

SEQUENCE LISTING

<110> VLP THERAPEUTICS, INC

<120> CYTOKINE IMMUNOTHERAPY

<130> 676090

<150> US63/017993

<151> 2020-04-30

<160> 24

<170> PatentIn version 3.5

<210> 1

<211> 539

<212> PRT

<213> Artificial Sequence

<220>

<223> Fused polypeptide comprising mouse IL-12B p40, linker and mouse IL-12A p35 without singal sequence (Mouse IL-12 (p40-p35))

<400> 1

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95

Thr Leu Ser His Ser His Leu Leu Leu His Lys Lys Glu Asn Gly Ile
100 105 110

Trp Ser Thr Glu Ile Leu Lys Asn Phe Lys Asn Lys Thr Phe Leu Lys
115 120 125

Cys Glu Ala Pro Asn Tyr Ser Gly Arg Phe Thr Cys Ser Trp Leu Val
130 135 140

Gln Arg Asn Met Asp Leu Lys Phe Asn Ile Lys Ser Ser Ser Ser Pro
145 150 155 160



Pro Asp Ser Arg Ala Val Thr Cys Gly Met Ala Ser Leu Ser Ala Glu
 165 170 175

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

Gln Glu Asp Val Thr Cys Pro Thr Ala Glu Glu Thr Leu Pro Ile Glu
 195 200 205

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

Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn Leu
 225 230 235 240

Gln Met Lys Pro Leu Lys Asn Ser Gln Val Glu Val Ser Trp Glu Tyr
 245 250 255

Pro Asp Ser Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Lys Phe Phe
 260 265 270

Val Arg Ile Gln Arg Lys Lys Glu Lys Met Lys Glu Thr Glu Glu Gly
 275 280 285

Cys Asn Gln Lys Gly Ala Phe Leu Val Glu Lys Thr Ser Thr Glu Val
 290 295 300

Gln Cys Lys Gly Gly Asn Val Cys Val Gln Ala Gln Asp Arg Tyr Tyr
 305 310 315 320

Asn Ser Ser Cys Ser Lys Trp Ala Cys Val Pro Cys Arg Val Arg Ser
 325 330 335

Val Pro Gly Val Gly Val Pro Gly Val Gly Arg Val Ile Pro Val Ser
 340 345 350

Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg Asn Leu Leu Lys Thr Thr
 355 360 365

Asp Asp Met Val Lys Thr Ala Arg Glu Lys Leu Lys His Tyr Ser Cys
 370 375 380

Thr Ala Glu Asp Ile Asp His Glu Asp Ile Thr Arg Asp Gln Thr Ser
 385 390 395 400

Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu His Lys Asn Glu Ser Cys
 405 410 415



Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr Arg Gly Ser Cys Leu Pro
420 425 430

Pro Gln Lys Thr Ser Leu Met Met Thr Leu Cys Leu Gly Ser Ile Tyr
435 440 445

Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe Gln Ala Ile Asn Ala Ala
450 455 460

Leu Gln Asn His Asn His Gln Gln Ile Ile Leu Asp Lys Gly Met Leu
465 470 475 480

Val Ala Ile Asp Glu Leu Met Gln Ser Leu Asn His Asn Gly Glu Thr
485 490 495

Leu Arg Gln Lys Pro Pro Val Gly Glu Ala Asp Pro Tyr Arg Val Lys
500 505 510

Met Lys Leu Cys Ile Leu Leu His Ala Phe Ser Thr Arg Val Val Thr
515 520 525

Ile Asn Arg Val Met Gly Tyr Leu Ser Ser Ala
530 535

<210> 2
<211> 336
<212> PRT
<213> Artificial Sequence

<220>
<223> Mouse IL-12B (p40)

<400> 2

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95



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

<210> 3
 <211> 193
 <212> PRT



<213> Artificial Sequence

<220>

<223> Mouse IL-12A (35p) without signal sequence

<400> 3

Arg Val Ile Pro Val Ser Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg
1 5 10 15

Asn Leu Leu Lys Thr Thr Asp Asp Met Val Lys Thr Ala Arg Glu Lys
20 25 30

Leu Lys His Tyr Ser Cys Thr Ala Glu Asp Ile Asp His Glu Asp Ile
35 40 45

Thr Arg Asp Gln Thr Ser Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu
50 55 60

His Lys Asn Glu Ser Cys Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr
65 70 75 80

Arg Gly Ser Cys Leu Pro Pro Gln Lys Thr Ser Leu Met Met Thr Leu
85 90 95

Cys Leu Gly Ser Ile Tyr Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe
100 105 110

Gln Ala Ile Asn Ala Ala Leu Gln Asn His Asn His Gln Gln Ile Ile
115 120 125

Leu Asp Lys Gly Met Leu Val Ala Ile Asp Glu Leu Met Gln Ser Leu
130 135 140

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

Asp Pro Tyr Arg Val Lys Met Lys Leu Cys Ile Leu Leu His Ala Phe
165 170 175

Ser Thr Arg Val Val Thr Ile Asn Arg Val Met Gly Tyr Leu Ser Ser
180 185 190

Ala

<210> 4

<211> 10

<212> PRT

<213> Artificial Sequence

<220>



<223> linker

<400> 4

Val Pro Gly Val Gly Val Pro Gly Val Gly
1 5 10

<210> 5

<211> 698

<212> PRT

<213> Artificial Sequence

<220>

<223> Fused pypeptide comprising mouse IL-12(p40-p35), Human IgG4CH3
and Influenza HA(flex-TM-Cyt)

<400> 5

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95

Thr Leu Ser His Ser His Leu Leu Leu His Lys Lys Glu Asn Gly Ile
100 105 110

Trp Ser Thr Glu Ile Leu Lys Asn Phe Lys Asn Lys Thr Phe Leu Lys
115 120 125

Cys Glu Ala Pro Asn Tyr Ser Gly Arg Phe Thr Cys Ser Trp Leu Val
130 135 140

Gln Arg Asn Met Asp Leu Lys Phe Asn Ile Lys Ser Ser Ser Ser Pro
145 150 155 160

Pro Asp Ser Arg Ala Val Thr Cys Gly Met Ala Ser Leu Ser Ala Glu
165 170 175

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



Gln Glu Asp Val Thr Cys Pro Thr Ala Glu Glu Thr Leu Pro Ile Glu
 195 200 205

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

Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn Leu
 225 230 235 240

Gln Met Lys Pro Leu Lys Asn Ser Gln Val Glu Val Ser Trp Glu Tyr
 245 250 255

Pro Asp Ser Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Lys Phe Phe
 260 265 270

Val Arg Ile Gln Arg Lys Lys Glu Lys Met Lys Glu Thr Glu Glu Gly
 275 280 285

Cys Asn Gln Lys Gly Ala Phe Leu Val Glu Lys Thr Ser Thr Glu Val
 290 295 300

Gln Cys Lys Gly Gly Asn Val Cys Val Gln Ala Gln Asp Arg Tyr Tyr
 305 310 315 320

Asn Ser Ser Cys Ser Lys Trp Ala Cys Val Pro Cys Arg Val Arg Ser
 325 330 335

Val Pro Gly Val Gly Val Pro Gly Val Gly Arg Val Ile Pro Val Ser
 340 345 350

Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg Asn Leu Leu Lys Thr Thr
 355 360 365

Asp Asp Met Val Lys Thr Ala Arg Glu Lys Leu Lys His Tyr Ser Cys
 370 375 380

Thr Ala Glu Asp Ile Asp His Glu Asp Ile Thr Arg Asp Gln Thr Ser
 385 390 395 400

Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu His Lys Asn Glu Ser Cys
 405 410 415

Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr Arg Gly Ser Cys Leu Pro
 420 425 430

Pro Gln Lys Thr Ser Leu Met Met Thr Leu Cys Leu Gly Ser Ile Tyr
 435 440 445



Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe Gln Ala Ile Asn Ala Ala
450 455 460

Leu Gln Asn His Asn His Gln Gln Ile Ile Leu Asp Lys Gly Met Leu
465 470 475 480

Val Ala Ile Asp Glu Leu Met Gln Ser Leu Asn His Asn Gly Glu Thr
485 490 495

Leu Arg Gln Lys Pro Pro Val Gly Glu Ala Asp Pro Tyr Arg Val Lys
500 505 510

Met Lys Leu Cys Ile Leu Leu His Ala Phe Ser Thr Arg Val Val Thr
515 520 525

Ile Asn Arg Val Met Gly Tyr Leu Ser Ser Ala Gly Ser Gly Gln Pro
530 535 540

Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Gln Glu Glu Met Thr
545 550 555 560

Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser
565 570 575

Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr
580 585 590

Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr
595 600 605

Ser Arg Leu Thr Val Asp Lys Ser Arg Trp Gln Glu Gly Asn Val Phe
610 615 620

Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys
625 630 635 640

Ser Leu Ser Leu Ser Leu Gly Lys Gly Ser Gly Val Lys Leu Glu Ser
645 650 655

Met Gly Ile Tyr Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser
660 665 670

Leu Val Leu Leu Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser
675 680 685

Asn Gly Ser Leu Gln Cys Arg Ile Cys Ile
690 695



<210> 6
<211> 107
<212> PRT
<213> Artificial Sequence

<220>
<223> human IgG4CH3

<400> 6

Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Gln Glu
1 5 10 15

Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe
20 25 30

Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu
35 40 45

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

Phe Leu Tyr Ser Arg Leu Thr Val Asp Lys Ser Arg Trp Gln Glu Gly
65 70 75 80

Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr
85 90 95

Thr Gln Lys Ser Leu Ser Leu Ser Leu Gly Lys
100 105

<210> 7
<211> 48
<212> PRT
<213> Artificial Sequence

<220>
<223> Influenza HA(flexible-TM-Cyt)

<400> 7

Gly Val Lys Leu Glu Ser Met Gly Ile Tyr Gln Ile Leu Ala Ile Tyr
1 5 10 15

Ser Thr Val Ala Ser Ser Leu Val Leu Leu Val Ser Leu Gly Ala Ile
20 25 30

Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln Cys Arg Ile Cys Ile
35 40 45

<210> 8
<211> 589
<212> PRT
<213> Artificial Sequence



<220>

<223> Fused polypeptide comprising mouse IL-12(p40-p35) and influenza
HA(Flex-TM-Cyt)

<400> 8

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95

Thr Leu Ser His Ser His Leu Leu Leu His Lys Lys Glu Asn Gly Ile
100 105 110

Trp Ser Thr Glu Ile Leu Lys Asn Phe Lys Asn Lys Thr Phe Leu Lys
115 120 125

Cys Glu Ala Pro Asn Tyr Ser Gly Arg Phe Thr Cys Ser Trp Leu Val
130 135 140

Gln Arg Asn Met Asp Leu Lys Phe Asn Ile Lys Ser Ser Ser Ser Pro
145 150 155 160

Pro Asp Ser Arg Ala Val Thr Cys Gly Met Ala Ser Leu Ser Ala Glu
165 170 175

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

Gln Glu Asp Val Thr Cys Pro Thr Ala Glu Glu Thr Leu Pro Ile Glu
195 200 205

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

Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn Leu
225 230 235 240



Gln Met Lys Pro Leu Lys Asn Ser Gln Val Glu Val Ser Trp Glu Tyr
245 250 255

Pro Asp Ser Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Lys Phe Phe
260 265 270

Val Arg Ile Gln Arg Lys Lys Glu Lys Met Lys Glu Thr Glu Glu Gly
275 280 285

Cys Asn Gln Lys Gly Ala Phe Leu Val Glu Lys Thr Ser Thr Glu Val
290 295 300

Gln Cys Lys Gly Gly Asn Val Cys Val Gln Ala Gln Asp Arg Tyr Tyr
305 310 315 320

Asn Ser Ser Cys Ser Lys Trp Ala Cys Val Pro Cys Arg Val Arg Ser
325 330 335

Val Pro Gly Val Gly Val Pro Gly Val Gly Arg Val Ile Pro Val Ser
340 345 350

Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg Asn Leu Leu Lys Thr Thr
355 360 365

Asp Asp Met Val Lys Thr Ala Arg Glu Lys Leu Lys His Tyr Ser Cys
370 375 380

Thr Ala Glu Asp Ile Asp His Glu Asp Ile Thr Arg Asp Gln Thr Ser
385 390 395 400

Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu His Lys Asn Glu Ser Cys
405 410 415

Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr Arg Gly Ser Cys Leu Pro
420 425 430

Pro Gln Lys Thr Ser Leu Met Met Thr Leu Cys Leu Gly Ser Ile Tyr
435 440 445

Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe Gln Ala Ile Asn Ala Ala
450 455 460

Leu Gln Asn His Asn His Gln Gln Ile Ile Leu Asp Lys Gly Met Leu
465 470 475 480

Val Ala Ile Asp Glu Leu Met Gln Ser Leu Asn His Asn Gly Glu Thr
485 490 495



Leu Arg Gln Lys Pro Pro Val Gly Glu Ala Asp Pro Tyr Arg Val Lys
500 505 510

Met Lys Leu Cys Ile Leu Leu His Ala Phe Ser Thr Arg Val Val Thr
515 520 525

Ile Asn Arg Val Met Gly Tyr Leu Ser Ser Ala Gly Ser Gly Val Lys
530 535 540

Leu Glu Ser Met Gly Ile Tyr Gln Ile Leu Ala Ile Tyr Ser Thr Val
545 550 555 560

Ala Ser Ser Leu Val Leu Leu Val Ser Leu Gly Ala Ile Ser Phe Trp
565 570 575

Met Cys Ser Asn Gly Ser Leu Gln Cys Arg Ile Cys Ile
580 585

<210> 9

<211> 859

<212> PRT

<213> Artificial Sequence

<220>

<223> Fused polypeptide comprising mouse IL-12 (p40-p35), human IgG4CH3
and human TLR4(TM-TIR)

<400> 9

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95

Thr Leu Ser His Ser His Leu Leu Leu His Lys Lys Glu Asn Gly Ile
100 105 110

Trp Ser Thr Glu Ile Leu Lys Asn Phe Lys Asn Lys Thr Phe Leu Lys
115 120 125



Cys Glu Ala Pro Asn Tyr Ser Gly Arg Phe Thr Cys Ser Trp Leu Val
 130 135 140

Gln Arg Asn Met Asp Leu Lys Phe Asn Ile Lys Ser Ser Ser Ser Pro
 145 150 155 160

Pro Asp Ser Arg Ala Val Thr Cys Gly Met Ala Ser Leu Ser Ala Glu
 165 170 175

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

Gln Glu Asp Val Thr Cys Pro Thr Ala Glu Glu Thr Leu Pro Ile Glu
 195 200 205

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

Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn Leu
 225 230 235 240

Gln Met Lys Pro Leu Lys Asn Ser Gln Val Glu Val Ser Trp Glu Tyr
 245 250 255

Pro Asp Ser Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Lys Phe Phe
 260 265 270

Val Arg Ile Gln Arg Lys Lys Glu Lys Met Lys Glu Thr Glu Glu Gly
 275 280 285

Cys Asn Gln Lys Gly Ala Phe Leu Val Glu Lys Thr Ser Thr Glu Val
 290 295 300

Gln Cys Lys Gly Gly Asn Val Cys Val Gln Ala Gln Asp Arg Tyr Tyr
 305 310 315 320

Asn Ser Ser Cys Ser Lys Trp Ala Cys Val Pro Cys Arg Val Arg Ser
 325 330 335

Val Pro Gly Val Gly Val Pro Gly Val Gly Arg Val Ile Pro Val Ser
 340 345 350

Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg Asn Leu Leu Lys Thr Thr
 355 360 365

Asp Asp Met Val Lys Thr Ala Arg Glu Lys Leu Lys His Tyr Ser Cys
 370 375 380



Thr Ala Glu Asp Ile Asp His Glu Asp Ile Thr Arg Asp Gln Thr Ser
385 390 395 400

Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu His Lys Asn Glu Ser Cys
405 410 415

Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr Arg Gly Ser Cys Leu Pro
420 425 430

Pro Gln Lys Thr Ser Leu Met Met Thr Leu Cys Leu Gly Ser Ile Tyr
435 440 445

Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe Gln Ala Ile Asn Ala Ala
450 455 460

Leu Gln Asn His Asn His Gln Gln Ile Ile Leu Asp Lys Gly Met Leu
465 470 475 480

Val Ala Ile Asp Glu Leu Met Gln Ser Leu Asn His Asn Gly Glu Thr
485 490 495

Leu Arg Gln Lys Pro Pro Val Gly Glu Ala Asp Pro Tyr Arg Val Lys
500 505 510

Met Lys Leu Cys Ile Leu Leu His Ala Phe Ser Thr Arg Val Val Thr
515 520 525

Ile Asn Arg Val Met Gly Tyr Leu Ser Ser Ala Gly Ser Gly Gln Pro
530 535 540

Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Gln Glu Glu Met Thr
545 550 555 560

Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr Pro Ser
565 570 575

Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn Asn Tyr
580 585 590

Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe Leu Tyr
595 600 605

Ser Arg Leu Thr Val Asp Lys Ser Arg Trp Gln Glu Gly Asn Val Phe
610 615 620

Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr Gln Lys
625 630 635 640



Ser Leu Ser Leu Ser Leu Gly Lys Gly Ser Lys Thr Ile Ile Gly Val
645 650 655

Ser Val Leu Ser Val Leu Val Val Ser Val Val Ala Val Leu Val Tyr
660 665 670

Lys Phe Tyr Phe His Leu Met Leu Leu Ala Gly Cys Ile Lys Tyr Gly
675 680 685

Arg Gly Glu Asn Ile Tyr Asp Ala Phe Val Ile Tyr Ser Ser Gln Asp
690 695 700

Glu Asp Trp Val Arg Asn Glu Leu Val Lys Asn Leu Glu Glu Gly Val
705 710 715 720

Pro Pro Phe Gln Leu Cys Leu His Tyr Arg Asp Phe Ile Pro Gly Val
725 730 735

Ala Ile Ala Ala Asn Ile Ile His Glu Gly Phe His Lys Ser Arg Lys
740 745 750

Val Ile Val Val Val Ser Gln His Phe Ile Gln Ser Arg Trp Cys Ile
755 760 765

Phe Glu Tyr Glu Ile Ala Gln Thr Trp Gln Phe Leu Ser Ser Arg Ala
770 775 780

Gly Ile Ile Phe Ile Val Leu Gln Lys Val Glu Lys Thr Leu Leu Arg
785 790 795 800

Gln Gln Val Glu Leu Tyr Arg Leu Leu Ser Arg Asn Thr Tyr Leu Glu
805 810 815

Trp Glu Asp Ser Val Leu Gly Arg His Ile Phe Trp Arg Arg Leu Arg
820 825 830

Lys Ala Leu Leu Asp Gly Lys Ser Trp Asn Pro Glu Gly Thr Val Gly
835 840 845

Thr Gly Cys Asn Trp Gln Glu Ala Thr Ser Ile
850 855

<210> 10
<211> 209
<212> PRT
<213> Artificial Sequence

<220>
<223> human TLR4(TM-TIR)

<400> 10



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

Ile

<210> 11
 <211> 750
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fused polypeptide comprising mouse IL-12(p40-p35) and human
 TLR4(TM-TIR)



<400> 11

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95

Thr Leu Ser His Ser His Leu Leu Leu His Lys Lys Glu Asn Gly Ile
100 105 110

Trp Ser Thr Glu Ile Leu Lys Asn Phe Lys Asn Lys Thr Phe Leu Lys
115 120 125

Cys Glu Ala Pro Asn Tyr Ser Gly Arg Phe Thr Cys Ser Trp Leu Val
130 135 140

Gln Arg Asn Met Asp Leu Lys Phe Asn Ile Lys Ser Ser Ser Ser Pro
145 150 155 160

Pro Asp Ser Arg Ala Val Thr Cys Gly Met Ala Ser Leu Ser Ala Glu
165 170 175

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

Gln Glu Asp Val Thr Cys Pro Thr Ala Glu Glu Thr Leu Pro Ile Glu
195 200 205

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

Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn Leu
225 230 235 240

Gln Met Lys Pro Leu Lys Asn Ser Gln Val Glu Val Ser Trp Glu Tyr
245 250 255



Pro Asp Ser Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Lys Phe Phe
 260 265 270

Val Arg Ile Gln Arg Lys Lys Glu Lys Met Lys Glu Thr Glu Glu Gly
 275 280 285

Cys Asn Gln Lys Gly Ala Phe Leu Val Glu Lys Thr Ser Thr Glu Val
 290 295 300

Gln Cys Lys Gly Gly Asn Val Cys Val Gln Ala Gln Asp Arg Tyr Tyr
 305 310 315 320

Asn Ser Ser Cys Ser Lys Trp Ala Cys Val Pro Cys Arg Val Arg Ser
 325 330 335

Val Pro Gly Val Gly Val Pro Gly Val Gly Arg Val Ile Pro Val Ser
 340 345 350

Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg Asn Leu Leu Lys Thr Thr
 355 360 365

Asp Asp Met Val Lys Thr Ala Arg Glu Lys Leu Lys His Tyr Ser Cys
 370 375 380

Thr Ala Glu Asp Ile Asp His Glu Asp Ile Thr Arg Asp Gln Thr Ser
 385 390 395 400

Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu His Lys Asn Glu Ser Cys
 405 410 415

Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr Arg Gly Ser Cys Leu Pro
 420 425 430

Pro Gln Lys Thr Ser Leu Met Met Thr Leu Cys Leu Gly Ser Ile Tyr
 435 440 445

Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe Gln Ala Ile Asn Ala Ala
 450 455 460

Leu Gln Asn His Asn His Gln Gln Ile Ile Leu Asp Lys Gly Met Leu
 465 470 475 480

Val Ala Ile Asp Glu Leu Met Gln Ser Leu Asn His Asn Gly Glu Thr
 485 490 495

Leu Arg Gln Lys Pro Pro Val Gly Glu Ala Asp Pro Tyr Arg Val Lys
 500 505 510



Met Lys Leu Cys Ile Leu Leu His Ala Phe Ser Thr Arg Val Val Thr
515 520 525

Ile Asn Arg Val Met Gly Tyr Leu Ser Ser Ala Gly Ser Lys Thr Ile
530 535 540

Ile Gly Val Ser Val Leu Ser Val Leu Val Val Ser Val Val Ala Val
545 550 555 560

Leu Val Tyr Lys Phe Tyr Phe His Leu Met Leu Leu Ala Gly Cys Ile
565 570 575

Lys Tyr Gly Arg Gly Glu Asn Ile Tyr Asp Ala Phe Val Ile Tyr Ser
580 585 590

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

Glu Gly Val Pro Pro Phe Gln Leu Cys Leu His Tyr Arg Asp Phe Ile
610 615 620

Pro Gly Val Ala Ile Ala Ala Asn Ile Ile His Glu Gly Phe His Lys
625 630 635 640

Ser Arg Lys Val Ile Val Val Val Ser Gln His Phe Ile Gln Ser Arg
645 650 655

Trp Cys Ile Phe Glu Tyr Glu Ile Ala Gln Thr Trp Gln Phe Leu Ser
660 665 670

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

Leu Leu Arg Gln Gln Val Glu Leu Tyr Arg Leu Leu Ser Arg Asn Thr
690 695 700

Tyr Leu Glu Trp Glu Asp Ser Val Leu Gly Arg His Ile Phe Trp Arg
705 710 715 720

Arg Leu Arg Lys Ala Leu Leu Asp Gly Lys Ser Trp Asn Pro Glu Gly
725 730 735

Thr Val Gly Thr Gly Cys Asn Trp Gln Glu Ala Thr Ser Ile
740 745 750

<210> 12

<211> 698

<212> PRT

<213> Artificial Sequence



<220>

<223> Fused polypeptide comprising mouse IL-12(p40-p35), mouse IgG4CH3
and influenza HA(Flex-TM-Cyt)

<400> 12

Met Ala Cys Pro Gln Lys Leu Thr Ile Ser Trp Phe Ala Ile Val Leu
1 5 10 15

Leu Val Ser Pro Leu Met Ala Met Trp Glu Leu Glu Lys Asp Val Tyr
20 25 30

Val Val Glu Val Asp Trp Thr Pro Asp Ala Pro Gly Glu Thr Val Asn
35 40 45

Leu Thr Cys Asp Thr Pro Glu Glu Asp Asp Ile Thr Trp Thr Ser Asp
50 55 60

Gln Arg His Gly Val Ile Gly Ser Gly Lys Thr Leu Thr Ile Thr Val
65 70 75 80

Lys Glu Phe Leu Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu
85 90 95

Thr Leu Ser His Ser His Leu Leu Leu His Lys Lys Glu Asn Gly Ile
100 105 110

Trp Ser Thr Glu Ile Leu Lys Asn Phe Lys Asn Lys Thr Phe Leu Lys
115 120 125

Cys Glu Ala Pro Asn Tyr Ser Gly Arg Phe Thr Cys Ser Trp Leu Val
130 135 140

Gln Arg Asn Met Asp Leu Lys Phe Asn Ile Lys Ser Ser Ser Ser Pro
145 150 155 160

Pro Asp Ser Arg Ala Val Thr Cys Gly Met Ala Ser Leu Ser Ala Glu
165 170 175

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

Gln Glu Asp Val Thr Cys Pro Thr Ala Glu Glu Thr Leu Pro Ile Glu
195 200 205

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

Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn Leu
225 230 235 240



Gln Met Lys Pro Leu Lys Asn Ser Gln Val Glu Val Ser Trp Glu Tyr
 245 250 255

Pro Asp Ser Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Lys Phe Phe
 260 265 270

Val Arg Ile Gln Arg Lys Lys Glu Lys Met Lys Glu Thr Glu Glu Gly
 275 280 285

Cys Asn Gln Lys Gly Ala Phe Leu Val Glu Lys Thr Ser Thr Glu Val
 290 295 300

Gln Cys Lys Gly Gly Asn Val Cys Val Gln Ala Gln Asp Arg Tyr Tyr
 305 310 315 320

Asn Ser Ser Cys Ser Lys Trp Ala Cys Val Pro Cys Arg Val Arg Ser
 325 330 335

Val Pro Gly Val Gly Val Pro Gly Val Gly Arg Val Ile Pro Val Ser
 340 345 350

Gly Pro Ala Arg Cys Leu Ser Gln Ser Arg Asn Leu Leu Lys Thr Thr
 355 360 365

Asp Asp Met Val Lys Thr Ala Arg Glu Lys Leu Lys His Tyr Ser Cys
 370 375 380

Thr Ala Glu Asp Ile Asp His Glu Asp Ile Thr Arg Asp Gln Thr Ser
 385 390 395 400

Thr Leu Lys Thr Cys Leu Pro Leu Glu Leu His Lys Asn Glu Ser Cys
 405 410 415

Leu Ala Thr Arg Glu Thr Ser Ser Thr Thr Arg Gly Ser Cys Leu Pro
 420 425 430

Pro Gln Lys Thr Ser Leu Met Met Thr Leu Cys Leu Gly Ser Ile Tyr
 435 440 445

Glu Asp Leu Lys Met Tyr Gln Thr Glu Phe Gln Ala Ile Asn Ala Ala
 450 455 460

Leu Gln Asn His Asn His Gln Gln Ile Ile Leu Asp Lys Gly Met Leu
 465 470 475 480

Val Ala Ile Asp Glu Leu Met Gln Ser Leu Asn His Asn Gly Glu Thr
 485 490 495



Leu Arg Gln Lys Pro Pro Val Gly Glu Ala Asp Pro Tyr Arg Val Lys
 500 505 510

Met Lys Leu Cys Ile Leu Leu His Ala Phe Ser Thr Arg Val Val Thr
 515 520 525

Ile Asn Arg Val Met Gly Tyr Leu Ser Ser Ala Gly Ser Gly Arg Pro
 530 535 540

Lys Ala Pro Gln Val Tyr Thr Ile Pro Pro Pro Lys Glu Gln Met Ala
 545 550 555 560

Lys Asp Lys Val Ser Leu Thr Cys Met Ile Thr Asn Phe Phe Pro Glu
 565 570 575

Asp Ile Thr Val Glu Trp Gln Trp Asn Gly Gln Pro Ala Glu Asn Tyr
 580 585 590

Lys Asn Thr Gln Pro Ile Met Asp Thr Asp Gly Ser Tyr Phe Val Tyr
 595 600 605

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

Thr Cys Ser Val Leu His Glu Gly Leu His Asn His His Thr Glu Lys
 625 630 635 640

Ser Leu Ser His Ser Pro Gly Lys Gly Ser Gly Val Lys Leu Glu Ser
 645 650 655

Met Gly Ile Tyr Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser
 660 665 670

Leu Val Leu Leu Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser
 675 680 685

Asn Gly Ser Leu Gln Cys Arg Ile Cys Ile
 690 695

<210> 13
 <211> 106
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Mouse IgG4CH3

<400> 13

Gly Arg Pro Lys Ala Pro Gln Val Tyr Thr Ile Pro Pro Pro Lys Glu
 1 5 10 15



Gln Met Ala Lys Asp Lys Val Ser Leu Thr Cys Met Ile Thr Asn Phe
 20 25 30

Phe Pro Glu Asp Ile Thr Val Glu Trp Gln Trp Asn Gly Gln Pro Ala
 35 40 45

Glu Asn Tyr Lys Asn Thr Gln Pro Ile Met Asp Thr Asp Gly Ser Tyr
 50 55 60

Phe Val Tyr Ser Lys Leu Asn Val Gln Lys Ser Asn Trp Glu Ala Gly
 65 70 75 80

Asn Thr Phe Thr Cys Ser Val Leu His Glu Gly Leu His Asn His His
 85 90 95

Thr Glu Lys Ser Leu Ser His Ser Pro Gly
 100 105

<210> 14
 <211> 535
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fused polypeptide comprising human IL-12B p40, linker and human
 IL-12A p35 without signal sequence (Human IL-12(p40-p35))

<400> 14

Met Cys His Gln Gln Leu Val Ile Ser Trp Phe Ser Leu Val Phe Leu
 1 5 10 15

Ala Ser Pro Leu Val Ala Ile Trp Glu Leu Lys Lys Asp Val Tyr Val
 20 25 30

Val Glu Leu Asp Trp Tyr Pro Asp Ala Pro Gly Glu Met Val Val Leu
 35 40 45

Thr Cys Asp Thr Pro Glu Glu Asp Gly Ile Thr Trp Thr Leu Asp Gln
 50 55 60

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

Glu Phe Gly Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu Val
 85 90 95

Leu Ser His Ser Leu Leu Leu Leu His Lys Lys Glu Asp Gly Ile Trp
 100 105 110



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

Leu Arg Cys Glu Ala Lys Asn Tyr Ser Gly Arg Phe Thr Cys Trp Trp
130 135 140

Leu Thr Thr Ile Ser Thr Asp Leu Thr Phe Ser Val Lys Ser Ser Arg
145 150 155 160

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

Ala Glu Arg Val Arg Gly Asp Asn Lys Glu Tyr Glu Tyr Ser Val Glu
180 185 190

Cys Gln Glu Asp Ser Ala Cys Pro Ala Ala Glu Glu Ser Leu Pro Ile
195 200 205

Glu Val Met Val Asp Ala Val His Lys Leu Lys Tyr Glu Asn Tyr Thr
210 215 220

Ser Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn
225 230 235 240

Leu Gln Leu Lys Pro Leu Lys Asn Ser Arg Gln Val Glu Val Ser Trp
245 250 255

Glu Tyr Pro Asp Thr Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Thr
260 265 270

Phe Cys Val Gln Val Gln Gly Lys Ser Lys Arg Glu Lys Lys Asp Arg
275 280 285

Val Phe Thr Asp Lys Thr Ser Ala Thr Val Ile Cys Arg Lys Asn Ala
290 295 300

Ser Ile Ser Val Arg Ala Gln Asp Arg Tyr Tyr Ser Ser Ser Trp Ser
305 310 315 320

Glu Trp Ala Ser Val Pro Cys Ser Val Pro Gly Val Gly Val Pro Gly
325 330 335

Val Gly Arg Asn Leu Pro Val Ala Thr Pro Asp Pro Gly Met Phe Pro
340 345 350

Cys Leu His His Ser Gln Asn Leu Leu Arg Ala Val Ser Asn Met Leu
355 360 365

Gln Lys Ala Arg Gln Thr Leu Glu Phe Tyr Pro Cys Thr Ser Glu Glu



370

375

380

Ile Asp His Glu Asp Ile Thr Lys Asp Lys Thr Ser Thr Val Glu Ala
385 390 395 400

Cys Leu Pro Leu Glu Leu Thr Lys Asn Glu Ser Cys Leu Asn Ser Arg
405 410 415

Glu Thr Ser Phe Ile Thr Asn Gly Ser Cys Leu Ala Ser Arg Lys Thr
420 425 430

Ser Phe Met Met Ala Leu Cys Leu Ser Ser Ile Tyr Glu Asp Leu Lys
435 440 445

Met Tyr Gln Val Glu Phe Lys Thr Met Asn Ala Lys Leu Leu Met Asp
450 455 460

Pro Lys Arg Gln Ile Phe Leu Asp Gln Asn Met Leu Ala Val Ile Asp
465 470 475 480

Glu Leu Met Gln Ala Leu Asn Phe Asn Ser Glu Thr Val Pro Gln Lys
485 490 495

Ser Ser Leu Glu Glu Pro Asp Phe Tyr Lys Thr Lys Ile Lys Leu Cys
500 505 510

Ile Leu Leu His Ala Phe Arg Ile Arg Ala Val Thr Ile Asp Arg Val
515 520 525

Met Ser Tyr Leu Asn Ala Ser
530 535

<210> 15

<211> 328

<212> PRT

<213> Artificial Sequence

<220>

<223> Human IL-12B(p40)

<400> 15

Met Cys His Gln Gln Leu Val Ile Ser Trp Phe Ser Leu Val Phe Leu
1 5 10 15

Ala Ser Pro Leu Val Ala Ile Trp Glu Leu Lys Lys Asp Val Tyr Val
20 25 30

Val Glu Leu Asp Trp Tyr Pro Asp Ala Pro Gly Glu Met Val Val Leu
35 40 45



Thr Cys Asp Thr Pro Glu Glu Asp Gly Ile Thr Trp Thr Leu Asp Gln
50 55 60

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

Glu Phe Gly Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu Val
85 90 95

Leu Ser His Ser Leu Leu Leu Leu His Lys Lys Glu Asp Gly Ile Trp
100 105 110

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

Leu Arg Cys Glu Ala Lys Asn Tyr Ser Gly Arg Phe Thr Cys Trp Trp
130 135 140

Leu Thr Thr Ile Ser Thr Asp Leu Thr Phe Ser Val Lys Ser Ser Arg
145 150 155 160

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

Ala Glu Arg Val Arg Gly Asp Asn Lys Glu Tyr Glu Tyr Ser Val Glu
180 185 190

Cys Gln Glu Asp Ser Ala Cys Pro Ala Ala Glu Glu Ser Leu Pro Ile
195 200 205

Glu Val Met Val Asp Ala Val His Lys Leu Lys Tyr Glu Asn Tyr Thr
210 215 220

Ser Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn
225 230 235 240

Leu Gln Leu Lys Pro Leu Lys Asn Ser Arg Gln Val Glu Val Ser Trp
245 250 255

Glu Tyr Pro Asp Thr Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Thr
260 265 270

Phe Cys Val Gln Val Gln Gly Lys Ser Lys Arg Glu Lys Lys Asp Arg
275 280 285

Val Phe Thr Asp Lys Thr Ser Ala Thr Val Ile Cys Arg Lys Asn Ala
290 295 300

Ser Ile Ser Val Arg Ala Gln Asp Arg Tyr Tyr Ser Ser Ser Trp Ser



305 310 315 320

Glu Trp Ala Ser Val Pro Cys Ser
325

<210> 16
<211> 22
<212> PRT
<213> Artificial Sequence

<220>
<223> Signal sequence of human IL-12A (p35)

<400> 16

Met Cys Pro Ala Arg Ser Leu Leu Leu Val Ala Thr Leu Val Leu Leu
1 5 10 15

Asp His Leu Ser Leu Ala
20

<210> 17
<211> 197
<212> PRT
<213> Artificial Sequence

<220>
<223> Human IL-12A (p35) without signal sequence

<400> 17

Arg Asn Leu Pro Val Ala Thr Pro Asp Pro Gly Met Phe Pro Cys Leu
1 5 10 15

His His Ser Gln Asn Leu Leu Arg Ala Val Ser Asn Met Leu Gln Lys
20 25 30

Ala Arg Gln Thr Leu Glu Phe Tyr Pro Cys Thr Ser Glu Glu Ile Asp
35 40 45

His Glu Asp Ile Thr Lys Asp Lys Thr Ser Thr Val Glu Ala Cys Leu
50 55 60

Pro Leu Glu Leu Thr Lys Asn Glu Ser Cys Leu Asn Ser Arg Glu Thr
65 70 75 80

Ser Phe Ile Thr Asn Gly Ser Cys Leu Ala Ser Arg Lys Thr Ser Phe
85 90 95

Met Met Ala Leu Cys Leu Ser Ser Ile Tyr Glu Asp Leu Lys Met Tyr
100 105 110

Gln Val Glu Phe Lys Thr Met Asn Ala Lys Leu Leu Met Asp Pro Lys
115 120 125



Arg Gln Ile Phe Leu Asp Gln Asn Met Leu Ala Val Ile Asp Glu Leu
 130 135 140

Met Gln Ala Leu Asn Phe Asn Ser Glu Thr Val Pro Gln Lys Ser Ser
 145 150 155 160

Leu Glu Glu Pro Asp Phe Tyr Lys Thr Lys Ile Lys Leu Cys Ile Leu
 165 170 175

Leu His Ala Phe Arg Ile Arg Ala Val Thr Ile Asp Arg Val Met Ser
 180 185 190

Tyr Leu Asn Ala Ser
 195

<210> 18
 <211> 694
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Fused polypeptide comprising human IL-12(p40-p35) , human
 IgG4CH3 and Influenza HA (Flex-TM-Cyt)

<400> 18

Met Cys His Gln Gln Leu Val Ile Ser Trp Phe Ser Leu Val Phe Leu
 1 5 10 15

Ala Ser Pro Leu Val Ala Ile Trp Glu Leu Lys Lys Asp Val Tyr Val
 20 25 30

Val Glu Leu Asp Trp Tyr Pro Asp Ala Pro Gly Glu Met Val Val Leu
 35 40 45

Thr Cys Asp Thr Pro Glu Glu Asp Gly Ile Thr Trp Thr Leu Asp Gln
 50 55 60

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

Glu Phe Gly Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu Val
 85 90 95

Leu Ser His Ser Leu Leu Leu Leu His Lys Lys Glu Asp Gly Ile Trp
 100 105 110

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



Leu Arg Cys Glu Ala Lys Asn Tyr Ser Gly Arg Phe Thr Cys Trp Trp
130 135 140

Leu Thr Thr Ile Ser Thr Asp Leu Thr Phe Ser Val Lys Ser Ser Arg
145 150 155 160

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

Ala Glu Arg Val Arg Gly Asp Asn Lys Glu Tyr Glu Tyr Ser Val Glu
180 185 190

Cys Gln Glu Asp Ser Ala Cys Pro Ala Ala Glu Glu Ser Leu Pro Ile
195 200 205

Glu Val Met Val Asp Ala Val His Lys Leu Lys Tyr Glu Asn Tyr Thr
210 215 220

Ser Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn
225 230 235 240

Leu Gln Leu Lys Pro Leu Lys Asn Ser Arg Gln Val Glu Val Ser Trp
245 250 255

Glu Tyr Pro Asp Thr Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Thr
260 265 270

Phe Cys Val Gln Val Gln Gly Lys Ser Lys Arg Glu Lys Lys Asp Arg
275 280 285

Val Phe Thr Asp Lys Thr Ser Ala Thr Val Ile Cys Arg Lys Asn Ala
290 295 300

Ser Ile Ser Val Arg Ala Gln Asp Arg Tyr Tyr Ser Ser Ser Trp Ser
305 310 315 320

Glu Trp Ala Ser Val Pro Cys Ser Val Pro Gly Val Gly Val Pro Gly
325 330 335

Val Gly Arg Asn Leu Pro Val Ala Thr Pro Asp Pro Gly Met Phe Pro
340 345 350

Cys Leu His His Ser Gln Asn Leu Leu Arg Ala Val Ser Asn Met Leu
355 360 365

Gln Lys Ala Arg Gln Thr Leu Glu Phe Tyr Pro Cys Thr Ser Glu Glu
370 375 380

Ile Asp His Glu Asp Ile Thr Lys Asp Lys Thr Ser Thr Val Glu Ala



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



Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
660 665 670

Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu
675 680 685

Gln Cys Arg Ile Cys Ile
690

<210> 19
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> SG promoter

<400> 19
cctgaatgga ctacgacata gtctagtccg ccaag 35

<210> 20
<211> 44
<212> DNA
<213> Artificial Sequence

<220>
<223> 5'UTR

<400> 20
ataggcggcg catgagagaa gcccagacca attacctacc caaa 44

<210> 21
<211> 125
<212> DNA
<213> Artificial Sequence

<220>
<223> 3'UTR

<400> 21
gcgatcgcat acagcagcaa ttggcaagct gcttacatag aactcgcggc gattggcatg 60

ccgccttaaa atttttatit tttttttctt ttcttttccg aatcggattt tgtttttaat 120
atttc 125

<210> 22
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> poly A tail

<400> 22
aaaaaaaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa aaaaa 55



<210> 23
<211> 2493
<212> PRT
<213> Artificial Sequence; poly A

<220>
<223> VEEV TC-83 Replicon nsP1-4

<220>
<221> misc_feature
<222> (1880)..(1880)
<223> Xaa can be any naturally occurring amino acid

<400> 23

Met Glu Lys Val His Val Asp Ile Glu Glu Asp Ser Pro Phe Leu Arg
1 5 10 15

Ala Leu Gln Arg Ser Phe Pro Gln Phe Glu Val Glu Ala Lys Gln Val
20 25 30

Thr Asp Asn Asp His Ala Asn Ala Arg Ala Phe Ser His Leu Ala Ser
35 40 45

Lys Leu Ile Glu Thr Glu Val Asp Pro Ser Asp Thr Ile Leu Asp Ile
50 55 60

Gly Ser Ala Pro Ala Arg Arg Met Tyr Ser Lys His Lys Tyr His Cys
65 70 75 80

Ile Cys Pro Met Arg Cys Ala Glu Asp Pro Asp Arg Leu Tyr Lys Tyr
85 90 95

Ala Thr Lys Leu Lys Lys Asn Cys Lys Glu Ile Thr Asp Lys Glu Leu
100 105 110

Asp Lys Lys Met Lys Glu Leu Ala Ala Val Met Ser Asp Pro Asp Leu
115 120 125

Glu Thr Glu Thr Met Cys Leu His Asp Asp Glu Ser Cys Arg Tyr Glu
130 135 140

Gly Gln Val Ala Val Tyr Gln Asp Val Tyr Ala Val Asp Gly Pro Thr
145 150 155 160

Ser Leu Tyr His Gln Ala Asn Lys Gly Val Arg Val Ala Tyr Trp Ile
165 170 175

Gly Phe Asp Thr Thr Pro Phe Met Phe Lys Asn Leu Ala Gly Ala Tyr
180 185 190



Pro Ser Tyr Ser Thr Asn Trp Ala Asp Glu Thr Val Leu Thr Ala Arg
195 200 205

Asn Ile Gly Leu Cys Ser Ser Asp Val Met Glu Arg Ser Arg Arg Gly
210 215 220

Met Ser Ile Leu Arg Lys Lys Tyr Leu Lys Pro Ser Asn Asn Val Leu
225 230 235 240

Phe Ser Val Gly Ser Thr Ile Tyr His Glu Lys Arg Asp Leu Leu Arg
245 250 255

Ser Trp His Leu Pro Ser Val Phe His Leu Arg Gly Lys Gln Asn Tyr
260 265 270

Thr Cys Arg Cys Glu Thr Ile Val Ser Cys Asp Gly Tyr Val Val Lys
275 280 285

Arg Ile Ala Ile Ser Pro Gly Leu Tyr Gly Lys Pro Ser Gly Tyr Ala
290 295 300

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

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

Thr Leu Cys Asp Gln Met Thr Gly Ile Leu Ala Thr Asp Val Ser Ala
340 345 350

Asp Asp Ala Gln Lys Leu Leu Val Gly Leu Asn Gln Arg Ile Val Val
355 360 365

Asn Gly Arg Thr Gln Arg Asn Thr Asn Thr Met Lys Asn Tyr Leu Leu
370 375 380

Pro Val Val Ala Gln Ala Phe Ala Arg Trp Ala Lys Glu Tyr Lys Glu
385 390 395 400

Asp Gln Glu Asp Glu Arg Pro Leu Gly Leu Arg Asp Arg Gln Leu Val
405 410 415

Met Gly Cys Cys Trp Ala Phe Arg Arg His Lys Ile Thr Ser Ile Tyr
420 425 430

Lys Arg Pro Asp Thr Gln Thr Ile Ile Lys Val Asn Ser Asp Phe His
435 440 445

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



450

455

460

Arg Thr Arg Ile Arg Lys Met Leu Glu Glu His Lys Glu Pro Ser Pro
 465 470 475 480

Leu Ile Thr Ala Glu Asp Ile Gln Glu Ala Lys Cys Ala Ala Asp Glu
 485 490 495

Ala Lys Glu Val Arg Glu Ala Glu Glu Leu Arg Ala Ala Leu Pro Pro
 500 505 510

Leu Ala Ala Asp Phe Glu Glu Pro Thr Leu Glu Ala Asp Val Asp Leu
 515 520 525

Met Leu Gln Glu Ala Gly Ala Gly Ser Val Glu Thr Pro Arg Gly Leu
 530 535 540

Ile Lys Val Thr Ser Tyr Ala Gly Glu Asp Lys Ile Gly Ser Tyr Ala
 545 550 555 560

Val Leu Ser Pro Gln Ala Val Leu Lys Ser Glu Lys Leu Ser Cys Ile
 565 570 575

His Pro Leu Ala Glu Gln Val Ile Val Ile Thr His Ser Gly Arg Lys
 580 585 590

Gly Arg Tyr Ala Val Glu Pro Tyr His Gly Lys Val Val Val Pro Glu
 595 600 605

Gly His Ala Ile Pro Val Gln Asp Phe Gln Ala Leu Ser Glu Ser Ala
 610 615 620

Thr Ile Val Tyr Asn Glu Arg Glu Phe Val Asn Arg Tyr Leu His His
 625 630 635 640

Ile Ala Thr His Gly Gly Ala Leu Asn Thr Asp Glu Glu Tyr Tyr Lys
 645 650 655

Thr Val Lys Pro Ser Glu His Asp Gly Glu Tyr Leu Tyr Asp Ile Asp
 660 665 670

Arg Lys Gln Cys Val Lys Lys Glu Leu Val Thr Gly Leu Gly Leu Thr
 675 680 685

Gly Glu Leu Val Asp Pro Pro Phe His Glu Phe Ala Tyr Glu Ser Leu
 690 695 700

Arg Thr Arg Pro Ala Ala Pro Tyr Gln Val Pro Thr Ile Gly Val Tyr
 705 710 715 720



Gly Val Pro Gly Ser Gly Lys Ser Gly Ile Ile Lys Ser Ala Val Thr
 725 730 735

Lys Lys Asp Leu Val Val Ser Ala Lys Lys Glu Asn Cys Ala Glu Ile
 740 745 750

Ile Arg Asp Val Lys Lys Met Lys Gly Leu Asp Val Asn Ala Arg Thr
 755 760 765

Val Asp Ser Val Leu Leu Asn Gly Cys Lys His Pro Val Glu Thr Leu
 770 775 780

Tyr Ile Asp Glu Ala Phe Ala Cys His Ala Gly Thr Leu Arg Ala Leu
 785 790 795 800

Ile Ala Ile Ile Arg Pro Lys Lys Ala Val Leu Cys Gly Asp Pro Lys
 805 810 815

Gln Cys Gly Phe Phe Asn Met Met Cys Leu Lys Val His Phe Asn His
 820 825 830

Glu Ile Cys Thr Gln Val Phe His Lys Ser Ile Ser Arg Arg Cys Thr
 835 840 845

Lys Ser Val Thr Ser Val Val Ser Thr Leu Phe Tyr Asp Lys Arg Met
 850 855 860

Arg Thr Thr Asn Pro Lys Glu Thr Lys Ile Val Ile Asp Thr Thr Gly
 865 870 875 880

Ser Thr Lys Pro Lys Gln Asp Asp Leu Ile Leu Thr Cys Phe Arg Gly
 885 890 895

Trp Val Lys Gln Leu Gln Ile Asp Tyr Lys Gly Asn Glu Ile Met Thr
 900 905 910

Ala Ala Ala Ser Gln Gly Leu Thr Arg Lys Gly Val Tyr Ala Val Arg
 915 920 925

Tyr Lys Val Asn Glu Asn Pro Leu Tyr Ala Pro Thr Ser Glu His Val
 930 935 940

Asn Val Leu Leu Thr Arg Thr Glu Asp Arg Ile Val Trp Lys Thr Leu
 945 950 955 960

Ala Gly Asp Pro Trp Ile Lys Ile Leu Thr Ala Lys Tyr Pro Gly Asn
 965 970 975



Phe Thr Ala Thr Ile Glu Glu Trp Gln Ala Glu His Asp Ala Ile Met
980 985 990

Arg His Ile Leu Glu Arg Pro Asp Pro Thr Asp Val Phe Gln Asn Lys
995 1000 1005

Ala Asn Val Cys Trp Ala Lys Ala Leu Val Pro Val Leu Lys Thr
1010 1015 1020

Ala Gly Ile Asp Met Thr Thr Glu Gln Trp Asn Thr Val Asp Tyr
1025 1030 1035

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

Leu Cys Val Arg Phe Phe Gly Leu Asp Leu Asp Ser Gly Leu Phe
1055 1060 1065

Ser Ala Pro Thr Val Pro Leu Ser Ile Arg Asn Asn His Trp Asp
1070 1075 1080

Asn Ser Pro Ser Pro Asn Met Tyr Gly Leu Asn Lys Glu Val Val
1085 1090 1095

Arg Gln Leu Ser Arg Arg Tyr Pro Gln Leu Pro Arg Ala Val Ala
1100 1105 1110

Thr Gly Arg Val Tyr Asp Met Asn Thr Gly Thr Leu Arg Asn Tyr
1115 1120 1125

Asp Pro Arg Ile Asn Leu Val Pro Val Asn Arg Arg Leu Pro His
1130 1135 1140

Ala Leu Val Leu His His Asn Glu His Pro Gln Ser Asp Phe Ser
1145 1150 1155

Ser Phe Val Ser Lys Leu Lys Gly Arg Thr Val Leu Val Val Gly
1160 1165 1170

Glu Lys Leu Ser Val Pro Gly Lys Lys Val Asp Trp Leu Ser Asp
1175 1180 1185

Gln Pro Glu Ala Thr Phe Arg Ala Arg Leu Asp Leu Gly Ile Pro
1190 1195 1200

Gly Asp Val Pro Lys Tyr Asp Ile Val Phe Ile Asn Val Arg Thr
1205 1210 1215



Pro Tyr Lys Tyr His His Tyr Gln Gln Cys Glu Asp His Ala Ile
1220 1225 1230

Lys Leu Ser Met Leu Thr Lys Lys Ala Cys Leu His Leu Asn Pro
1235 1240 1245

Gly Gly Thr Cys Val Ser Ile Gly Tyr Gly Tyr Ala Asp Arg Ala
1250 1255 1260

Ser Glu Ser Ile Ile Gly Ala Ile Ala Arg Gln Phe Lys Phe Ser
1265 1270 1275

Arg Val Cys Lys Pro Lys Ser Ser His Glu Glu Thr Glu Val Leu
1280 1285 1290

Phe Val Phe Ile Gly Tyr Asp Arg Lys Ala Arg Thr His Asn Pro
1295 1300 1305

Tyr Lys Leu Ser Ser Thr Leu Thr Asn Ile Tyr Thr Gly Ser Arg
1310 1315 1320

Leu His Glu Ala Gly Cys Ala Pro Ser Tyr His Val Val Arg Gly
1325 1330 1335

Asp Ile Ala Thr Ala Thr Glu Gly Val Ile Ile Asn Ala Ala Asn
1340 1345 1350

Ser Lys Gly Gln Pro Gly Gly Gly Val Cys Gly Ala Leu Tyr Lys
1355 1360 1365

Lys Phe Pro Glu Ser Phe Asp Leu Gln Pro Ile Glu Val Gly Lys
1370 1375 1380

Ala Arg Leu Val Lys Gly Ala Ala Lys His Ile Ile His Ala Val
1385 1390 1395

Gly Pro Asn Phe Asn Lys Val Ser Glu Val Glu Gly Asp Lys Gln
1400 1405 1410

Leu Ala Glu Ala Tyr Glu Ser Ile Ala Lys Ile Val Asn Asp Asn
1415 1420 1425

Asn Tyr Lys Ser Val Ala Ile Pro Leu Leu Ser Thr Gly Ile Phe
1430 1435 1440

Ser Gly Asn Lys Asp Arg Leu Thr Gln Ser Leu Asn His Leu Leu
1445 1450 1455

Thr Ala Leu Asp Thr Thr Asp Ala Asp Val Ala Ile Tyr Cys Arg



1460		1465		1470
Asp Lys Lys Trp Glu Met Thr Leu Lys Glu Ala Val Ala Arg Arg				
1475		1480		1485
Glu Ala Val Glu Glu Ile Cys Ile Ser Asp Asp Ser Ser Val Thr				
1490		1495		1500
Glu Pro Asp Ala Glu Leu Val Arg Val His Pro Lys Ser Ser Leu				
1505		1510		1515
Ala Gly Arg Lys Gly Tyr Ser Thr Ser Asp Gly Lys Thr Phe Ser				
1520		1525		1530
Tyr Leu Glu Gly Thr Lys Phe His Gln Ala Ala Lys Asp Ile Ala				
1535		1540		1545
Glu Ile Asn Ala Met Trp Pro Val Ala Thr Glu Ala Asn Glu Gln				
1550		1555		1560
Val Cys Met Tyr Ile Leu Gly Glu Ser Met Ser Ser Ile Arg Ser				
1565		1570		1575
Lys Cys Pro Val Glu Glu Ser Glu Ala Ser Thr Pro Pro Ser Thr				
1580		1585		1590
Leu Pro Cys Leu Cys Ile His Ala Met Thr Pro Glu Arg Val Gln				
1595		1600		1605
Arg Leu Lys Ala Ser Arg Pro Glu Gln Ile Thr Val Cys Ser Ser				
1610		1615		1620
Phe Pro Leu Pro Lys Tyr Arg Ile Thr Gly Val Gln Lys Ile Gln				
1625		1630		1635
Cys Ser Gln Pro Ile Leu Phe Ser Pro Lys Val Pro Ala Tyr Ile				
1640		1645		1650
His Pro Arg Lys Tyr Leu Val Glu Thr Pro Pro Val Glu Glu Thr				
1655		1660		1665
Pro Glu Ser Pro Ala Glu Asn Gln Ser Thr Glu Gly Thr Pro Glu				
1670		1675		1680
Gln Pro Ala Leu Val Asn Val Asp Ala Thr Arg Thr Arg Met Pro				
1685		1690		1695
Glu Pro Ile Ile Ile Glu Glu Glu Glu Glu Asp Ser Ile Ser Leu				
1700		1705		1710



Leu Ser Asp Gly Pro Thr His Gln Val Leu Gln Val Glu Ala Asp
 1715 1720 1725
 Ile His Gly Ser Pro Ser Val Ser Ser Ser Ser Trp Ser Ile Pro
 1730 1735 1740
 His Ala Ser Asp Phe Asp Val Asp Ser Leu Ser Ile Leu Asp Thr
 1745 1750 1755
 Leu Asp Gly Ala Ser Val Thr Ser Gly Ala Val Ser Ala Glu Thr
 1760 1765 1770
 Asn Ser Tyr Phe Ala Arg Ser Met Glu Phe Arg Ala Arg Pro Val
 1775 1780 1785
 Pro Ala Pro Arg Thr Val Phe Arg Asn Pro Pro His Pro Ala Pro
 1790 1795 1800
 Arg Thr Arg Thr Pro Pro Leu Ala His Ser Arg Ala Ser Ser Arg
 1805 1810 1815
 Thr Ser Leu Val Ser Thr Pro Pro Gly Val Asn Arg Val Ile Thr
 1820 1825 1830
 Arg Glu Glu Leu Glu Ala Leu Thr Pro Ser Arg Ala Pro Ser Arg
 1835 1840 1845
 Ser Ala Ser Arg Thr Ser Leu Val Ser Asn Pro Pro Gly Val Asn
 1850 1855 1860
 Arg Val Ile Thr Arg Glu Glu Phe Glu Ala Phe Val Ala Gln Gln
 1865 1870 1875
 Gln Xaa Arg Phe Asp Ala Gly Ala Tyr Ile Phe Ser Ser Asp Thr
 1880 1885 1890
 Gly Gln Gly His Leu Gln Gln Lys Ser Val Arg Gln Thr Val Leu
 1895 1900 1905
 Ser Glu Val Val Leu Glu Arg Thr Glu Leu Glu Ile Ser Tyr Ala
 1910 1915 1920
 Pro Arg Leu Asp Gln Glu Lys Glu Glu Leu Leu Arg Lys Lys Leu
 1925 1930 1935
 Gln Leu Asn Pro Thr Pro Ala Asn Arg Ser Arg Tyr Gln Ser Arg
 1940 1945 1950



Arg Val Glu Asn Met Lys Ala Ile Thr Ala Arg Arg Ile Leu Gln
 1955 1960 1965

Gly Leu Gly His Tyr Leu Lys Ala Glu Gly Lys Val Glu Cys Tyr
 1970 1975 1980

Arg Thr Leu His Pro Val Pro Leu Tyr Ser Ser Ser Val Asn Arg
 1985 1990 1995

Ala Phe Ser Ser Pro Lys Val Ala Val Glu Ala Cys Asn Ala Met
 2000 2005 2010

Leu Lys Glu Asn Phe Pro Thr Val Ala Ser Tyr Cys Ile Ile Pro
 2015 2020 2025

Glu Tyr Asp Ala Tyr Leu Asp Met Val Asp Gly Ala Ser Cys Cys
 2030 2035 2040

Leu Asp Thr Ala Ser Phe Cys Pro Ala Lys Leu Arg Ser Phe Pro
 2045 2050 2055

Lys Lys His Ser Tyr Leu Glu Pro Thr Ile Arg Ser Ala Val Pro
 2060 2065 2070

Ser Ala Ile Gln Asn Thr Leu Gln Asn Val Leu Ala Ala Ala Thr
 2075 2080 2085

Lys Arg Asn Cys Asn Val Thr Gln Met Arg Glu Leu Pro Val Leu
 2090 2095 2100

Asp Ser Ala Ala Phe Asn Val Glu Cys Phe Lys Lys Tyr Ala Cys
 2105 2110 2115

Asn Asn Glu Tyr Trp Glu Thr Phe Lys Glu Asn Pro Ile Arg Leu
 2120 2125 2130

Thr Glu Glu Asn Val Val Asn Tyr Ile Thr Lys Leu Lys Gly Pro
 2135 2140 2145

Lys Ala Ala Ala Leu Phe Ala Lys Thr His Asn Leu Asn Met Leu
 2150 2155 2160

Gln Asp Ile Pro Met Asp Arg Phe Val Met Asp Leu Lys Arg Asp
 2165 2170 2175

Val Lys Val Thr Pro Gly Thr Lys His Thr Glu Glu Arg Pro Lys
 2180 2185 2190



Val Gln Val Ile Gln Ala Ala Asp Pro Leu Ala Thr Ala Asp Leu
2195 2200 2205

Cys Gly Ile His Arg Glu Leu Val Arg Arg Leu Asn Ala Val Leu
2210 2215 2220

Leu Pro Asn Ile His Thr Leu Phe Asp Met Ser Ala Glu Asp Phe
2225 2230 2235

Asp Ala Ile Ile Ala Glu His Phe Gln Pro Gly Asp Cys Val Leu
2240 2245 2250

Glu Thr Asp Ile Ala Ser Phe Asp Lys Ser Glu Asp Asp Ala Met
2255 2260 2265

Ala Leu Thr Ala Leu Met Ile Leu Glu Asp Leu Gly Val Asp Ala
2270 2275 2280

Glu Leu Leu Thr Leu Ile Glu Ala Ala Phe Gly Glu Ile Ser Ser
2285 2290 2295

Ile His Leu Pro Thr Lys Thr Lys Phe Lys Phe Gly Ala Met Met
2300 2305 2310

Lys Ser Gly Met Phe Leu Thr Leu Phe Val Asn Thr Val Ile Asn
2315 2320 2325

Ile Val Ile Ala Ser Arg Val Leu Arg Glu Arg Leu Thr Gly Ser
2330 2335 2340

Pro Cys Ala Ala Phe Ile Gly Asp Asp Asn Ile Val Lys Gly Val
2345 2350 2355

Lys Ser Asp Lys Leu Met Ala Asp Arg Cys Ala Thr Trp Leu Asn
2360 2365 2370

Met Glu Val Lys Ile Ile Asp Ala Val Val Gly Glu Lys Ala Pro
2375 2380 2385

Tyr Phe Cys Gly Gly Phe Ile Leu Cys Asp Ser Val Thr Gly Thr
2390 2395 2400

Ala Cys Arg Val Ala Asp Pro Leu Lys Arg Leu Phe Lys Leu Gly
2405 2410 2415

Lys Pro Leu Ala Val Asp Asp Glu His Asp Asp Asp Arg Arg Arg
2420 2425 2430

Ala Leu His Glu Glu Ser Thr Arg Trp Asn Arg Val Gly Ile Leu



2435

2440

2445

Pro Glu Leu Cys Lys Ala Val Glu Ser Arg Tyr Glu Thr Val Gly
 2450 2455 2460

Thr Ser Ile Ile Val Met Ala Met Thr Thr Leu Ala Ser Ser Val
 2465 2470 2475

Lys Ser Phe Ser Tyr Leu Arg Gly Ala Pro Ile Thr Leu Tyr Gly
 2480 2485 2490

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<212> PRT

<213> Artificial Sequence

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<223> VEEV TC-83 nsp3 E242K

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<222> (551)..(551)

<223> Xaa can be any naturally occurring amino acid

<400> 24

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Gly Val Ile Ile Asn Ala Ala Asn Ser Lys Gly Gln Pro Gly Gly Gly
 20 25 30

Val Cys Gly Ala Leu Tyr Lys Lys Phe Pro Glu Ser Phe Asp Leu Gln
 35 40 45

Pro Ile Glu Val Gly Lys Ala Arg Leu Val Lys Gly Ala Ala Lys His
 50 55 60

Ile Ile His Ala Val Gly Pro Asn Phe Asn Lys Val Ser Glu Val Glu
 65 70 75 80

Gly Asp Lys Gln Leu Ala Glu Ala Tyr Glu Ser Ile Ala Lys Ile Val
 85 90 95

Asn Asp Asn Asn Tyr Lys Ser Val Ala Ile Pro Leu Leu Ser Thr Gly
 100 105 110

Ile Phe Ser Gly Asn Lys Asp Arg Leu Thr Gln Ser Leu Asn His Leu
 115 120 125

Leu Thr Ala Leu Asp Thr Thr Asp Ala Asp Val Ala Ile Tyr Cys Arg
 130 135 140



Asp Lys Lys Trp Glu Met Thr Leu Lys Glu Ala Val Ala Arg Arg Glu
 145 150 155 160

Ala Val Glu Glu Ile Cys Ile Ser Asp Asp Ser Ser Val Thr Glu Pro
 165 170 175

Asp Ala Glu Leu Val Arg Val His Pro Lys Ser Ser Leu Ala Gly Arg
 180 185 190

Lys Gly Tyr Ser Thr Ser Asp Gly Lys Thr Phe Ser Tyr Leu Glu Gly
 195 200 205

Thr Lys Phe His Gln Ala Ala Lys Asp Ile Ala Glu Ile Asn Ala Met
 210 215 220

Trp Pro Val Ala Thr Glu Ala Asn Glu Gln Val Cys Met Tyr Ile Leu
 225 230 235 240

Gly Lys Ser Met Ser Ser Ile Arg Ser Lys Cys Pro Val Glu Glu Ser
 245 250 255

Glu Ala Ser Thr Pro Pro Ser Thr Leu Pro Cys Leu Cys Ile His Ala
 260 265 270

Met Thr Pro Glu Arg Val Gln Arg Leu Lys Ala Ser Arg Pro Glu Gln
 275 280 285

Ile Thr Val Cys Ser Ser Phe Pro Leu Pro Lys Tyr Arg Ile Thr Gly
 290 295 300

Val Gln Lys Ile Gln Cys Ser Gln Pro Ile Leu Phe Ser Pro Lys Val
 305 310 315 320

Pro Ala Tyr Ile His Pro Arg Lys Tyr Leu Val Glu Thr Pro Pro Val
 325 330 335

Asp Glu Thr Pro Glu Pro Ser Ala Glu Asn Gln Ser Thr Glu Gly Thr
 340 345 350

Pro Glu Gln Pro Pro Leu Ile Thr Glu Asp Glu Thr Arg Thr Arg Thr
 355 360 365

Pro Glu Pro Ile Ile Ile Glu Glu Glu Glu Glu Asp Ser Ile Ser Leu
 370 375 380

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



His Gly Pro Pro Ser Val Ser Ser Ser Ser Trp Ser Ile Pro His Ala
405 410 415

Ser Asp Phe Asp Val Asp Ser Leu Ser Ile Leu Asp Thr Leu Glu Gly
420 425 430

Ala Ser Val Thr Ser Gly Ala Thr Ser Ala Glu Thr Asn Ser Tyr Phe
435 440 445

Ala Lys Ser Met Glu Phe Leu Ala Arg Pro Val Pro Ala Pro Arg Thr
450 455 460

Val Phe Arg Asn Pro Pro His Pro Ala Pro Arg Thr Arg Thr Pro Ser
465 470 475 480

Leu Ala Pro Ser Arg Ala Cys Ser Arg Thr Ser Leu Val Ser Thr Pro
485 490 495

Pro Gly Val Asn Arg Val Ile Thr Arg Glu Glu Leu Glu Ala Leu Thr
500 505 510

Pro Ser Arg Thr Pro Ser Arg Ser Val Ser Arg Thr Ser Leu Val Ser
515 520 525

Asn Pro Pro Gly Val Asn Arg Val Ile Thr Arg Glu Glu Phe Glu Ala
530 535 540

Phe Val Ala Gln Gln Gln Xaa Arg Phe Asp Ala Gly Ala
545 550 555

