SEQUENCE LISTING

<110> THE UNITED STATES OF AMERICA, AS REPRESENTED BY THE SECRETARY, DEPARTMENT OF HEALTH AND HUMAN SERVICES

<120> CHIMERIC ANTIGEN RECEPTORS TARGETING B-CELL MATURATION ANTIGEN

<130> 712361

<150> US 61/622,600
<151> 2012-04-11

<160> 12

<170> PatentIn version 3.5

<210> 1
<211> 1512
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 1
atggccctgc ctgtgacagc tctgctgctg cccctggccc tgctgctcca tgccgccaga 60

cccgacatcg tgctgaccca gagcccccc agcctggcca tgtctctggg caagagagcc 120

accatcagct gccgggccag cgagagcgtg accatcctgg gcagccacct gatctactgg 180

tatcagcaga agcctggcca gccccccacc ctgctgatcc agctggctag caatgtgcag 240

accggcgtgc ccgccagatt cagcggcagc ggcagcagaa ccgacttcac cctgaccatc 300

gaccccgtgg aagaggacga cgtggccgtg tactactgcc tgcagagccg gaccatcccc 360

cggacctttg gcggaggaac aaagctggaa atcaagggca gcaccagcgg ctccggcaag 420

cctggctctg gcgagggcag cacaaaggga cagattcagc tggtgcagag cggccctgag 480

ctgaagaaac ccggcgagac agtgaagatc agctgcaagg cctccggcta caccttccgg 540

cactacagca tgaactgggt gaaacaggcc cctggcaagg gcctgaagtg gatgggccgg 600

atcaacaccg agagcggcgt gcccatctac gccgacgact tcaagggcag attcgccttc 660

agcgtggaaa ccagcgccag caccgcctac ctggtgatca acaacctgaa ggacgaggat 720

accgccagct acttctgcag caacgactac ctgtacagcc tggacttctg gggccagggc 780

accgccctga ccgtgtccag cttcgtgcct gtgttcctgc ccgccaagcc caccaccacc 840

cctgccccta gacctcccac cccagcccca acaatcgcca gccagcctct gtccctgcgg 900

cccgaagcct gtagacctgc tgccggcgga gccgtgcaca ccagaggcct ggatttcgcc 960

tgcgacatct acatctgggc ccctctggcc ggcacctgtg gcgtgctgct gctgagcctg 1020

gtgatcaccc tgtactgcaa ccaccggaac agaagcaagc ggagccggct gctgcacagc 1080

gactacatga acatgacccc aagacggcct ggccccaccc ggaagcacta ccagccttac 1140

gcccctccca gagacttcgc cgcctaccgg tccagagtga agttcagcag atccgccgac 1200

gcccctgcct accagcaggg acagaaccag ctgtacaacg agctgaacct gggcagacgg 1260

gaagagtacg acgtgctgga caagcggaga ggccgggacc ccgagatggg cggaaagccc 1320

agacggaaga acccccagga aggcctgtat aacgaactgc agaaagacaa gatggccgag 1380

gcctacagcg agatcggcat gaagggcgag cggaggcgcg gcaagggcca cgatggcctg 1440

taccagggcc tgagcaccgc caccaaggac acctacgacg ccctgcacat gcaggccctg 1500

ccccccagat ga 1512

<210> 2
<211> 1512
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 2
atggccctgc ctgtgacagc tctgctcctc cctctggccc tgctgctcca tgccgccaga 60

cccgacatcg tgctgaccca gagcccccccc agcctggcca tgtctctggg caagagagcc 120

accatcagct gccgggccag cgagagcgtg accatcctgg gcagccacct gatccactgg 180

tatcagcaga agcccggcca gccccccacc ctgctgatcc agctcgccag caatgtgcag 240

accggcgtgc ccgccagatt cagcggcagc ggcagcagaa ccgacttcac cctgaccatc 300

gaccccgtgg aagaggacga cgtggccgtg tactactgcc tgcagagccg gaccatcccc 360

cggacctttg gcggaggcac caaactggaa atcaagggca gcaccagcgg ctccggcaag 420

cctggctctg gcgagggcag cacaaaggga cagattcagc tggtgcagag cggccctgag 480

ctgaagaaac ccggcgagac agtgaagatc agctgcaagg cctccggcta caccttcacc 540

gactacagca tcaactgggt gaaaagagcc cctggcaagg gcctgaagtg gatgggctgg 600

atcaacaccg agacaagaga gcccgcctac gcctacgact tccggggcag attcgccttc 660

agcctggaaa ccagcgccag caccgcctac ctgcagatca acaacctgaa gtacgaggac 720

accgccacct acttttgcgc cctggactac agctacgcca tggactactg gggccagggc 780

accagcgtga ccgtgtccag cttcgtgccc gtgttcctgc ccgccaaacc taccaccacc 840

cctgccccta gacctcccac cccagcccca acaatcgcca gccagcctct gtctctgcgg 900

cccgaagcct gtagacctgc tgccggcgga gccgtgcaca ccagaggcct ggacttcgcc 960

tgcgacatct acatctgggc ccctctggcc ggcacctgtg gcgtgctgct gctgagcctg 1020

gtgatcaccc tgtactgcaa ccaccggaac agaagcaagc ggagccggct gctgcacagc 1080

gactacatga acatgacccc aagacggcct ggccccaccc ggaagcacta ccagccttac 1140

gcccctccca gagacttcgc cgcctaccgg tccagagtga agttcagcag atccgccgac 1200

gcccctgcct accagcaggg acagaaccag ctgtacaacg agctgaacct gggcagacgg 1260

gaagagtacg acgtgctgga caagcggaga ggccgggacc ccgagatggg cggaaagccc 1320

agacggaaga acccccagga aggcctgtat aacgaactgc agaaagacaa gatggccgag 1380

gcctacagcg agatcggcat gaagggcgag cggaggcgcg gcaagggcca cgatggcctg 1440

taccagggcc tgagcaccgc caccaaggac acctacgacg ccctgcacat gcaggccctg 1500

cccccagat ga 1512

<210> 3
<211> 1512
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 3
atggctctgc ctgtgacagc tctgctgctg cctctggccc tgctgctgca tgccgccaga 60

cctgatatcg tgctgaccca gagccctccc agcctggcca tgtctctggg caagagagcc 120

accatcagct gcagagccag cgagagcgtg accatcctgg gcagccacct gatctactgg 180

tatcagcaga agcccggcca gccccccaca ctgctgattc agctggcctc caatgtgcag 240

accggcgtgc cagccagatt ttccggcagc ggcagcagaa ccgacttcac cctgaccatc 300

gaccccgtgg aagaggacga cgtggccgtg tactactgcc tgcagagcag aaccatcccc 360

cggacctttg gcggaggcac caagctggaa atcaagggca gcaccagcgg ctccggcaag 420

cctggatctg gcgagggatc taccaaggga cagatccagc tggtgcagag cggccctgag 480

ctgaagaaac ccggcgagac agtgaagatc tcctgcaagg ccagcggcta caccttcacc 540

cactacagca tgaactgggt caagcaggcc cctggcaagg gcctgaagtg gatgggccgg 600

atcaacaccg agacaggcga gcccctgtac gccgacgact ttaagggcag attcgccttc 660

agcctggaaa ccagcgccag caccgcctac ctcgtgatca acaacctgaa gaacgaggac 720

accgccacct ttttctgctc caacgactac ctgtacagct gcgactactg gggccagggc 780

accaccctga cagtgtctag cttcgtgccc gtgttcctgc ccgccaagcc tacaacaacc 840

cctgccccta gacctcccac cccagccccc acaattgcct ctcagcctct gagcctgagg 900

cccgaggctt gtagaccagc tgctggcgga gccgtgcaca ccagaggact ggatttcgcc 960

tgcgacatct acatctgggc ccctctggcc ggcacctgtg gcgtgctgct gctgagcctg 1020

gtgatcaccc tgtactgcaa ccaccggaac agaagcaagc ggagccggct gctgcacagc 1080

gactacatga acatgacccc aagacggcct ggccccaccc ggaagcacta ccagccttac 1140

gcccctccca gagacttcgc cgcctaccgg tccagagtga agttcagcag atccgccgac 1200

gcccctgcct accagcaggg acagaaccag ctgtacaacg agctgaacct gggcagacgg 1260

gaagagtacg acgtgctgga caagcggaga ggccgggacc ccgagatggg cggaaagccc 1320

agacggaaga acccccagga aggcctgtat aacgaactgc agaaagacaa gatggccgag 1380

gcctacagcg agatcggcat gaagggcgag cggaggcgcg gcaagggcca cgatggcctg 1440

taccagggcc tgagcaccgc caccaaggac acctacgacg ccctgcacat gcaggccctg 1500

cccccagat ga 1512

<210> 4
<211> 503

<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 4

```
Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1               5                  10                  15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
            20                  25                  30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
        35                  40                  45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65                  70                  75                  80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
            100                 105                 110

Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
    130                 135                 140

Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145                 150                 155                 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
                165                 170                 175

Tyr Thr Phe Arg His Tyr Ser Met Asn Trp Val Lys Gln Ala Pro Gly
            180                 185                 190

Lys Gly Leu Lys Trp Met Gly Arg Ile Asn Thr Glu Ser Gly Val Pro
        195                 200                 205

Ile Tyr Ala Asp Asp Phe Lys Gly Arg Phe Ala Phe Ser Val Glu Thr
    210                 215                 220

Ser Ala Ser Thr Ala Tyr Leu Val Ile Asn Asn Leu Lys Asp Glu Asp
225                 230                 235                 240
```

```
Thr Ala Ser Tyr Phe Cys Ser Asn Asp Tyr Leu Tyr Ser Leu Asp Phe
                245                 250                 255

Trp Gly Gln Gly Thr Ala Leu Thr Val Ser Ser Phe Val Pro Val Phe
            260                 265                 270

Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro Pro Thr Pro
        275                 280                 285

Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro Glu Ala Cys
    290                 295                 300

Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu Asp Phe Ala
305                 310                 315                 320

Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys Gly Val Leu
                325                 330                 335

Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg Asn Arg Ser
            340                 345                 350

Lys Arg Ser Arg Leu Leu His Ser Asp Tyr Met Asn Met Thr Pro Arg
        355                 360                 365

Arg Pro Gly Pro Thr Arg Lys His Tyr Gln Pro Tyr Ala Pro Pro Arg
    370                 375                 380

Asp Phe Ala Ala Tyr Arg Ser Arg Val Lys Phe Ser Arg Ser Ala Asp
385                 390                 395                 400

Ala Pro Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr Asn Glu Leu Asn
                405                 410                 415

Leu Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg Arg Gly Arg
            420                 425                 430

Asp Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro Gln Glu Gly
        435                 440                 445

Leu Tyr Asn Glu Leu Gln Lys Asp Lys Met Ala Glu Ala Tyr Ser Glu
    450                 455                 460

Ile Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His Asp Gly Leu
465                 470                 475                 480

Tyr Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp Ala Leu His
                485                 490                 495

Met Gln Ala Leu Pro Pro Arg
            500
```

<210> 5
<211> 503
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 5

```
Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1               5                  10                  15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
            20                  25                  30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
        35                  40                  45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65                  70                  75                  80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
            100                 105                 110

Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
    130                 135                 140

Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145                 150                 155                 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
                165                 170                 175

Tyr Thr Phe Thr Asp Tyr Ser Ile Asn Trp Val Lys Arg Ala Pro Gly
            180                 185                 190

Lys Gly Leu Lys Trp Met Gly Trp Ile Asn Thr Glu Thr Arg Glu Pro
        195                 200                 205

Ala Tyr Ala Tyr Asp Phe Arg Gly Arg Phe Ala Phe Ser Leu Glu Thr
    210                 215                 220

Ser Ala Ser Thr Ala Tyr Leu Gln Ile Asn Asn Leu Lys Tyr Glu Asp
225                 230                 235                 240
```

Thr Ala Thr Tyr Phe Cys Ala Leu Asp Tyr Ser Tyr Ala Met Asp Tyr
245 250 255

Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Phe Val Pro Val Phe
260 265 270

Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro Pro Thr Pro
275 280 285

Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro Glu Ala Cys
290 295 300

Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu Asp Phe Ala
305 310 315 320

Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys Gly Val Leu
325 330 335

Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg Asn Arg Ser
340 345 350

Lys Arg Ser Arg Leu Leu His Ser Asp Tyr Met Asn Met Thr Pro Arg
355 360 365

Arg Pro Gly Pro Thr Arg Lys His Tyr Gln Pro Tyr Ala Pro Pro Arg
370 375 380

Asp Phe Ala Ala Tyr Arg Ser Arg Val Lys Phe Ser Arg Ser Ala Asp
385 390 395 400

Ala Pro Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr Asn Glu Leu Asn
405 410 415

Leu Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg Arg Gly Arg
420 425 430

Asp Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro Gln Glu Gly
435 440 445

Leu Tyr Asn Glu Leu Gln Lys Asp Lys Met Ala Glu Ala Tyr Ser Glu
450 455 460

Ile Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His Asp Gly Leu
465 470 475 480

Tyr Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp Ala Leu His
485 490 495

Met Gln Ala Leu Pro Pro Arg
500

<210> 6
<211> 503
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 6

Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1 5 10 15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
20 25 30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
35 40 45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65 70 75 80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
85 90 95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
100 105 110

Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
115 120 125

Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
130 135 140

Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145 150 155 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
165 170 175

Tyr Thr Phe Thr His Tyr Ser Met Asn Trp Val Lys Gln Ala Pro Gly
180 185 190

Lys Gly Leu Lys Trp Met Gly Arg Ile Asn Thr Glu Thr Gly Glu Pro
195 200 205

Leu Tyr Ala Asp Asp Phe Lys Gly Arg Phe Ala Phe Ser Leu Glu Thr
210 215 220

```
Ser Ala Ser Thr Ala Tyr Leu Val Ile Asn Asn Leu Lys Asn Glu Asp
225                 230                 235                 240

Thr Ala Thr Phe Phe Cys Ser Asn Asp Tyr Leu Tyr Ser Cys Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Thr Leu Thr Val Ser Ser Phe Val Pro Val Phe
            260                 265                 270

Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro Pro Thr Pro
        275                 280                 285

Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro Glu Ala Cys
    290                 295                 300

Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu Asp Phe Ala
305                 310                 315                 320

Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys Gly Val Leu
                325                 330                 335

Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg Asn Arg Ser
            340                 345                 350

Lys Arg Ser Arg Leu Leu His Ser Asp Tyr Met Asn Met Thr Pro Arg
        355                 360                 365

Arg Pro Gly Pro Thr Arg Lys His Tyr Gln Pro Tyr Ala Pro Pro Arg
    370                 375                 380

Asp Phe Ala Ala Tyr Arg Ser Arg Val Lys Phe Ser Arg Ser Ala Asp
385                 390                 395                 400

Ala Pro Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr Asn Glu Leu Asn
                405                 410                 415

Leu Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg Arg Gly Arg
            420                 425                 430

Asp Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro Gln Glu Gly
        435                 440                 445

Leu Tyr Asn Glu Leu Gln Lys Asp Lys Met Ala Glu Ala Tyr Ser Glu
    450                 455                 460

Ile Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His Asp Gly Leu
465                 470                 475                 480

Tyr Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp Ala Leu His
                485                 490                 495
```

Met Gln Ala Leu Pro Pro Arg
500

<210> 7
<211> 18
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 7

Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly Glu Gly Ser Thr
1 5 10 15

Lys Gly

<210> 8
<211> 507
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 8

Met Leu Leu Leu Val Thr Ser Leu Leu Leu Cys Glu Leu Pro His Pro
1 5 10 15

Ala Phe Leu Leu Ile Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser
20 25 30

Leu Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser
35 40 45

Glu Ser Val Thr Ile Leu Gly Ser His Leu Ile His Trp Tyr Gln Gln
50 55 60

Lys Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val
65 70 75 80

Gln Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp
85 90 95

Phe Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr
100 105 110

Tyr Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr
115 120 125

Lys Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser
130 135 140

```
Gly Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro
145                 150                 155                 160

Glu Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser
                165                 170                 175

Gly Tyr Thr Phe Thr Asp Tyr Ser Ile Asn Trp Val Lys Arg Ala Pro
            180                 185                 190

Gly Lys Gly Leu Lys Trp Met Gly Trp Ile Asn Thr Glu Thr Arg Glu
        195                 200                 205

Pro Ala Tyr Ala Tyr Asp Phe Arg Gly Arg Phe Ala Phe Ser Leu Glu
    210                 215                 220

Thr Ser Ala Ser Thr Ala Tyr Leu Gln Ile Asn Asn Leu Lys Tyr Glu
225                 230                 235                 240

Asp Thr Ala Thr Tyr Phe Cys Ala Leu Asp Tyr Ser Tyr Ala Met Asp
                245                 250                 255

Tyr Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala Ala Ala Phe
            260                 265                 270

Val Pro Val Phe Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg
        275                 280                 285

Pro Pro Thr Pro Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg
    290                 295                 300

Pro Glu Ala Cys Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly
305                 310                 315                 320

Leu Asp Phe Ala Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr
                325                 330                 335

Cys Gly Val Leu Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His
            340                 345                 350

Arg Asn Arg Ser Lys Arg Ser Arg Leu Leu His Ser Asp Tyr Met Asn
        355                 360                 365

Met Thr Pro Arg Arg Pro Gly Pro Thr Arg Lys His Tyr Gln Pro Tyr
    370                 375                 380

Ala Pro Pro Arg Asp Phe Ala Ala Tyr Arg Ser Arg Val Lys Phe Ser
385                 390                 395                 400

Arg Ser Ala Asp Ala Pro Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr
                405                 410                 415
```

Asn Glu Leu Asn Leu Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys
420 425 430

Arg Arg Gly Arg Asp Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn
435 440 445

Pro Gln Glu Gly Leu Tyr Asn Glu Leu Gln Lys Asp Lys Met Ala Glu
450 455 460

Ala Tyr Ser Glu Ile Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly
465 470 475 480

His Asp Gly Leu Tyr Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr
485 490 495

Asp Ala Leu His Met Gln Ala Leu Pro Pro Arg
500 505

<210> 9
<211> 506
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 9

Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1 5 10 15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
20 25 30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
35 40 45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65 70 75 80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
85 90 95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
100 105 110

Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
115 120 125

Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
130 135 140

```
Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145                 150                 155                 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
                165                 170                 175

Tyr Thr Phe Thr Asp Tyr Ser Ile Asn Trp Val Lys Arg Ala Pro Gly
            180                 185                 190

Lys Gly Leu Lys Trp Met Gly Trp Ile Asn Thr Glu Thr Arg Glu Pro
        195                 200                 205

Ala Tyr Ala Tyr Asp Phe Arg Gly Arg Phe Ala Phe Ser Leu Glu Thr
    210                 215                 220

Ser Ala Ser Thr Ala Tyr Leu Gln Ile Asn Asn Leu Lys Tyr Glu Asp
225                 230                 235                 240

Thr Ala Thr Tyr Phe Cys Ala Leu Asp Tyr Ser Tyr Ala Met Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala Ala Ala Phe Val
            260                 265                 270

Pro Val Phe Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro
        275                 280                 285

Pro Thr Pro Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro
    290                 295                 300

Glu Ala Cys Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu
305                 310                 315                 320

Asp Phe Ala Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys
                325                 330                 335

Gly Val Leu Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg
            340                 345                 350

Asn Arg Ser Lys Arg Ser Arg Leu Leu His Ser Asp Tyr Met Asn Met
        355                 360                 365

Thr Pro Arg Arg Pro Gly Pro Thr Arg Lys His Tyr Gln Pro Tyr Ala
    370                 375                 380

Pro Pro Arg Asp Phe Ala Ala Tyr Arg Ser Arg Val Lys Phe Ser Arg
385                 390                 395                 400

Ser Ala Asp Ala Pro Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr Asn
                405                 410                 415
```

```
Glu Leu Asn Leu Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg
            420                 425                 430

Arg Gly Arg Asp Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro
        435                 440                 445

Gln Glu Gly Leu Tyr Asn Glu Leu Gln Lys Asp Lys Met Ala Glu Ala
    450                 455                 460

Tyr Ser Glu Ile Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His
465                 470                 475                 480

Asp Gly Leu Tyr Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp
                485                 490                 495

Ala Leu His Met Gln Ala Leu Pro Pro Arg
            500                 505
```

<210> 10
<211> 512
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 10

```
Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1               5                   10                  15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
            20                  25                  30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
        35                  40                  45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65                  70                  75                  80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
            100                 105                 110

Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
        115                 120                 125
```

```
Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
    130                 135                 140

Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145                 150                 155                 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
                165                 170                 175

Tyr Thr Phe Thr Asp Tyr Ser Ile Asn Trp Val Lys Arg Ala Pro Gly
            180                 185                 190

Lys Gly Leu Lys Trp Met Gly Trp Ile Asn Thr Glu Thr Arg Glu Pro
        195                 200                 205

Ala Tyr Ala Tyr Asp Phe Arg Gly Arg Phe Ala Phe Ser Leu Glu Thr
    210                 215                 220

Ser Ala Ser Thr Ala Tyr Leu Gln Ile Asn Asn Leu Lys Tyr Glu Asp
225                 230                 235                 240

Thr Ala Thr Tyr Phe Cys Ala Leu Asp Tyr Ser Tyr Ala Met Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala Ala Ala Phe Val
            260                 265                 270

Pro Val Phe Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro
        275                 280                 285

Pro Thr Pro Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro
    290                 295                 300

Glu Ala Cys Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu
305                 310                 315                 320

Asp Phe Ala Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys
                325                 330                 335

Gly Val Leu Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg
            340                 345                 350

Asn Arg Phe Ser Val Val Lys Arg Gly Arg Lys Lys Leu Leu Tyr Ile
        355                 360                 365

Phe Lys Gln Pro Phe Met Arg Pro Val Gln Thr Thr Gln Glu Glu Asp
    370                 375                 380

Gly Cys Ser Cys Arg Phe Pro Glu Glu Glu Glu Gly Gly Cys Glu Leu
385                 390                 395                 400
```

Arg Val Lys Phe Ser Arg Ser Ala Asp Ala Pro Ala Tyr Gln Gln Gly
405 410 415

Gln Asn Gln Leu Tyr Asn Glu Leu Asn Leu Gly Arg Arg Glu Glu Tyr
420 425 430

Asp Val Leu Asp Lys Arg Arg Gly Arg Asp Pro Glu Met Gly Gly Lys
435 440 445

Pro Arg Arg Lys Asn Pro Gln Glu Gly Leu Tyr Asn Glu Leu Gln Lys
450 455 460

Asp Lys Met Ala Glu Ala Tyr Ser Glu Ile Gly Met Lys Gly Glu Arg
465 470 475 480

Arg Arg Gly Lys Gly His Asp Gly Leu Tyr Gln Gly Leu Ser Thr Ala
485 490 495

Thr Lys Asp Thr Tyr Asp Ala Leu His Met Gln Ala Leu Pro Pro Arg
500 505 510

<210> 11
<211> 502
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 11

Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1 5 10 15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
20 25 30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
35 40 45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65 70 75 80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
85 90 95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
100 105 110

Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
115 120 125

```
Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
    130                 135                 140

Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145                 150                 155                 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
                165                 170                 175

Tyr Thr Phe Thr Asp Tyr Ser Ile Asn Trp Val Lys Arg Ala Pro Gly
            180                 185                 190

Lys Gly Leu Lys Trp Met Gly Trp Ile Asn Thr Glu Thr Arg Glu Pro
        195                 200                 205

Ala Tyr Ala Tyr Asp Phe Arg Gly Arg Phe Ala Phe Ser Leu Glu Thr
    210                 215                 220

Ser Ala Ser Thr Ala Tyr Leu Gln Ile Asn Asn Leu Lys Tyr Glu Asp
225                 230                 235                 240

Thr Ala Thr Tyr Phe Cys Ala Leu Asp Tyr Ser Tyr Ala Met Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala Ala Ala Phe Val
            260                 265                 270

Pro Val Phe Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro
        275                 280                 285

Pro Thr Pro Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro
    290                 295                 300

Glu Ala Cys Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu
305                 310                 315                 320

Asp Phe Ala Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys
                325                 330                 335

Gly Val Leu Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg
            340                 345                 350

Asn Arg Arg Asp Gln Arg Leu Pro Pro Asp Ala His Lys Pro Pro Gly
        355                 360                 365

Gly Gly Ser Phe Arg Thr Pro Ile Gln Glu Glu Gln Ala Asp Ala His
    370                 375                 380

Ser Thr Leu Ala Lys Ile Arg Val Lys Phe Ser Arg Ser Ala Asp Ala
385                 390                 395                 400
```

```
Pro Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr Asn Glu Leu Asn Leu
                405                 410                 415

Gly Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg Arg Gly Arg Asp
            420                 425                 430

Pro Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro Gln Glu Gly Leu
        435                 440                 445

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

Gly Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His Asp Gly Leu Tyr
465                 470                 475                 480

Gln Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp Ala Leu His Met
                485                 490                 495

Gln Ala Leu Pro Pro Arg
            500
```

<210> 12
<211> 549
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 12

```
Met Ala Leu Pro Val Thr Ala Leu Leu Leu Pro Leu Ala Leu Leu Leu
1               5                   10                  15

His Ala Ala Arg Pro Asp Ile Val Leu Thr Gln Ser Pro Pro Ser Leu
            20                  25                  30

Ala Met Ser Leu Gly Lys Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu
        35                  40                  45

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

Pro Gly Gln Pro Pro Thr Leu Leu Ile Gln Leu Ala Ser Asn Val Gln
65                  70                  75                  80

Thr Gly Val Pro Ala Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe
                85                  90                  95

Thr Leu Thr Ile Asp Pro Val Glu Glu Asp Asp Val Ala Val Tyr Tyr
            100                 105                 110
```

```
Cys Leu Gln Ser Arg Thr Ile Pro Arg Thr Phe Gly Gly Gly Thr Lys
        115                 120                 125

Leu Glu Ile Lys Gly Ser Thr Ser Gly Ser Gly Lys Pro Gly Ser Gly
    130                 135                 140

Glu Gly Ser Thr Lys Gly Gln Ile Gln Leu Val Gln Ser Gly Pro Glu
145                 150                 155                 160

Leu Lys Lys Pro Gly Glu Thr Val Lys Ile Ser Cys Lys Ala Ser Gly
                165                 170                 175

Tyr Thr Phe Thr Asp Tyr Ser Ile Asn Trp Val Lys Arg Ala Pro Gly
            180                 185                 190

Lys Gly Leu Lys Trp Met Gly Trp Ile Asn Thr Glu Thr Arg Glu Pro
        195                 200                 205

Ala Tyr Ala Tyr Asp Phe Arg Gly Arg Phe Ala Phe Ser Leu Glu Thr
    210                 215                 220

Ser Ala Ser Thr Ala Tyr Leu Gln Ile Asn Asn Leu Lys Tyr Glu Asp
225                 230                 235                 240

Thr Ala Thr Tyr Phe Cys Ala Leu Asp Tyr Ser Tyr Ala Met Asp Tyr
                245                 250                 255

Trp Gly Gln Gly Thr Ser Val Thr Val Ser Ser Ala Ala Ala Phe Val
            260                 265                 270

Pro Val Phe Leu Pro Ala Lys Pro Thr Thr Thr Pro Ala Pro Arg Pro
        275                 280                 285

Pro Thr Pro Ala Pro Thr Ile Ala Ser Gln Pro Leu Ser Leu Arg Pro
    290                 295                 300

Glu Ala Cys Arg Pro Ala Ala Gly Gly Ala Val His Thr Arg Gly Leu
305                 310                 315                 320

Asp Phe Ala Cys Asp Ile Tyr Ile Trp Ala Pro Leu Ala Gly Thr Cys
                325                 330                 335

Gly Val Leu Leu Leu Ser Leu Val Ile Thr Leu Tyr Cys Asn His Arg
            340                 345                 350

Asn Arg Phe Ser Val Val Lys Arg Gly Arg Lys Lys Leu Leu Tyr Ile
        355                 360                 365

Phe Lys Gln Pro Phe Met Arg Pro Val Gln Thr Thr Gln Glu Glu Asp
    370                 375                 380
```

Gly Cys Ser Cys Arg Phe Pro Glu Glu Glu Glu Gly Gly Cys Glu Leu
385 390 395 400

Arg Arg Asp Gln Arg Leu Pro Pro Asp Ala His Lys Pro Pro Gly Gly
405 410 415

Gly Ser Phe Arg Thr Pro Ile Gln Glu Glu Gln Ala Asp Ala His Ser
420 425 430

Thr Leu Ala Lys Ile Arg Val Lys Phe Ser Arg Ser Ala Asp Ala Pro
435 440 445

Ala Tyr Gln Gln Gly Gln Asn Gln Leu Tyr Asn Glu Leu Asn Leu Gly
450 455 460

Arg Arg Glu Glu Tyr Asp Val Leu Asp Lys Arg Arg Gly Arg Asp Pro
465 470 475 480

Glu Met Gly Gly Lys Pro Arg Arg Lys Asn Pro Gln Glu Gly Leu Tyr
485 490 495

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

Met Lys Gly Glu Arg Arg Arg Gly Lys Gly His Asp Gly Leu Tyr Gln
515 520 525

Gly Leu Ser Thr Ala Thr Lys Asp Thr Tyr Asp Ala Leu His Met Gln
530 535 540

Ala Leu Pro Pro Arg
545