctggaatcta tcttgatcaa accgagcaac agtgaggatc tcctaaaagc agtcctcggg	840
gccaagaaga aactcaacat gtttgtctca gatcaagttg gagatagaaa tccctatgaa	900
aacatccttt ataaagtctg tctttcaggt gaaggatggc catacatagc ctgtagaacg	960
tcagttgtgg ggagagcatg ggagaacaca acaattgatc tcacaaatga aaaacttggt	1020
gccaactcat ctaggccagt gcctggagca gcaggccac ctgaggtggg cttgagttac	1080
agtcagacaa tgctgttgaa agacttgatg ggagggattg atcccaatgc tcccacatgg	1140
attgacattg agggcaggtt caatgatcca gtggagatag caatattcca accacaaaat	1200
gggcaattca tacattttta cagggaacct acggaccaga agcaattcaa gcaggactca	1260
aagtattcac acggcatgga tcttgctgat ctcttcaatg cacagcctgg gctgacctca	1320
tcagttatag gtgctctccc acaagggatg gttttgagct gtcaaggttc tgatgacatc	1380
agaaagcttc tggactcaca aaatagaagg gacataaaac tcattgatgt tgagatgacc	1440
aaggaggcct caagagaata tgaagataaa gtgtgggaca aatatggctg gctatgcaaa	1500
atgcacactg gggtagttag agacaaaaag aagaaagaga tcacccaca ctgtgcactc	1560
atggactgca tcatttttga gagtgttcc aaggcaagac tccctgatct aaaaaccgtt	1620
cacaacatcc tgccacatga tttaatcttc agaggacca atgttgtgac actctaa	1677

<210> 44
<211> 558
<212> PRT
<213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 44

Met Ser Leu Ser Lys Glu Val Lys Ser Phe Gln Trp Thr Gln Ala Leu
1 5 10 15

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

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

Asn Val Gln Arg Ile Met Arg Lys Glu Arg Arg Asp Asp Lys Asp Leu
50 55 60

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu
65 70 75 80

Lys Ser Thr Ser Lys Lys Asn Val Leu Lys Val Gly Arg Leu Ser Ala
85 90 95

Glu Glu Leu Met Thr Leu Ala Ala Asp Leu Glu Lys Leu Lys Ala Lys
100 105 110

Ile Met Arg Thr Glu Arg Pro Gln Ala Ser Gly Val Tyr Met Gly Asn
115 120 125

Leu Thr Ala Gln Gln Leu Asp Gln Arg Ser Gln Ile Leu Gln Met Val
130 135 140

Gly Met Arg Arg Pro Gln Gln Gly Ala Ser Gly Val Val Arg Val Trp
145 150 155 160

Asp Val Lys Asp Ser Ser Leu Leu Asn Asn Gln Phe Gly Thr Met Pro
165 170 175

Ser Leu Thr Met Ala Cys Met Ala Lys Gln Ser Gln Thr Pro Leu Asn

180

185

190

Asp Val Val Gln Ala Leu Thr Asp Leu Gly Leu Leu Tyr Thr Val Lys
 195 200 205

Tyr Pro Asn Leu Ser Asp Leu Glu Arg Leu Lys Asp Lys His Pro Val
 210 215 220

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

Asn Phe Ser Leu Gly Ala Ala Val Lys Ala Gly Ala Ala Leu Leu Asp
 245 250 255

Gly Gly Asn Met Leu Glu Ser Ile Leu Ile Lys Pro Ser Asn Ser Glu
 260 265 270

Asp Leu Leu Lys Ala Val Leu Gly Ala Lys Lys Lys Leu Asn Met Phe
 275 280 285

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
 290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
 305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
 325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
 340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
 355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
 370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu
450 455 460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys
500 505 510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu
530 535 540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
545 550 555

<210> 45

<211> 273

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 45

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agcttgggta gatgcatga ccactatctt tgcagacact gtctgaatct cctgctgtca 180

gtttccgaca gatgtcctct ctgtaagtat ccactgccaa ccaaactgaa ggtgtcaaca 240

gtcccaagct cccacactcc ctatgaggag tga

273

<210> 46

<211> 90

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 46

Met	Gly	Gln	Gly	Lys	Ser	Lys	Glu	Glu	Arg	Asp	Thr	Ser	Asn	Thr	Gly
1				5					10					15	

Arg	Ala	Glu	Leu	Leu	Pro	Asp	Thr	Thr	Tyr	Leu	Gly	Pro	Leu	Asn	Cys
			20					25						30	

Lys	Ser	Cys	Trp	Gln	Lys	Phe	Asp	Ser	Leu	Val	Arg	Cys	His	Asp	His
		35					40					45			

Tyr	Leu	Cys	Arg	His	Cys	Leu	Asn	Leu	Leu	Leu	Ser	Val	Ser	Asp	Arg
	50					55					60				

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

Val	Pro	Ser	Ser	Pro	Pro	Pro	Tyr	Glu	Glu
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<210> 47

<211> 6630

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 47

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gagggactca aattgttatc acgctgtata gagatagaca gtgcagacaa aagtggttgc	180
atacacaacc acgatgacaa atctgttgaa acaatcctaa tagactctgg gattgtgtgt	240
ccaggactgc cactcatcat ccctgatggg tataagttga ttgacaattc ctttattctt	300
cttgaatgtt ttgttagaag cacaccagct agttttgaaa agaagttcat tgaggacacc	360
aacaaactag catgcatcaa agaagatctt gctgttgcag gcatcacact ggttccaata	420

gtggatggtc gttgtgatta tgataacagt ttcatgccag aatgggtgaa ttttaagttc	480
agagacctcc tatttaaact cctggagtat tctagtcaag atgagaaagt ttttgaggag	540
tctgaatact tcaggctctg tgagtctctt aagaccactg ttgacaaacg ttccggcatg	600
gactcaatga aaattttgaa agacgcaaga tcatttcata acgatgagat tatgaaaatg	660
tgccacgatg gtgtcaaccc caacatgagt tgcgatgatg tggctcttgg cataaattcc	720
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gtcagccctg ggggcttaat caaggaattc tctgaacttt atgaaaccct tactgataat	840
gatgacatat taatgttgag caaagaggca gttgaatcct gcccttaat gaggttcatt	900
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gaaaatgata aacattgggt tggttgttgc tacagtagtg tgaatgatag gcttgtgagc	1140
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<210> 48

<211> 2209

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-1)

<400> 48

Met Asp Glu Thr Ile Ala Asp Leu Arg Glu Leu Cys Leu Asn Tyr Ile
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Glu Gln Asp Glu Arg Leu Ser Arg Gln Lys Leu Asn Phe Leu Gly Gln
20 25 30

Arg Glu Pro Arg Met Val Leu Ile Glu Gly Leu Lys Leu Leu Ser Arg
35 40 45

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

Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly

210

215

220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
 225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Arg Leu Lys Arg
 245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
 260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
 275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
 290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
 305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
 325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
 340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
 355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
 370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
 385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
 405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
 420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu

645

650

655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
 660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
 690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
 705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
 725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
 740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
 755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
 770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
 785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
 805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
 820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
 835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
 850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
1025 1030 1035

Arg His Met Gln Arg Gln Ser Leu Asn Phe Lys Phe Asp Trp Asp
1040 1045 1050

Lys Leu Glu Glu Asp Val Arg Ile Ser Glu Arg Glu Ser Asn Ser
1055 1060 1065

Glu Ser Leu Ser Lys Ala Leu Ser Leu Thr Lys Cys Met Ser Ala

1070						1075						1080			
Ala	Leu	Lys	Asn	Leu	Cys	Phe	Tyr	Ser	Glu	Glu	Ser	Pro	Thr	Ser	
1085						1090					1095				
Tyr	Thr	Ser	Val	Gly	Pro	Asp	Ser	Gly	Arg	Leu	Lys	Phe	Ala	Leu	
1100						1105					1110				
Ser	Tyr	Lys	Glu	Gln	Val	Gly	Gly	Asn	Arg	Glu	Leu	Tyr	Ile	Gly	
1115						1120					1125				
Asp	Leu	Arg	Thr	Lys	Met	Phe	Thr	Arg	Leu	Val	Glu	Asp	Tyr	Phe	
1130						1135					1140				
Glu	Ser	Phe	Ser	Ser	Phe	Phe	Ser	Gly	Ser	Cys	Leu	Asn	Asn	Asp	
1145						1150					1155				
Lys	Glu	Phe	Glu	Asn	Ala	Ile	Leu	Ser	Met	Thr	Ile	Asn	Val	Arg	
1160						1165					1170				
Glu	Gly	Leu	Leu	Asn	Tyr	Ser	Met	Asp	His	Ser	Lys	Trp	Gly	Pro	
1175						1180					1185				
Met	Met	Cys	Pro	Phe	Leu	Phe	Leu	Met	Leu	Leu	Gln	Asn	Leu	Lys	
1190						1195					1200				
Leu	Gly	Asp	Asp	Gln	Tyr	Val	Arg	Ser	Gly	Lys	Asp	His	Val	Ser	
1205						1210					1215				
Thr	Leu	Leu	Thr	Trp	His	Met	His	Lys	Leu	Val	Glu	Val	Pro	Phe	
1220						1225					1230				
Pro	Val	Val	Asn	Ala	Met	Met	Lys	Ser	Tyr	Val	Lys	Ser	Lys	Leu	
1235						1240					1245				
Lys	Leu	Leu	Lys	Gly	Ser	Gly	Thr	Thr	Val	Thr	Glu	Arg	Ile	Phe	
1250						1255					1260				
Arg	Glu	Tyr	Phe	Glu	Met	Gly	Val	Val	Pro	Ser	His	Ile	Ser	Ser	
1265						1270					1275				

Leu Ile Asp Met Gly Gln Gly Ile Leu His Asn Ala Ser Asp Phe
1280 1285 1290

Tyr Gly Leu Ile Ser Glu Arg Phe Ile Asn Tyr Cys Ile Gly Val
1295 1300 1305

Ile Phe Gly Glu Arg Pro Glu Ala Tyr Thr Ser Ser Asp Asp Gln
1310 1315 1320

Ile Thr Leu Phe Asp Lys Arg Leu Ser Asp Leu Val Asp Ser Asp
1325 1330 1335

Pro Glu Glu Val Leu Val Leu Leu Glu Phe His Ser His Leu Ser
1340 1345 1350

Gly Leu Leu Asn Lys Phe Ile Ser Pro Lys Ser Val Val Gly Arg
1355 1360 1365

Phe Ala Ala Glu Phe Lys Ser Arg Phe Tyr Val Trp Gly Glu Glu
1370 1375 1380

Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
1385 1390 1395

Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile
1400 1405 1410

Ala Asp Gln Ala Ile Ala Asn Gly Val Pro Val Phe Leu Val Asn
1415 1420 1425

Cys Ile Gln Arg Arg Thr Leu Asp Leu Leu Lys Tyr Ala Asn Phe
1430 1435 1440

Pro Leu Asp Pro Phe Leu Leu Asn Thr His Thr Asp Val Lys Asp
1445 1450 1455

Trp Leu Asp Gly Ser Arg Gly Tyr Arg Ile Gln Arg Leu Ile Glu
1460 1465 1470

Glu Leu Cys Pro Ser Glu Thr Lys Ile Met Arg Lys Leu Val Arg

1475						1480						1485			
Arg	Leu	His	His	Lys	Leu	Lys	Asn	Gly	Glu	Cys	Asn	Glu	Glu	Phe	
1490						1495					1500				
Phe	Leu	Asp	Leu	Phe	Asn	Arg	Glu	Met	Lys	Glu	Ala	Ile	Leu	Gln	
1505						1510					1515				
Leu	Gly	Glu	Ile	Leu	Gly	Leu	Glu	Asp	Asp	Leu	Asn	Glu	Leu	Ala	
1520						1525					1530				
Ser	Ile	Asn	Trp	Leu	Asn	Leu	Asn	Glu	Met	Phe	Pro	Leu	Arg	Met	
1535						1540					1545				
Val	Leu	Arg	Gln	Lys	Val	Val	Tyr	Pro	Ser	Val	Met	Thr	Phe	Gln	
1550						1555					1560				
Glu	Glu	Lys	Ile	Pro	Ser	Leu	Ile	Lys	Thr	Leu	Gln	Asn	Lys	Leu	
1565						1570					1575				
Cys	Ser	Lys	Phe	Thr	Arg	Gly	Ala	Gln	Lys	Leu	Leu	Ser	Glu	Ala	
1580						1585					1590				
Ile	Asn	Lys	Ser	Ala	Phe	Gln	Ser	Cys	Val	Ser	Ser	Gly	Phe	Ile	
1595						1600					1605				
Gly	Leu	Cys	Lys	Thr	Leu	Gly	Ser	Arg	Cys	Val	Arg	Asn	Lys	Asn	
1610						1615					1620				
Arg	Glu	Asn	Met	Tyr	Ile	Arg	Lys	Val	Leu	Glu	Asp	Leu	Thr	Met	
1625						1630					1635				
Asp	Glu	His	Val	Thr	Arg	Val	His	Lys	Gln	Asp	Gly	Val	Met	Leu	
1640						1645					1650				
Tyr	Ile	Cys	Asp	Lys	Gln	Arg	His	Pro	Glu	Ala	His	Arg	Asp	His	
1655						1660					1665				
Ile	Asn	Leu	Leu	Arg	Pro	Leu	Leu	Trp	Asp	Tyr	Ile	Cys	Ile	Ser	
1670						1675					1680				

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
1700 1705 1710

Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
1715 1720 1725

Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg
1730 1735 1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Ser
1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
1835 1840 1845

Val Ala Thr Ala Arg Thr Leu Gly Asn Phe Ser Trp Phe Pro His
1850 1855 1860

Lys Asp Met Met Pro Ser Glu Asp Gly Ala Glu Ala Leu Gly Pro
1865 1870 1875

Phe Gln Ser Phe Ile Leu Lys Val Val Asn Lys Lys Ile Glu Arg

1880						1885						1890			
Pro	Met	Phe	Arg	Asn	Asp	Leu	Gln	Phe	Gly	Phe	Gly	Trp	Phe	Ser	
	1895					1900					1905				
Tyr	Arg	Val	Gly	Asp	Val	Val	Cys	Asn	Ala	Ala	Met	Leu	Ile	Lys	
	1910					1915					1920				
Gln	Gly	Leu	Thr	Asp	Pro	Lys	Ala	Phe	Lys	Ser	Leu	Arg	Asp	Leu	
	1925					1930					1935				
Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser	
	1940					1945					1950				
Ile	Thr	Val	Asp	Phe	Thr	His	Asn	Gln	Asn	Asn	Thr	Asp	Cys	Leu	
	1955					1960					1965				
Arg	Lys	Phe	Ser	Leu	Ile	Phe	Val	Val	Lys	Cys	Gln	Leu	Gln	Ser	
	1970					1975					1980				
Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Phe	Phe	Lys	Gly	
	1985					1990					1995				
Glu	Val	Asp	Arg	Arg	Leu	Leu	Asp	Glu	Cys	Leu	Asn	Leu	Leu	Arg	
	2000					2005					2010				
Thr	Asp	Pro	Ile	Phe	Lys	Ala	Asn	Asp	Gly	Val	Phe	Asp	Ile	Arg	
	2015					2020					2025				
Ser	Glu	Glu	Phe	Glu	Asp	Tyr	Met	Glu	Asp	Pro	Leu	Thr	Leu	Gly	
	2030					2035					2040				
Asp	Ser	Leu	Glu	Leu	Glu	Leu	Ile	Gly	Ser	Arg	Arg	Ile	Leu	Asn	
	2045					2050					2055				
Glu	Ile	Lys	Ser	Thr	Asp	Phe	Glu	Arg	Ile	Gly	Pro	Glu	Trp	Glu	
	2060					2065					2070				
Pro	Val	Pro	Leu	Thr	Ile	Arg	Lys	Gly	Ala	Leu	Phe	Glu	Gly	Arg	
	2075					2080					2085				

Asn Phe Val Gln Asn Ile Ser Val Lys Leu Glu Thr Lys Asp Met
 2090 2095 2100

Arg Val Phe Leu Ala Glu Leu Glu Gly Cys Gly Glu Ile Gly Asp
 2105 2110 2115

Val Leu Gly Ser Leu Leu Leu His Arg Phe Arg Thr Gly Glu His
 2120 2125 2130

Leu Met Glu Ser Glu Ile Ser Thr Val Leu Gln Glu Leu Cys Met
 2135 2140 2145

Asp Arg Ser Val Met Leu Thr Pro Leu Ser Phe Val Pro Asp Trp
 2150 2155 2160

Phe Thr Phe Arg Asp Cys Arg Leu Cys Phe Ser Arg Ser Lys Asn
 2165 2170 2175

Thr Val Met Tyr Glu Thr Ala Gly Gly Arg Phe Arg Leu Lys Gly
 2180 2185 2190

Lys Ser Cys Asp Asp Trp Leu Ala Glu Arg Val Ala Glu Glu Ile
 2195 2200 2205

Asp

<210> 49
 <211> 1497
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 49
 atgggtcaga ttgtgacaat gtttgaggct ttgcctcaca tcattgatga ggatcatcaac 60
 attgtcatta ttgtgctcat tataatcacg agcatcaaag ctgtgtacaa tttcgccacc 120
 tgtgggatat tagcactggg cagcttcctt tttttggctg gtaggtcctg tggcatgtac 180
 ggccttaatg gtcccgacat ctataaaggg gtttaccagt tcaaatacgt ggagtttgat 240
 atgtctcact taaatctgac gatgcccaat gcgtgctcag ccaacaactc tcatactac 300
 atcagtatgg gaagctctgg actggagcta actttcacta acgactccat ccttaatcac 360

aatttttgca acttaacctc cgctttcaac aaaaagactt ttgaccatac actcatgagt	420
atagtctcga gtctgcacct cagtattaga gggaattcca accacaaagc agtgtcttgt	480
gattttaaca atggcatcac cattcaatac aacttgtcat tttcggaccc acagagcgct	540
ataagccagt gttggacttt cagaggtaga gtcttggaca tgtttagaac tgcctttgga	600
ggaaaataca tgagaagtgg ctggggctgg gcaggttcag atggcaagac cacttggtgc	660
agccaaacaa gctatcagta cctaatacata caaaacagga cttgggaaaa ccactgtaga	720
tatgcaggcc cttttgggat gtctagaatc ctctttgctc aggaaaagac aaagtttctc	780
actaggagac ttgcaggcac attcacctgg accctgtcag actcctcagg agtagaaaat	840
ccaggtgggtt attgcctgac caaatggatg atccttgctg cagagctcaa atgttttggg	900
aacacagctg ttgcaaaatg taatgtcaat catgatgaag agttctgtga catgctacga	960
ctaattgatt acaacaaggc cgccctgagt aagttcaagc aagatgtaga gtctgccttg	1020
catgtattca aaacaacagt aaattctctg atttccgatac agctgttgat gaggaatcat	1080
ctaagagatc taatgggggt accatactgt aattactcaa agttctggta tctggaacat	1140
gctaagactg gtgagactag tgtaccaag tgctggcttg tcactaatgg ctctacttg	1200
aatgagaccc actttagtga tcaaatacga caagaagcag ataacatgat cacagagatg	1260
ttgaggaagg actacataaa aagacaaggg agtactcctt tagccttaat ggatcttttg	1320
atgttttcaa catcagcata tctaatacagc atctttctgc atcttgtgaa gataccaaca	1380
catagacaca taaagggcgg ttcatgtcca aagccacacc gcttgaccaa caaggggatc	1440
tgtagttgtg gtgcattcaa ggtgcctggg gtaaaaacta tctggaaaag acgctga	1497

<210> 50
 <211> 498
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 50

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

Glu	Val	Ile	Asn	Ile	Val	Ile	Ile	Val	Leu	Ile	Ile	Ile	Thr	Ser	Ile
			20				25						30		

Lys Ala Val Tyr Asn Phe Ala Thr Cys Gly Ile Leu Ala Leu Val Ser
35 40 45

Phe Leu Phe Leu Ala Gly Arg Ser Cys Gly Met Tyr Gly Leu Asn Gly
50 55 60

Pro Asp Ile Tyr Lys Gly Val Tyr Gln Phe Lys Ser Val Glu Phe Asp
65 70 75 80

Met Ser His Leu Asn Leu Thr Met Pro Asn Ala Cys Ser Ala Asn Asn
85 90 95

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp
165 170 175

Pro Gln Ser Ala Ile Ser Gln Cys Trp Thr Phe Arg Gly Arg Val Leu
180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys

245

250

255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
 260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
 275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
 290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
 305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
 325 330 335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
 355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
 370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
 385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
 405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
 420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
 435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
 450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
 465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
 485 490 495

Arg Arg

<210> 51
 <211> 1677
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 51
 atgtctttgt ccaaagaagt caaaagcttt cagtggacac aggcgttgag gagggagttg 60
 cagagtttta catcagatgt aaaggctgcc gtcacaaagg acgcaaccag tcttctaaat 120
 ggggttgact tttctgaagt cagcaacgtt cagaggatca tgagaaagga aaggagggat 180
 gataaagact tgcagagact caggagtctt aaccagactg tgcattctct tgttgatctg 240
 aagtctacat caaagaaaaa tgttctgaaa gtgggaagac ttagtgcaga ggaattgatg 300
 acccttgacg ctgatctcga gaagctgaag gccaaaatta tgagaactga gaggcctcaa 360
 gcttctggag tctacatggg aaatttgaca gcacaacaac ttgatcaaag atcccaaata 420
 ctgcaaatgg ttgggatgag aagacctcag cagggtgcaa gtggtgtagt aagggtttgg 480
 gatgtgaagg actcatcact tctgaacaat cagttcggca caatgccaag cctgacaatg 540
 gcttgcatgg caaaacagtc acagaccca ctcaatgatg ttgtgcaggc actcacagac 600
 cttggcttac tttacacagt caaatacccg aatctcagtg atcttgaaag gctaaaggat 660
 aaacaccag ttctgggggt cattactgaa cagcaatcta gtatcaatat ctctggttat 720
 aatttcagtc ttgggtgcagc tgtgaaagcg ggggcagctc tgctagatgg agggaacatg 780
 ctggaatcta tcttgatcaa accgagcaac agtgaggatc tcctaaaagc agtcctcggg 840
 gccaagaaga aactcaacat gtttgtctca gatcaagttg gagatagaaa tccctatgaa 900
 aacatccttt ataaagtctg tctttcaggt gaaggatggc catacatagc ctgtagaacg 960
 tcagttgtgg ggagagcatg ggagaacaca acaattgatc tcacaaatga aaaacttggt 1020
 gccaaactcat ctaggccagt gcctggagca gcaggccac cttaggtggg cttgagttac 1080

agtcagacaa tgctgttgaa agacttgatg ggagggattg atcccaatgc tcccacatgg 1140
 attgacattg agggcagggtt caatgatcca gtggagatag caatattcca accacaaaat 1200
 gggcaattca tacattttta cagggaacct acggaccaga agcaattcaa gcaggactca 1260
 aagtattcac acggcatgga tcttgctgat ctcttcaatg cacagcctgg gctgacctca 1320
 tcagttatag gtgctctccc acaagggatg gttttgagct gtcaaggttc tgatgacatc 1380
 agaaagcttc tggactcaca aaatagaagg gacataaaac tcattgatgt tgagatgacc 1440
 aaggaggcct caagagaata tgaagataaa gtgtgggaca aatatggctg gctatgcaaa 1500
 atgcacactg gggtagtgag agacaaaaag aagaaagaga tcaccccaca ctgtgcactc 1560
 atggactgca tcatttttga gagtgcttcc aaggcaagac tccctgatct aaaaaccgtt 1620
 cacaacatcc tgccacatga tttaatcttc agaggaccca atgttgtgac actctaa 1677

<210> 52

<211> 558

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 52

Met Ser Leu Ser Lys Glu Val Lys Ser Phe Gln Trp Thr Gln Ala Leu
 1 5 10 15

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

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

Asn Val Gln Arg Ile Met Arg Lys Glu Arg Arg Asp Asp Lys Asp Leu
 50 55 60

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu
 65 70 75 80

Lys Ser Thr Ser Lys Lys Asn Val Leu Lys Val Gly Arg Leu Ser Ala
 85 90 95

Glu Glu Leu Met Thr Leu Ala Ala Asp Leu Glu Lys Leu Lys Ala Lys

100

105

110

Ile Met Arg Thr Glu Arg Pro Gln Ala Ser Gly Val Tyr Met Gly Asn
 115 120 125

Leu Thr Ala Gln Gln Leu Asp Gln Arg Ser Gln Ile Leu Gln Met Val
 130 135 140

Gly Met Arg Arg Pro Gln Gln Gly Ala Ser Gly Val Val Arg Val Trp
 145 150 155 160

Asp Val Lys Asp Ser Ser Leu Leu Asn Asn Gln Phe Gly Thr Met Pro
 165 170 175

Ser Leu Thr Met Ala Cys Met Ala Lys Gln Ser Gln Thr Pro Leu Asn
 180 185 190

Asp Val Val Gln Ala Leu Thr Asp Leu Gly Leu Leu Tyr Thr Val Lys
 195 200 205

Tyr Pro Asn Leu Ser Asp Leu Glu Arg Leu Lys Asp Lys His Pro Val
 210 215 220

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

Asn Phe Ser Leu Gly Ala Ala Val Lys Ala Gly Ala Ala Leu Leu Asp
 245 250 255

Gly Gly Asn Met Leu Glu Ser Ile Leu Ile Lys Pro Ser Asn Ser Glu
 260 265 270

Asp Leu Leu Lys Ala Val Leu Gly Ala Lys Lys Lys Leu Asn Met Phe
 275 280 285

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
 290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
 305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu
450 455 460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys
500 505 510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu

530

535

540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
 545 550 555

<210> 53

<211> 273

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 53

atgggccaag gcaagtccaa agaagaaagg gacaccagca atacaggcag agcagagctt 60

ttgccagaca ccacctatct tggctcctcta aattgtaaat catgttggca gaaatttgac 120

agcttgggta gatgccatga ccactatctt tgcagacact gtctgaatct cctgctgtca 180

gtttccgaca gatgtcctct ctgtaagtat ccactgccaa ccaaactgaa ggtgtcaaca 240

gtcccaagct cccacactcc ctatgaggag tga 273

<210> 54

<211> 90

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 54

Met Gly Gln Gly Lys Ser Lys Glu Glu Arg Asp Thr Ser Asn Thr Gly
 1 5 10 15

Arg Ala Glu Leu Leu Pro Asp Thr Thr Tyr Leu Gly Pro Leu Asn Cys
 20 25 30

Lys Ser Cys Trp Gln Lys Phe Asp Ser Leu Val Arg Cys His Asp His
 35 40 45

Tyr Leu Cys Arg His Cys Leu Asn Leu Leu Leu Ser Val Ser Asp Arg
 50 55 60

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

Val Pro Ser Ser Pro Pro Pro Tyr Glu Glu
 85 90

<210> 55
 <211> 6630
 <212> DNA
 <213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 55
 atggatgaaa ctattgcaga tttgagagag ttgtgtctaa attacataga acaggacgag 60
 aggctgtcaa ggcaaaaact caacttcctg ggacaaagag aaccagaat ggtgctaatt 120
 gagggactca aattgttatc acgctgtata gagatagaca gtgcagacaa aagtggttgc 180
 atacacaacc acgatgacaa atctgttgaa acaatcctaa tagactctgg gattgtgtgt 240
 ccaggactgc cactcatcat ccctgatggg tataagttga ttgacaattc ctttattctt 300
 cttgaatgtt ttgttagaag cacaccagct agttttgaaa agaagttcat tgaggacacc 360
 aacaaactag catgcatcaa agaagatctt gctgttgcag gcatcacact ggttccaata 420
 gtggatggtc gttgtgatta tgataacagt ttcatgccag aatgggtgaa ttttaagttc 480
 agagacctcc tatttaaact cctggagtat tctagtcaag atgagaaagt ttttgaggag 540
 tctgaatact tcaggctctg tgagtctctt aagaccactg ttgacaaacg ttccggcatg 600
 gactcaatga aaattttgaa agacgcaaga tcatttcata acgatgagat tatgaaaatg 660
 tgccacgatg gtgtcaaccc caacatgagt tgcgatgatg tggctcttgg cataaattcc 720
 ttttttggca ggtttaggag ggacctgtta aatgggaaac tcaaaaggaa tttccaaaag 780
 gtcagccctg ggggcttaat caaggaattc tctgaacttt atgaaaccct tactgataat 840
 gatgacatat taatgttgag caaagaggca gttgaatcct gccccttaat gaggttcatt 900
 acagcagaga cccatgggca tgagagagga agcgatgcta acactgagta tgaaaggcta 960
 ctctctatgt taaacaaggt gaaaagttta aaattattaa acactagaag gagacagctg 1020
 ctgaacttag atgtcttatg tctttcttca cttattaagc agtcaatttc caaagggttg 1080
 gaaaatgata aacattgggt tggttgttgc tacagtagtg tgaatgatag gcttgtgagc 1140
 cttcaaagta ccaaagaaga attcatgaga cttttgaaga acagaagaaa atcaagagtg 1200
 cacaaaaagg catctcttga tgagcttttt agggatatcca taaatgagtt catagcaaaa 1260
 atccagaaat gcctatcaac agtgggactt agttttgagc attacggact atcagaatgc 1320
 ctcgtgcaag aatgccatat accatttgct gaatttgaga actttatgag agccgggact 1380
 catcctgtaa tgcattacac aaaatttgaa gattacactt tccagcctaa catagagcaa 1440

ttgaggggtt tacagagttt gagaaaactg tcatctgttt gtttggctct aacaaacagc	1500
atgaaaacaa gctcagttgc aaggttgaga cagaaccaac tggggtctgt gagatatcaa	1560
gtggtggagt gcaaagaggt gttttgccag ataataaac tggattccga agagtatcat	1620
ctactatatc agaaaactgg agaatcatcg aggtgttatt ccatacaagg tccgatggt	1680
cacttgattt ctttttacgc agatccaaaa aggttctttt taccaatttt ttcagatgag	1740
gtgttcaca acatgataga cacaatgatt tcatggatta ggtcatgccc tgacttaaaa	1800
gattctctta ttgacattga gactgcacta aggacattga tcctactgat gtcaccaac	1860
ccaacaaaga gaaatcaaaa gcaggttcaa aatattaggt atttagtgat ggccatcgtc	1920
tcagactttt catcgacctc attaatggat aagttgaagg aggatctaata cacacctgcc	1980
gagaaagtgg tgtacaggct gcttcggttt ttgattagga caatttttgg tactggtgaa	2040
aaggtgttat tgagtcaaaa attcaagttt atgttgaatg tgtcatacct gtgtcatttg	2100
atcacaaagg agaccctga tagattgaca gatcagataa aatgttttga aaagttcttt	2160
gagcccaaga gtgagtttgg tttctttgtc aaccctaagg aaacaatcac acccgaagag	2220
gaatgtgttt tttatgaaca aatgaagaag ttcaccggta aagatattga ttgtcagcat	2280
tcaaccctg gtgttaattt agagatcttt agcatgatgg tatcttcatt caacaatggc	2340
accttaattc taaaagggga gaaaaggctc aacaatctgg accccatgac caactctgga	2400
tgtgcgacag cattagatct cgcaagcaac aaaagtgtgg ttgtcaataa acatctgaat	2460
ggagaacggc ttttgagta tgattttaac aaattgcttg ttagtgctgt gagccaaatt	2520
acagagggtc tcatgaggaa acaaaagtat aagctgagac actcagatta cgaatataag	2580
gtctcaaagc ttgtctctag attagtcatc ggttccagga aaacagaagt agacaaatta	2640
gaagatgac cggtagatgt gtgtttcgag ggggaggagg agacaagttt tttcaggagt	2700
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<212> PRT
<213> Lymphocytic choriomeningitis virus (mutant P52-1.3)

<400> 56

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Glu Gln Asp Glu Arg Leu Ser Arg Gln Lys Leu Asn Phe Leu Gly Gln
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Arg Glu Pro Arg Met Val Leu Ile Glu Gly Leu Lys Leu Leu Ser Arg
35 40 45

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

Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
115 120 125

Asp Leu Ala Val Ala Gly Ile Thr Leu Val Pro Ile Val Asp Gly Arg

130

135

140

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
 145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
 165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
 180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
 195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
 210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
 225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
 245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
 260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
 275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
 290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
 305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
 325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
 340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala
485 490 495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile

565

570

575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
 580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
 595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
 610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
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Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
 645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
 660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
 690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
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Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
 725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
 740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
 755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
 770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys
915 920 925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu

995

1000

1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
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Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
 1025 1030 1035

Arg His Met Gln Arg Gln Ser Leu Asn Phe Lys Phe Asp Trp Asp
 1040 1045 1050

Lys Leu Glu Glu Asp Val Arg Ile Ser Glu Arg Glu Ser Asn Ser
 1055 1060 1065

Glu Ser Leu Ser Lys Ala Leu Ser Leu Thr Lys Cys Met Ser Ala
 1070 1075 1080

Ala Leu Lys Asn Leu Cys Phe Tyr Ser Glu Glu Ser Pro Thr Ser
 1085 1090 1095

Tyr Thr Ser Val Gly Pro Asp Ser Gly Arg Leu Lys Phe Ala Leu
 1100 1105 1110

Ser Tyr Lys Glu Gln Val Gly Gly Asn Arg Glu Leu Tyr Ile Gly
 1115 1120 1125

Asp Leu Arg Thr Lys Met Phe Thr Arg Leu Val Glu Asp Tyr Phe
 1130 1135 1140

Glu Ser Phe Ser Ser Phe Phe Ser Gly Ser Cys Leu Asn Asn Asp
 1145 1150 1155

Lys Glu Phe Glu Asn Ala Ile Leu Ser Met Thr Ile Asn Val Arg
 1160 1165 1170

Glu Gly Leu Leu Asn Tyr Ser Met Asp His Ser Lys Trp Gly Pro
 1175 1180 1185

Met Met Cys Pro Phe Leu Phe Leu Met Leu Leu Gln Asn Leu Lys
 1190 1195 1200

Leu Gly Asp Asp Gln Tyr Val Arg Ser Gly Lys Asp His Val Ser
1205 1210 1215

Thr Leu Leu Thr Trp His Met His Lys Leu Val Glu Val Pro Phe
1220 1225 1230

Pro Val Val Asn Ala Met Met Lys Ser Tyr Val Lys Ser Lys Leu
1235 1240 1245

Lys Leu Leu Lys Gly Ser Gly Thr Thr Val Thr Glu Arg Ile Phe
1250 1255 1260

Arg Glu Tyr Phe Glu Met Gly Val Val Pro Ser His Ile Ser Ser
1265 1270 1275

Leu Ile Asp Met Gly Gln Gly Ile Leu His Asn Ala Ser Asp Phe
1280 1285 1290

Tyr Gly Leu Ile Ser Glu Arg Phe Ile Asn Tyr Cys Ile Gly Val
1295 1300 1305

Ile Phe Gly Glu Arg Pro Glu Ala Tyr Thr Ser Ser Asp Asp Gln
1310 1315 1320

Ile Thr Leu Phe Asp Lys Arg Leu Ser Asp Leu Val Asp Ser Asp
1325 1330 1335

Pro Glu Glu Val Leu Val Leu Leu Glu Phe His Ser His Leu Ser
1340 1345 1350

Gly Leu Leu Asn Lys Phe Ile Ser Pro Lys Ser Val Val Gly Arg
1355 1360 1365

Phe Ala Ala Glu Phe Lys Ser Arg Phe Tyr Val Trp Gly Glu Glu
1370 1375 1380

Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
1385 1390 1395

Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile

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Pro	Leu	Asp	Pro	Phe	Leu	Leu	Asn	Thr	His	Thr	Asp	Val	Lys	Asp	
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Glu	Leu	Cys	Pro	Ser	Glu	Thr	Lys	Ile	Met	Arg	Lys	Leu	Val	Arg	
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Arg	Leu	His	His	Lys	Leu	Lys	Asn	Gly	Glu	Cys	Asn	Glu	Glu	Phe	
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Phe	Leu	Asp	Leu	Phe	Asn	Arg	Glu	Lys	Lys	Glu	Ala	Ile	Leu	Gln	
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Leu	Gly	Glu	Ile	Leu	Gly	Leu	Glu	Asp	Asp	Leu	Asn	Glu	Leu	Ala	
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Ser	Ile	Asn	Trp	Leu	Asn	Leu	Asn	Glu	Met	Phe	Pro	Leu	Arg	Met	
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Val	Leu	Arg	Gln	Lys	Val	Val	Tyr	Pro	Ser	Val	Met	Thr	Phe	Gln	
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Glu	Glu	Lys	Ile	Pro	Ser	Leu	Ile	Lys	Thr	Leu	Gln	Asn	Lys	Leu	
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Cys	Ser	Lys	Phe	Thr	Arg	Gly	Ala	Gln	Lys	Leu	Leu	Ser	Glu	Ala	
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Gly Leu Cys Lys Thr Leu Gly Ser Arg Cys Val Arg Asn Lys Asn
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Arg Glu Asn Met Tyr Ile Arg Lys Val Leu Glu Asp Leu Thr Met
1625 1630 1635

Asp Glu His Val Thr Arg Val His Lys Gln Asp Gly Val Met Leu
1640 1645 1650

Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
1655 1660 1665

Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
1670 1675 1680

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
1700 1705 1710

Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
1715 1720 1725

Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg
1730 1735 1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Ser
1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser

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Lys	Asp	Met	Met	Pro	Ser	Glu	Asp	Gly	Ala	Glu	Ala	Leu	Gly	Pro	
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Tyr	Arg	Val	Gly	Asp	Val	Val	Cys	Asn	Ala	Ala	Met	Leu	Ile	Lys	
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Gln	Gly	Leu	Thr	Asp	Pro	Lys	Ala	Phe	Lys	Ser	Leu	Arg	Asp	Leu	
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Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser	
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Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Ser	Phe	Lys	Gly	
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Thr Asp Pro Ile Phe Lys Ala Asn Asp Gly Val Phe Asp Ile Arg
2015 2020 2025

Ser Glu Glu Phe Glu Asp Tyr Met Glu Asp Pro Leu Thr Leu Gly
2030 2035 2040

Asp Ser Leu Glu Leu Glu Leu Ile Gly Ser Arg Arg Ile Leu Asn
2045 2050 2055

Glu Ile Lys Ser Thr Asp Phe Glu Arg Ile Gly Pro Glu Trp Glu
2060 2065 2070

Pro Val Pro Leu Thr Ile Arg Lys Gly Ala Leu Phe Glu Gly Arg
2075 2080 2085

Asn Phe Val Gln Asn Ile Ser Val Lys Leu Glu Thr Lys Asp Met
2090 2095 2100

Arg Val Phe Leu Ala Glu Leu Glu Gly Cys Gly Lys Ile Gly Asp
2105 2110 2115

Val Leu Gly Ser Leu Leu Leu His Arg Phe Arg Thr Gly Glu His
2120 2125 2130

Leu Met Glu Ser Glu Ile Ser Thr Val Leu Gln Glu Leu Cys Met
2135 2140 2145

Asp Arg Ser Val Met Leu Thr Pro Leu Ser Phe Val Pro Asp Trp
2150 2155 2160

Phe Thr Phe Arg Asp Cys Arg Leu Cys Phe Ser Arg Ser Lys Asn
2165 2170 2175

Thr Val Met Tyr Glu Thr Thr Gly Gly Arg Phe Arg Leu Lys Gly
2180 2185 2190

Lys Ser Cys Asp Asp Trp Leu Ala Glu Arg Val Ala Glu Glu Ile
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Asp

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 <213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

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<210> 58

<211> 498

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 58

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

Phe Leu Phe Leu Ala Gly Arg Ser Cys Gly Met Tyr Gly Leu Asn Gly
50 55 60

Pro Asp Ile Tyr Lys Gly Val Tyr Gln Phe Lys Ser Val Glu Phe Asp
65 70 75 80

Met Ser His Leu Asn Leu Thr Met Pro Asn Ala Cys Ser Ala Asn Asn
85 90 95

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

Thr Asn Asp Ser Ile Leu Asn His Asn Phe Cys Asn Leu Thr Ser Ala
115 120 125

Phe Asn Lys Lys Thr Phe Asp His Thr Leu Met Ser Ile Val Ser Ser
130 135 140

Leu His Leu Ser Ile Arg Gly Asn Ser Asn His Lys Ala Val Ser Cys
145 150 155 160

Asp Phe Asn Asn Gly Ile Thr Ile Gln Tyr Asn Leu Ser Phe Ser Asp

165

170

175

Pro Gln Ser Ala Met Ser Gln Cys Arg Thr Phe Arg Gly Arg Val Leu
 180 185 190

Asp Met Phe Arg Thr Ala Phe Gly Gly Lys Tyr Met Arg Ser Gly Trp
 195 200 205

Gly Trp Ala Gly Ser Asp Gly Lys Thr Thr Trp Cys Ser Gln Thr Ser
 210 215 220

Tyr Gln Tyr Leu Ile Ile Gln Asn Arg Thr Trp Glu Asn His Cys Arg
 225 230 235 240

Tyr Ala Gly Pro Phe Gly Met Ser Arg Ile Leu Phe Ala Gln Glu Lys
 245 250 255

Thr Lys Phe Leu Thr Arg Arg Leu Ala Gly Thr Phe Thr Trp Thr Leu
 260 265 270

Ser Asp Ser Ser Gly Val Glu Asn Pro Gly Gly Tyr Cys Leu Thr Lys
 275 280 285

Trp Met Ile Leu Ala Ala Glu Leu Lys Cys Phe Gly Asn Thr Ala Val
 290 295 300

Ala Lys Cys Asn Val Asn His Asp Glu Glu Phe Cys Asp Met Leu Arg
 305 310 315 320

Leu Ile Asp Tyr Asn Lys Ala Ala Leu Ser Lys Phe Lys Gln Asp Val
 325 330 335

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

Asp Gln Leu Leu Met Arg Asn His Leu Arg Asp Leu Met Gly Val Pro
 355 360 365

Tyr Cys Asn Tyr Ser Lys Phe Trp Tyr Leu Glu His Ala Lys Thr Gly
 370 375 380

Glu Thr Ser Val Pro Lys Cys Trp Leu Val Thr Asn Gly Ser Tyr Leu
 385 390 395 400

Asn Glu Thr His Phe Ser Asp Gln Ile Glu Gln Glu Ala Asp Asn Met
 405 410 415

Ile Thr Glu Met Leu Arg Lys Asp Tyr Ile Lys Arg Gln Gly Ser Thr
 420 425 430

Pro Leu Ala Leu Met Asp Leu Leu Met Phe Ser Thr Ser Ala Tyr Leu
 435 440 445

Ile Ser Ile Phe Leu His Leu Val Lys Ile Pro Thr His Arg His Ile
 450 455 460

Lys Gly Gly Ser Cys Pro Lys Pro His Arg Leu Thr Asn Lys Gly Ile
 465 470 475 480

Cys Ser Cys Gly Ala Phe Lys Val Pro Gly Val Lys Thr Ile Trp Lys
 485 490 495

Arg Arg

- <210> 59
- <211> 1677
- <212> DNA
- <213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 59	
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<210> 60

<211> 558

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 60

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

20

25

30

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

Asn Val Gln Arg Ile Met Arg Lys Glu Arg Arg Asp Asp Lys Asp Leu
 50 55 60

Gln Arg Leu Arg Ser Leu Asn Gln Thr Val His Ser Leu Val Asp Leu
 65 70 75 80

Lys Ser Thr Ser Lys Lys Asn Val Leu Lys Val Gly Arg Leu Ser Ala
 85 90 95

Glu Glu Leu Met Thr Leu Ala Ala Asp Leu Glu Lys Leu Lys Ala Lys
 100 105 110

Ile Met Arg Thr Glu Arg Pro Gln Ala Ser Gly Val Tyr Met Gly Asn
 115 120 125

Leu Thr Ala Gln Gln Leu Asp Gln Arg Ser Gln Ile Leu Gln Met Val
 130 135 140

Gly Met Arg Arg Pro Gln Gln Gly Ala Ser Gly Val Val Arg Val Trp
 145 150 155 160

Asp Val Lys Asp Ser Ser Leu Leu Asn Asn Gln Phe Gly Thr Met Pro
 165 170 175

Ser Leu Thr Met Ala Cys Met Ala Lys Gln Ser Gln Thr Pro Leu Asn
 180 185 190

Asp Val Val Gln Ala Leu Thr Asp Leu Gly Leu Leu Tyr Thr Val Lys
 195 200 205

Tyr Pro Asn Leu Ser Asp Leu Glu Arg Leu Lys Asp Lys His Pro Val
 210 215 220

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

Asn Phe Ser Leu Gly Ala Ala Val Lys Ala Gly Ala Ala Leu Leu Asp
245 250 255

Gly Gly Asn Met Leu Glu Ser Ile Leu Ile Lys Pro Ser Asn Ser Glu
260 265 270

Asp Leu Leu Lys Ala Val Leu Gly Ala Lys Lys Lys Leu Asn Met Phe
275 280 285

Val Ser Asp Gln Val Gly Asp Arg Asn Pro Tyr Glu Asn Ile Leu Tyr
290 295 300

Lys Val Cys Leu Ser Gly Glu Gly Trp Pro Tyr Ile Ala Cys Arg Thr
305 310 315 320

Ser Val Val Gly Arg Ala Trp Glu Asn Thr Thr Ile Asp Leu Thr Asn
325 330 335

Glu Lys Leu Val Ala Asn Ser Ser Arg Pro Val Pro Gly Ala Ala Gly
340 345 350

Pro Pro Gln Val Gly Leu Ser Tyr Ser Gln Thr Met Leu Leu Lys Asp
355 360 365

Leu Met Gly Gly Ile Asp Pro Asn Ala Pro Thr Trp Ile Asp Ile Glu
370 375 380

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

Gly Gln Phe Ile His Phe Tyr Arg Glu Pro Thr Asp Gln Lys Gln Phe
405 410 415

Lys Gln Asp Ser Lys Tyr Ser His Gly Met Asp Leu Ala Asp Leu Phe
420 425 430

Asn Ala Gln Pro Gly Leu Thr Ser Ser Val Ile Gly Ala Leu Pro Gln
435 440 445

Gly Met Val Leu Ser Cys Gln Gly Ser Asp Asp Ile Arg Lys Leu Leu

450

455

460

Asp Ser Gln Asn Arg Arg Asp Ile Lys Leu Ile Asp Val Glu Met Thr
 465 470 475 480

Lys Glu Ala Ser Arg Glu Tyr Glu Asp Lys Val Trp Asp Lys Tyr Gly
 485 490 495

Trp Leu Cys Lys Met His Thr Gly Val Val Arg Asp Lys Lys Lys Lys
 500 505 510

Glu Ile Thr Pro His Cys Ala Leu Met Asp Cys Ile Ile Phe Glu Ser
 515 520 525

Ala Ser Lys Ala Arg Leu Pro Asp Leu Lys Thr Val His Asn Ile Leu
 530 535 540

Pro His Asp Leu Ile Phe Arg Gly Pro Asn Val Val Thr Leu
 545 550 555

<210> 61

<211> 273

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 61

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agcttggtta gatgcatga ccactatctt tgcagacact gtctgaatct cctgctgtca 180

gtttccgaca gatgtcctct ctgtaagtat ccactgccaa ccaaactgaa ggtgtcaaca 240

gtcccaagct cccacactcc ctatgaggag tga 273

<210> 62

<211> 90

<212> PRT

<213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 62

Met Gly Gln Gly Lys Ser Lys Glu Glu Arg Asp Thr Ser Asn Thr Gly
 1 5 10 15

Arg Ala Glu Leu Leu Pro Asp Thr Thr Tyr Leu Gly Pro Leu Asn Cys
20 25 30

Lys Ser Cys Trp Gln Lys Phe Asp Ser Leu Val Arg Cys His Asp His
35 40 45

Tyr Leu Cys Arg His Cys Leu Asn Leu Leu Leu Ser Val Ser Asp Arg
50 55 60

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

Val Pro Ser Ser Pro Pro Pro Tyr Glu Glu
85 90

<210> 63

<211> 6630

<212> DNA

<213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 63

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gagggactca aattgttatc acgctgtata gagatagaca gtgcagacaa aagtggttgc 180

atacacaacc acgatgacaa atctgttgaa acaatcctaa tagactctgg gattgtgtgt 240

ccaggactgc cactcatcat ccctgatggg tataagttga ttgacaattc ctttattctt 300

cttgaatgtt ttgttagaag cacaccagct agttttgaaa agaagttcat tgaggacacc 360

aacaaactag catgcatcaa agaagatctt gctgttgcag gcatcacact ggttccaata 420

gtggatgggc gttgtgatta tgataacagt ttcattgccag aatgggtgaa ttttaagttc 480

agagacctcc tatttaaact cctggagtat tctagtcaag atgagaaagt ttttgaggag 540

tctgaatact tcaggctctg tgagtctctt aagaccactg ttgacaaacg ttccggcatg 600

gactcaatga aaattttgaa agacgcaaga tcatttcata acgatgagat tatgaaaatg 660

tgccacgatg gtgtcaaccc caacatgagt tgcgatgatg tggctcttgg cataaattcc 720

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<210> 64
 <211> 2209
 <212> PRT
 <213> Lymphocytic choriomeningitis virus (mutant P52-2.1)

<400> 64

Met	Asp	Glu	Thr	Ile	Ala	Asp	Leu	Arg	Glu	Leu	Cys	Leu	Asn	Tyr	Ile
1				5				10						15	

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

Arg	Glu	Pro	Arg	Met	Val	Leu	Ile	Glu	Gly	Leu	Lys	Leu	Leu	Ser	Arg
		35				40					45				

Cys	Ile	Glu	Ile	Asp	Ser	Ala	Asp	Lys	Ser	Gly	Cys	Ile	His	Asn	His
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

50

55

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Asp Asp Lys Ser Val Glu Thr Ile Leu Ile Asp Ser Gly Ile Val Cys
 65 70 75 80

Pro Gly Leu Pro Leu Ile Ile Pro Asp Gly Tyr Lys Leu Ile Asp Asn
 85 90 95

Ser Leu Ile Leu Leu Glu Cys Phe Val Arg Ser Thr Pro Ala Ser Phe
 100 105 110

Glu Lys Lys Phe Ile Glu Asp Thr Asn Lys Leu Ala Cys Ile Lys Glu
 115 120 125

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

Cys Asp Tyr Asp Asn Ser Phe Met Pro Glu Trp Val Asn Phe Lys Phe
 145 150 155 160

Arg Asp Leu Leu Phe Lys Leu Leu Glu Tyr Ser Ser Gln Asp Glu Lys
 165 170 175

Val Phe Glu Glu Ser Glu Tyr Phe Arg Leu Cys Glu Ser Leu Lys Thr
 180 185 190

Thr Val Asp Lys Arg Ser Gly Met Asp Ser Met Lys Ile Leu Lys Asp
 195 200 205

Ala Arg Ser Phe His Asn Asp Glu Ile Met Lys Met Cys His Asp Gly
 210 215 220

Val Asn Pro Asn Met Ser Cys Asp Asp Val Val Phe Gly Ile Asn Ser
 225 230 235 240

Phe Phe Gly Arg Phe Arg Arg Asp Leu Leu Asn Gly Lys Leu Lys Arg
 245 250 255

Asn Phe Gln Lys Val Ser Pro Gly Gly Leu Ile Lys Glu Phe Ser Glu
 260 265 270

Leu Tyr Glu Thr Leu Thr Asp Asn Asp Asp Ile Leu Met Leu Ser Lys
275 280 285

Glu Ala Val Glu Ser Cys Pro Leu Met Arg Phe Ile Thr Ala Glu Thr
290 295 300

His Gly His Glu Arg Gly Ser Asp Ala Asn Thr Glu Tyr Glu Arg Leu
305 310 315 320

Leu Ser Met Leu Asn Lys Val Lys Ser Leu Lys Leu Leu Asn Thr Arg
325 330 335

Arg Arg Gln Leu Leu Asn Leu Asp Val Leu Cys Leu Ser Ser Leu Ile
340 345 350

Lys Gln Ser Ile Ser Lys Gly Leu Glu Asn Asp Lys His Trp Val Gly
355 360 365

Cys Cys Tyr Ser Ser Val Asn Asp Arg Leu Val Ser Leu Gln Ser Thr
370 375 380

Lys Glu Glu Phe Met Arg Leu Leu Lys Asn Arg Arg Lys Ser Arg Val
385 390 395 400

His Lys Lys Ala Ser Leu Asp Glu Leu Phe Arg Val Ser Ile Asn Glu
405 410 415

Phe Ile Ala Lys Ile Gln Lys Cys Leu Ser Thr Val Gly Leu Ser Phe
420 425 430

Glu His Tyr Gly Leu Ser Glu Cys Leu Val Gln Glu Cys His Ile Pro
435 440 445

Phe Ala Glu Phe Glu Asn Phe Met Arg Ala Gly Thr His Pro Val Met
450 455 460

His Tyr Thr Lys Phe Glu Asp Tyr Thr Phe Gln Pro Asn Ile Glu Gln
465 470 475 480

Leu Arg Gly Leu Gln Ser Leu Arg Lys Leu Ser Ser Val Cys Leu Ala

485

490

495

Leu Thr Asn Ser Met Lys Thr Ser Ser Val Ala Arg Leu Arg Gln Asn
 500 505 510

Gln Leu Gly Ser Val Arg Tyr Gln Val Val Glu Cys Lys Glu Val Phe
 515 520 525

Cys Gln Ile Ile Lys Leu Asp Ser Glu Glu Tyr His Leu Leu Tyr Gln
 530 535 540

Lys Thr Gly Glu Ser Ser Arg Cys Tyr Ser Ile Gln Gly Pro Asp Gly
 545 550 555 560

His Leu Ile Ser Phe Tyr Ala Asp Pro Lys Arg Phe Phe Leu Pro Ile
 565 570 575

Phe Ser Asp Glu Val Leu His Asn Met Ile Asp Thr Met Ile Ser Trp
 580 585 590

Ile Arg Ser Cys Pro Asp Leu Lys Asp Ser Leu Ile Asp Ile Glu Thr
 595 600 605

Ala Leu Arg Thr Leu Ile Leu Leu Met Leu Thr Asn Pro Thr Lys Arg
 610 615 620

Asn Gln Lys Gln Val Gln Asn Ile Arg Tyr Leu Val Met Ala Ile Val
 625 630 635 640

Ser Asp Phe Ser Ser Thr Ser Leu Met Asp Lys Leu Lys Glu Asp Leu
 645 650 655

Ile Thr Pro Ala Glu Lys Val Val Tyr Arg Leu Leu Arg Phe Leu Ile
 660 665 670

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

Lys Phe Met Leu Asn Val Ser Tyr Leu Cys His Leu Ile Thr Lys Glu
 690 695 700

Thr Pro Asp Arg Leu Thr Asp Gln Ile Lys Cys Phe Glu Lys Phe Phe
705 710 715 720

Glu Pro Lys Ser Glu Phe Gly Phe Phe Val Asn Pro Lys Glu Thr Ile
725 730 735

Thr Pro Glu Glu Glu Cys Val Phe Tyr Glu Gln Met Lys Lys Phe Thr
740 745 750

Gly Lys Asp Ile Asp Cys Gln His Ser Thr Pro Gly Val Asn Leu Glu
755 760 765

Ile Phe Ser Met Met Val Ser Ser Phe Asn Asn Gly Thr Leu Ile Leu
770 775 780

Lys Gly Glu Lys Arg Leu Asn Asn Leu Asp Pro Met Thr Asn Ser Gly
785 790 795 800

Cys Ala Thr Ala Leu Asp Leu Ala Ser Asn Lys Ser Val Val Val Asn
805 810 815

Lys His Leu Asn Gly Glu Arg Leu Leu Glu Tyr Asp Phe Asn Lys Leu
820 825 830

Leu Val Ser Ala Val Ser Gln Ile Thr Glu Gly Phe Met Arg Lys Gln
835 840 845

Lys Tyr Lys Leu Arg His Ser Asp Tyr Glu Tyr Lys Val Ser Lys Leu
850 855 860

Val Ser Arg Leu Val Ile Gly Ser Arg Lys Thr Glu Val Asp Lys Leu
865 870 875 880

Glu Asp Asp Pro Val Asp Val Cys Phe Glu Gly Glu Glu Glu Thr Ser
885 890 895

Phe Phe Arg Ser Leu Glu Asp Lys Val Ser Ser Thr Ile Thr Arg Tyr
900 905 910

Asn Arg Gly Thr Arg Leu Asn Glu Gly Gln Gly Glu Gly Glu Phe Lys

915

920

925

Asn Thr Lys Gly Leu His His Leu Gln Ile Ile Leu Ser Gly Lys Arg
 930 935 940

Ala Tyr Leu Arg Lys Val Ile Leu Ser Glu Ile Ser Phe His Leu Val
 945 950 955 960

Glu Asp Phe Asp Pro Ser Cys Leu Thr Asn Asp Asp Met Arg Phe Ile
 965 970 975

Cys Glu Ala Val Glu Gly Ser Thr Glu Leu Ser Pro Leu Tyr Phe Thr
 980 985 990

Ser Ala Val Lys Glu Gln Cys Gly Leu Asp Glu Met Ala Arg Asn Leu
 995 1000 1005

Cys Arg Lys Phe Phe Ser Glu Gly Asp Trp Phe Ser Cys Met Lys
 1010 1015 1020

Met Ile Leu Leu Gln Met Asn Ala Asn Ala Tyr Ser Gly Lys Tyr
 1025 1030 1035

Arg His Met Gln Arg Gln Ser Leu Asn Phe Lys Phe Asp Trp Asp
 1040 1045 1050

Lys Leu Glu Glu Asp Val Arg Ile Ser Glu Arg Glu Ser Asn Ser
 1055 1060 1065

Glu Ser Leu Ser Lys Ala Leu Ser Leu Thr Lys Cys Met Ser Ala
 1070 1075 1080

Ala Leu Lys Asn Leu Cys Phe Tyr Ser Glu Glu Ser Pro Thr Ser
 1085 1090 1095

Tyr Thr Ser Val Gly Pro Asp Ser Gly Arg Leu Lys Phe Ala Leu
 1100 1105 1110

Ser Tyr Lys Glu Gln Val Gly Gly Asn Arg Glu Leu Tyr Ile Gly
 1115 1120 1125

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

1325

1330

1335

Pro Glu Glu Val Leu Val Leu Leu Glu Phe His Ser His Leu Ser
 1340 1345 1350

Gly Leu Leu Asn Lys Phe Ile Ser Pro Lys Ser Val Val Gly Arg
 1355 1360 1365

Phe Ala Ala Glu Phe Lys Ser Arg Phe Tyr Val Trp Gly Glu Glu
 1370 1375 1380

Val Pro Leu Leu Thr Lys Phe Val Ser Ala Ala Leu His Asn Val
 1385 1390 1395

Lys Cys Lys Glu Pro His Gln Leu Cys Glu Thr Ile Asp Thr Ile
 1400 1405 1410

Ala Asp Gln Ala Ile Ala Asn Gly Val Pro Val Phe Leu Val Asn
 1415 1420 1425

Cys Ile Gln Arg Arg Thr Leu Asp Leu Leu Lys Tyr Ala Asn Phe
 1430 1435 1440

Pro Leu Asp Pro Phe Leu Leu Asn Thr His Thr Asp Val Lys Asp
 1445 1450 1455

Trp Leu Asp Gly Ser Arg Gly Tyr Arg Ile Gln Arg Leu Ile Glu
 1460 1465 1470

Glu Leu Cys Pro Ser Glu Thr Lys Ile Met Arg Lys Leu Val Arg
 1475 1480 1485

Arg Leu His His Lys Leu Lys Asn Gly Glu Cys Asn Glu Glu Phe
 1490 1495 1500

Phe Leu Asp Leu Phe Asn Arg Glu Lys Lys Glu Ala Ile Leu Gln
 1505 1510 1515

Leu Gly Glu Ile Leu Gly Leu Glu Asp Asp Leu Asn Glu Leu Ala
 1520 1525 1530

Ser Ile Asn Trp Leu Asn Leu Asn Glu Met Phe Pro Leu Arg Met
1535 1540 1545

Val Leu Arg Gln Lys Val Val Tyr Pro Ser Val Met Thr Phe Gln
1550 1555 1560

Glu Glu Lys Ile Pro Ser Leu Ile Lys Thr Leu Gln Asn Lys Leu
1565 1570 1575

Cys Ser Lys Phe Thr Arg Gly Ala Gln Lys Leu Leu Ser Glu Ala
1580 1585 1590

Ile Asn Lys Ser Ala Phe Gln Ser Cys Val Ser Ser Gly Phe Ile
1595 1600 1605

Gly Leu Cys Lys Thr Leu Gly Ser Arg Cys Val Arg Asn Lys Asn
1610 1615 1620

Arg Glu Asn Met Tyr Ile Arg Lys Val Leu Glu Asp Leu Thr Met
1625 1630 1635

Asp Glu His Val Thr Arg Val His Lys Gln Asp Gly Val Met Leu
1640 1645 1650

Tyr Ile Cys Asp Lys Gln Arg His Pro Glu Ala His Arg Asp His
1655 1660 1665

Ile Asn Leu Leu Arg Pro Leu Leu Trp Asp Tyr Ile Cys Ile Ser
1670 1675 1680

Leu Ser Asn Ser Phe Glu Leu Gly Val Trp Val Leu Ala Glu Pro
1685 1690 1695

Val Lys Gly Lys Asn Glu Ser Asn Ser Ala Val Arg His Leu Asn
1700 1705 1710

Pro Cys Asp Tyr Val Ala Arg Lys Pro Glu Ser Ser Arg Leu Leu
1715 1720 1725

Glu Asp Lys Val Ser Leu Asn His Val Ile Gln Ser Val Arg Arg

1730

1735

1740

Leu Tyr Pro Lys Ile Phe Glu Asp Gln Leu Leu Pro Phe Met Ser
 1745 1750 1755

Asp Val Ser Ser Lys Asn Met Arg Trp Ser Pro Arg Ile Lys Phe
 1760 1765 1770

Leu Asp Leu Cys Val Leu Ile Asp Ile Asn Ser Glu Ser Leu Ser
 1775 1780 1785

Leu Ile Ser His Val Val Lys Trp Lys Arg Asp Glu His Tyr Thr
 1790 1795 1800

Val Leu Phe Ser Asp Leu Val Asn Ser His Gln Arg Ser Asp Ser
 1805 1810 1815

Ser Leu Val Asp Glu Phe Val Val Ser Thr Arg Asp Val Cys Lys
 1820 1825 1830

Asn Phe Leu Lys Gln Val Tyr Phe Glu Ser Phe Val Arg Glu Phe
 1835 1840 1845

Val Ala Thr Ala Arg Thr Leu Gly Asn Phe Ser Trp Phe Pro His
 1850 1855 1860

Lys Asp Met Met Pro Ser Glu Asp Gly Ala Glu Ala Leu Gly Pro
 1865 1870 1875

Phe Gln Ser Phe Ile Leu Lys Val Val Asn Lys Lys Ile Glu Arg
 1880 1885 1890

Pro Met Phe Arg Asn Asp Leu Gln Phe Gly Phe Gly Trp Phe Ser
 1895 1900 1905

Tyr Arg Val Gly Asp Val Val Cys Asn Ala Ala Met Leu Ile Lys
 1910 1915 1920

Gln Gly Leu Thr Asp Pro Lys Ala Phe Lys Ser Leu Arg Asp Leu
 1925 1930 1935

Trp	Asp	Tyr	Met	Leu	Ser	Ser	Thr	Glu	Gly	Ile	Leu	Glu	Phe	Ser
	1940					1945					1950			
Ile	Thr	Val	Asp	Phe	Thr	His	Asn	Gln	Asn	Asn	Thr	Asp	Cys	Leu
	1955					1960					1965			
Arg	Lys	Phe	Ser	Leu	Ile	Phe	Val	Val	Lys	Cys	Gln	Leu	Gln	Ser
	1970					1975					1980			
Pro	Gly	Val	Ala	Asp	Tyr	Leu	Ser	Cys	Ser	His	Phe	Phe	Lys	Gly
	1985					1990					1995			
Glu	Val	Asp	Arg	Arg	Leu	Leu	Asp	Glu	Cys	Leu	Asn	Leu	Leu	Arg
	2000					2005					2010			
Thr	Asp	Pro	Ile	Phe	Lys	Ala	Asn	Asp	Gly	Val	Phe	Asp	Ile	Arg
	2015					2020					2025			
Ser	Glu	Glu	Phe	Glu	Asp	Tyr	Met	Glu	Asp	Pro	Leu	Thr	Leu	Gly
	2030					2035					2040			
Asp	Ser	Leu	Glu	Leu	Glu	Leu	Ile	Gly	Ser	Arg	Arg	Ile	Leu	Asn
	2045					2050					2055			
Glu	Ile	Lys	Ser	Thr	Asp	Phe	Glu	Arg	Ile	Gly	Pro	Glu	Trp	Glu
	2060					2065					2070			
Pro	Val	Pro	Leu	Thr	Ile	Arg	Lys	Gly	Ala	Leu	Phe	Glu	Gly	Arg
	2075					2080					2085			
Asn	Phe	Val	Gln	Asn	Ile	Ser	Val	Lys	Leu	Glu	Thr	Lys	Asp	Met
	2090					2095					2100			
Arg	Val	Phe	Leu	Ala	Glu	Leu	Glu	Gly	Cys	Gly	Glu	Ile	Gly	Asp
	2105					2110					2115			
Val	Leu	Gly	Ser	Leu	Leu	Leu	His	Arg	Phe	Arg	Thr	Gly	Glu	His
	2120					2125					2130			
Leu	Met	Glu	Ser	Glu	Ile	Ser	Thr	Val	Leu	Gln	Glu	Leu	Cys	Met

2135

2140

2145

Asp Arg Ser Val Met Leu Thr Pro Leu Ser Phe Val Pro Asp Trp
2150 2155 2160

Phe Thr Phe Arg Asp Cys Arg Leu Cys Phe Ser Arg Ser Lys Asn
2165 2170 2175

Thr Val Met Tyr Glu Thr Thr Gly Gly Arg Phe Arg Leu Lys Gly
2180 2185 2190

Lys Ser Cys Asp Asp Trp Leu Ala Glu Arg Val Ala Glu Glu Ile
2195 2200 2205

Asp