SEQUENCE LISTING

<110> JOHNSON, Kristen
SHI, Jian

<120> PEPTIDES AND COMPOSITIONS FOR TREATMENT OF JOINT DAMAGE

<130> PAT055625

<150> 61/775400
<151> 2013-03-08

<150> 61/938123
<151> 2014-02-10

<160> 74

<170> PatentIn version 3.5

<210> 1
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<213> Homo sapiens

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Met Phe Thr Ile Lys Leu Leu Leu Phe Ile Val Pro Leu Val Ile Ser
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Ser Arg Ile Asp Gln Asp Asn Ser Ser Phe Asp Ser Leu Ser Pro Glu
20 25 30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
35 40 45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
50 55 60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65 70 75 80

Ser Phe Tyr Asp Leu Ser Leu Gln Thr Ser Glu Ile Lys Glu Glu Glu
85 90 95

Lys Glu Leu Arg Arg Thr Thr Tyr Lys Leu Gln Val Lys Asn Glu Glu
100 105 110

Val Lys Asn Met Ser Leu Glu Leu Asn Ser Lys Leu Glu Ser Leu Leu
115 120 125

Glu Glu Lys Ile Leu Leu Gln Gln Lys Val Lys Tyr Leu Glu Glu Gln
130 135 140

```
Leu Thr Asn Leu Ile Gln Asn Gln Pro Glu Thr Pro Glu His Pro Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Thr Phe Val Glu Lys Gln Asp Asn Ser Ile Lys
                165                 170                 175

Asp Leu Leu Gln Thr Val Glu Asp Gln Tyr Lys Gln Leu Asn Gln Gln
            180                 185                 190

His Ser Gln Ile Lys Glu Ile Glu Asn Gln Leu Arg Arg Thr Ser Ile
        195                 200                 205

Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro Arg
    210                 215                 220

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
225                 230                 235                 240

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
                245                 250                 255

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            260                 265                 270

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        275                 280                 285

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    290                 295                 300

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
305                 310                 315                 320

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                325                 330                 335

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
            340                 345                 350

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        355                 360                 365

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    370                 375                 380

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
385                 390                 395                 400
```

```
Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                405                 410                 415

Tyr Asn Lys Pro Arg Ala Lys Ser Lys Pro Glu Arg Arg Arg Gly Leu
            420                 425                 430

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        435                 440                 445

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    450                 455                 460
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<210> 2
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<213> Homo sapiens

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acgaagggcc aaattaatga catatttcaa aaactcaaca tatttgatca gtctttttat      300

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aacatgaggt atcactatac cttatt 2126

<210> 3
<211> 455
<212> PRT
<213> Mus musculus

<400> 3

Met His Thr Ile Lys Leu Phe Leu Phe Val Val Pro Leu Val Ile Ala
1 5 10 15

Ser Arg Val Asp Pro Asp Leu Ser Ser Phe Asp Ser Ala Pro Ser Glu
20 25 30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
35 40 45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
50 55 60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65 70 75 80

```
Ser Phe Tyr Asp Leu Ser Leu Arg Thr Asn Glu Ile Lys Glu Glu Glu
                85                  90                  95

Lys Glu Leu Arg Arg Thr Thr Ser Thr Leu Gln Val Lys Asn Glu Glu
            100                 105                 110

Val Lys Asn Met Ser Val Glu Leu Asn Ser Lys Leu Glu Ser Leu Leu
        115                 120                 125

Glu Glu Lys Thr Ala Leu Gln His Lys Val Arg Ala Leu Glu Glu Gln
    130                 135                 140

Leu Thr Asn Leu Ile Leu Ser Pro Ala Gly Ala Gln Glu His Pro Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Ser Phe Val Glu Gln Gln Asp Asn Ser Ile Arg
                165                 170                 175

Glu Leu Leu Gln Ser Val Glu Glu Gln Tyr Lys Gln Leu Ser Gln Gln
            180                 185                 190

His Met Gln Ile Lys Glu Ile Glu Lys Gln Leu Arg Lys Thr Gly Ile
        195                 200                 205

Gln Glu Pro Ser Glu Asn Ser Leu Ser Ser Lys Ser Arg Ala Pro Arg
    210                 215                 220

Thr Thr Pro Pro Leu Gln Leu Asn Glu Thr Glu Asn Thr Glu Gln Asp
225                 230                 235                 240

Asp Leu Pro Ala Asp Cys Ser Ala Val Tyr Asn Arg Gly Glu His Thr
                245                 250                 255

Ser Gly Val Tyr Thr Ile Lys Pro Arg Asn Ser Gln Gly Phe Asn Val
            260                 265                 270

Tyr Cys Asp Thr Gln Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        275                 280                 285

Lys Asp Gly Ser Gln Asp Phe Asn Glu Thr Trp Glu Asn Tyr Glu Lys
    290                 295                 300

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
305                 310                 315                 320

Tyr Ala Ile Val Gln Gln Ser Asn Tyr Ile Leu Arg Leu Glu Leu Gln
                325                 330                 335
```

```
Asp Trp Lys Asp Ser Lys His Tyr Val Glu Tyr Ser Phe His Leu Gly
            340                 345                 350

Ser His Glu Thr Asn Tyr Thr Leu His Val Ala Glu Ile Ala Gly Asn
        355                 360                 365

Ile Pro Gly Ala Leu Pro Glu His Thr Asp Leu Met Phe Ser Thr Trp
    370                 375                 380

Asn His Arg Ala Lys Gly Gln Leu Tyr Cys Pro Glu Ser Tyr Ser Gly
385                 390                 395                 400

Gly Trp Trp Trp Asn Asp Ile Cys Gly Glu Asn Asn Leu Asn Gly Lys
                405                 410                 415

Tyr Asn Lys Pro Arg Thr Lys Ser Arg Pro Glu Arg Arg Arg Gly Ile
            420                 425                 430

Tyr Trp Arg Pro Gln Ser Arg Lys Leu Tyr Ala Ile Lys Ser Ser Lys
        435                 440                 445

Met Met Leu Gln Pro Thr Thr
    450                 455


<210>  4
<211>  459
<212>  PRT
<213>  Canis familiaris

<400>  4

Met Tyr Thr Ile Lys Leu Phe Leu Phe Ile Ile Pro Leu Val Ile Ser
1               5                   10                  15

Ser Lys Ile Asp Arg Asp Tyr Ser Ser Tyr Asp Ser Val Ser Pro Glu
            20                  25                  30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
        35                  40                  45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
    50                  55                  60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65                  70                  75                  80

Ser Phe Tyr Asp Leu Ser Leu Gln Thr Asn Glu Ile Lys Glu Glu Glu
```

```
                85                  90                  95

Lys Glu Leu Arg Arg Thr Thr Ser Lys Leu Gln Val Lys Asn Glu Glu
            100                 105                 110

Val Lys Asn Met Ser Leu Glu Leu Asn Ser Lys Val Glu Ser Leu Leu
        115                 120                 125

Glu Glu Lys Ile Leu Leu Gln Gln Lys Val Arg Tyr Leu Glu Lys Gln
    130                 135                 140

Leu Thr Ser Leu Ile Lys Asn Gln Pro Glu Ile Gln Glu His Pro Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Thr Phe Val Glu Gln Gln Asp Asn Ser Ile Lys
                165                 170                 175

Asp Leu Leu Gln Thr Val Glu Glu Gln Tyr Arg Gln Leu Asn Gln Gln
            180                 185                 190

His Ser Gln Ile Lys Glu Ile Glu Asn Gln Leu Arg Asn Val Ile Gln
        195                 200                 205

Glu Ser Thr Glu Asn Ser Leu Ser Ser Lys Pro Arg Ala Pro Arg Thr
    210                 215                 220

Thr Pro Phe Leu His Leu Asn Glu Thr Lys Asn Val Glu His Asn Asp
225                 230                 235                 240

Ile Pro Ala Asn Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
                245                 250                 255

Gly Ile Tyr Ser Ile Arg Pro Ser Asn Ser Gln Val Phe Asn Val Tyr
            260                 265                 270

Cys Asp Val Lys Ser Gly Ser Ser Trp Thr Leu Ile Gln His Arg Ile
        275                 280                 285

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Arg Tyr Gly
    290                 295                 300

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
305                 310                 315                 320

Ser Ile Val Lys Gln Ser Asn Tyr Ile Leu Arg Ile Glu Leu Glu Asp
                325                 330                 335
```

```
Trp Asn Asp Asn Lys His Tyr Ile Glu Tyr Phe Phe His Leu Gly Asn
            340                 345                 350

His Glu Thr Asn Tyr Thr Leu His Leu Val Glu Ile Thr Gly Asn Ile
        355                 360                 365

Leu Asn Ala Leu Pro Glu His Lys Asp Leu Val Phe Ser Thr Trp Asp
    370                 375                 380

His Lys Ala Lys Gly His Val Asn Cys Pro Glu Ser Tyr Ser Gly Gly
385                 390                 395                 400

Trp Trp Trp His Asn Val Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                405                 410                 415

Asn Lys Gln Arg Ala Lys Thr Lys Pro Glu Arg Arg Arg Gly Leu Tyr
            420                 425                 430

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        435                 440                 445

Leu Ile His Pro Ile Asp Ser Glu Ser Ser Glu
    450                 455


<210>  5
<211>  469
<212>  PRT
<213>  Equus caballus

<400>  5

Met Tyr Thr Ile Lys Leu Phe Leu Val Ile Ala Pro Leu Val Ile Ser
1               5                   10                  15

Ser Arg Ile Asp Gln Asp Tyr Ser Ser Leu Asp Ser Ile Pro Pro Glu
            20                  25                  30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
        35                  40                  45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
    50                  55                  60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65                  70                  75                  80

Ser Phe Tyr Ala Leu Ser Leu Gln Thr Asn Glu Ile Lys Glu Glu Glu
                85                  90                  95
```

```
Lys Glu Leu Arg Arg Thr Thr Ser Lys Leu Gln Val Lys Asn Glu Glu
            100                 105                 110

Val Lys Asn Met Ser Leu Glu Leu Asn Ser Lys Leu Glu Ser Leu Leu
        115                 120                 125

Glu Glu Lys Ser Leu Leu Gln Gln Lys Val Lys Tyr Leu Glu Glu Gln
    130                 135                 140

Leu Thr Lys Leu Ile Lys Asn Gln Pro Glu Ile Gln Glu His Pro Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Thr Phe Val Glu Gln Gln Asp Asn Ser Ile Lys
                165                 170                 175

Asp Leu Leu Gln Thr Met Glu Glu Gln Tyr Arg Gln Leu Asn Gln Gln
            180                 185                 190

His Ser Gln Ile Lys Glu Ile Glu Asn Gln Leu Arg Arg Thr Gly Ile
        195                 200                 205

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

Thr Thr Pro Ser Phe His Leu Asn Glu Thr Lys Asp Val Glu His Asp
225                 230                 235                 240

Asp Phe Pro Ala Asp Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
                245                 250                 255

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

Tyr Cys Asp Val Ile Ser Gly Ser Ser Trp Ile Leu Ile Gln Arg Arg
        275                 280                 285

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Gln Asn Tyr Lys Tyr
    290                 295                 300

Gly Phe Gly Arg Leu Asp Phe Glu Phe Trp Leu Gly Leu Glu Lys Ile
305                 310                 315                 320

Tyr Ser Ile Val Lys Arg Ser Asn Tyr Ile Leu Arg Ile Glu Leu Glu
                325                 330                 335
```

```
Asp Trp Lys Asp Asn Lys His Thr Ile Glu Tyr Ser Phe His Leu Gly
            340                 345                 350

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Glu Ile Thr Gly Asn
        355                 360                 365

Val Pro Asn Ala Leu Pro Glu His Lys Asp Leu Val Phe Ser Thr Trp
    370                 375                 380

Asp His Lys Ala Lys Gly Gln Leu Asn Cys Leu Glu Ser Tyr Ser Gly
385                 390                 395                 400

Gly Trp Trp Trp His Asp Val Cys Gly Gly Asp Asn Pro Asn Gly Lys
                405                 410                 415

Tyr Asn Lys Pro Arg Ser Lys Thr Lys Pro Glu Arg Arg Arg Gly Ile
            420                 425                 430

Cys Trp Lys Ser Gln Asn Gly Arg Leu Tyr Thr Ile Lys Ser Thr Lys
        435                 440                 445

Met Leu Ile His Pro Ile Asp Ser Glu Ser Phe Glu Leu Arg Gln Ile
    450                 455                 460

Lys Lys Pro Met Asn
465
```

<210> 6
<211> 459
<212> PRT
<213> Bos taurus

<400> 6

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Met Tyr Thr Ile Lys Leu Phe Leu Ile Ile Ala Pro Leu Val Ile Ser
1               5                   10                  15

Ser Arg Thr Asp Gln Asp Tyr Thr Ser Leu Asp Ser Ile Ser Pro Glu
            20                  25                  30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
        35                  40                  45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
    50                  55                  60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65                  70                  75                  80
```

```
Ser Phe Tyr Asp Leu Ser Leu Gln Thr Asn Glu Ile Lys Glu Glu Glu
                85                  90                  95

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

Val Lys Asn Met Ser Leu Glu Leu Asp Ser Lys Leu Glu Ser Leu Leu
        115                 120                 125

Glu Glu Lys Ile Leu Leu Gln Gln Lys Val Arg Tyr Leu Glu Asp Gln
    130                 135                 140

Leu Thr Asp Leu Ile Lys Asn Gln Pro Gln Ile Gln Glu Tyr Leu Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Thr Leu Val Glu Gln Gln Asp Asn Ser Ile Lys
                165                 170                 175

Asp Leu Leu Gln Ile Val Glu Glu Gln Tyr Arg Gln Leu Asn Gln Gln
            180                 185                 190

Gln Ser Gln Ile Lys Glu Ile Glu Asn Gln Leu Arg Arg Thr Gly Ile
        195                 200                 205

Lys Glu Ser Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro Arg
    210                 215                 220

Thr Thr Pro Ser Phe His Ser Asn Glu Thr Lys Asn Val Glu His Asp
225                 230                 235                 240

Asp Ile Pro Ala Asp Cys Thr Ile Ile Tyr Asn Gln Gly Lys His Thr
                245                 250                 255

Ser Gly Ile Tyr Ser Ile Arg Pro Ser Asn Ser Gln Val Phe Asn Val
            260                 265                 270

Tyr Cys Asp Val Lys Ser Gly Ser Ser Trp Thr Leu Ile Gln His Arg
        275                 280                 285

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    290                 295                 300

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
305                 310                 315                 320

Tyr Ser Ile Val Met Gln Ser Asn Tyr Ile Leu Arg Ile Glu Leu Glu
```

```
                325                 330                 335

Asp Trp Lys Asp Lys Tyr Tyr Thr Glu Tyr Ser Phe His Leu Gly Asp
            340                 345                 350

His Glu Thr Asn Tyr Thr Leu His Leu Ala Glu Ile Ser Gly Asn Gly
        355                 360                 365

Pro Lys Ala Phe Pro Glu His Lys Asp Leu Met Phe Ser Thr Trp Asp
    370                 375                 380

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Ser Asn Ser Gly Gly
385                 390                 395                 400

Trp Trp Tyr His Asp Val Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                405                 410                 415

Asn Lys Pro Lys Ala Lys Ala Lys Pro Glu Arg Lys Glu Gly Ile Cys
            420                 425                 430

Trp Lys Ser Gln Asp Gly Arg Leu Tyr Ser Ile Lys Ala Thr Lys Met
        435                 440                 445

Leu Ile His Pro Ser Asp Ser Glu Asn Ser Glu
    450                 455


<210>  7
<211>  248
<212>  PRT
<213>  Homo sapiens

<400>  7

Ile Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro
1               5                   10                  15

Arg Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His
            20                  25                  30

Asp Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His
        35                  40                  45

Thr Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His
    50                  55                  60

Val Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His
65                  70                  75                  80
```

```
Arg Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys
                85                  90                  95

Tyr Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys
            100                 105                 110

Ile Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu
        115                 120                 125

Glu Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu
    130                 135                 140

Gly Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly
145                 150                 155                 160

Asn Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr
                165                 170                 175

Trp Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser
            180                 185                 190

Gly Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly
        195                 200                 205

Lys Tyr Asn Lys Pro Arg Ala Lys Ser Lys Pro Glu Arg Arg Arg Gly
    210                 215                 220

Leu Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr
225                 230                 235                 240

Lys Met Leu Ile His Pro Thr Asp
                245
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<210> 8
<211> 231
<212> PRT
<213> Homo sapiens

<400> 8

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Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                   10                  15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45
```

```
Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80

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

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190

Tyr Asn Lys Pro Arg Ala Lys Ser Lys Pro Glu Arg Arg Arg Gly Leu
        195                 200                 205

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
    210                 215                 220

Met Leu Ile His Pro Thr Asp
225                 230


<210>  9
<211>  228
<212>  PRT
<213>  Homo sapiens

<400>  9

Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                   10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30
```

```
Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140

Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Lys Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Thr Asp
225
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<210> 10
<211> 223
<212> PRT
<213> Homo sapiens

<400> 10

```
Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
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```
1               5                   10                  15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
            20                  25                  30

Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
        35                  40                  45

Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
    50                  55                  60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65                  70                  75                  80

Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
                85                  90                  95

Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
            100                 105                 110

Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
        115                 120                 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
    130                 135                 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145                 150                 155                 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
                165                 170                 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Lys Ser
            180                 185                 190

Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg
        195                 200                 205

Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp
    210                 215                 220


<210>  11
<211>  215
<212>  PRT
<213>  Homo sapiens

<400>  11
```

```
Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                   10                  15

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175

Tyr Asn Lys Pro Arg Ala Lys Ser Lys Pro Glu Arg Arg Arg Gly Leu
            180                 185                 190

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        195                 200                 205

Met Leu Ile His Pro Thr Asp
    210                 215


<210>  12
<211>  460
<212>  PRT
<213>  Artificial Sequence

<220>
```

<223> K423Q

<400> 12

```
Met Phe Thr Ile Lys Leu Leu Leu Phe Ile Val Pro Leu Val Ile Ser
1               5                  10                  15

Ser Arg Ile Asp Gln Asp Asn Ser Ser Phe Asp Ser Leu Ser Pro Glu
            20                  25                  30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
        35                  40                  45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
    50                  55                  60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65                  70                  75                  80

Ser Phe Tyr Asp Leu Ser Leu Gln Thr Ser Glu Ile Lys Glu Glu Glu
                85                  90                  95

Lys Glu Leu Arg Arg Thr Thr Tyr Lys Leu Gln Val Lys Asn Glu Glu
            100                 105                 110

Val Lys Asn Met Ser Leu Glu Leu Asn Ser Lys Leu Glu Ser Leu Leu
        115                 120                 125

Glu Glu Lys Ile Leu Leu Gln Gln Lys Val Lys Tyr Leu Glu Glu Gln
    130                 135                 140

Leu Thr Asn Leu Ile Gln Asn Gln Pro Glu Thr Pro Glu His Pro Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Thr Phe Val Glu Lys Gln Asp Asn Ser Ile Lys
                165                 170                 175

Asp Leu Leu Gln Thr Val Glu Asp Gln Tyr Lys Gln Leu Asn Gln Gln
            180                 185                 190

His Ser Gln Ile Lys Glu Ile Glu Asn Gln Leu Arg Arg Thr Ser Ile
        195                 200                 205

Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro Arg
    210                 215                 220

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
225                 230                 235                 240
```

```
Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
                245                 250                 255

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            260                 265                 270

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        275                 280                 285

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    290                 295                 300

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
305                 310                 315                 320

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                325                 330                 335

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
            340                 345                 350

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        355                 360                 365

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    370                 375                 380

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
385                 390                 395                 400

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                405                 410                 415

Tyr Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu
            420                 425                 430

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        435                 440                 445

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    450                 455                 460
```

<210> 13
<211> 460
<212> PRT
<213> Artificial Sequence

<220>
<223> K423S

<400> 13

```
Met Phe Thr Ile Lys Leu Leu Leu Phe Ile Val Pro Leu Val Ile Ser
1               5                  10                  15

Ser Arg Ile Asp Gln Asp Asn Ser Ser Phe Asp Ser Leu Ser Pro Glu
            20                  25                  30

Pro Lys Ser Arg Phe Ala Met Leu Asp Asp Val Lys Ile Leu Ala Asn
        35                  40                  45

Gly Leu Leu Gln Leu Gly His Gly Leu Lys Asp Phe Val His Lys Thr
    50                  55                  60

Lys Gly Gln Ile Asn Asp Ile Phe Gln Lys Leu Asn Ile Phe Asp Gln
65                  70                  75                  80

Ser Phe Tyr Asp Leu Ser Leu Gln Thr Ser Glu Ile Lys Glu Glu Glu
                85                  90                  95

Lys Glu Leu Arg Arg Thr Thr Tyr Lys Leu Gln Val Lys Asn Glu Glu
            100                 105                 110

Val Lys Asn Met Ser Leu Glu Leu Asn Ser Lys Leu Glu Ser Leu Leu
        115                 120                 125

Glu Glu Lys Ile Leu Leu Gln Gln Lys Val Lys Tyr Leu Glu Glu Gln
    130                 135                 140

Leu Thr Asn Leu Ile Gln Asn Gln Pro Glu Thr Pro Glu His Pro Glu
145                 150                 155                 160

Val Thr Ser Leu Lys Thr Phe Val Glu Lys Gln Asp Asn Ser Ile Lys
                165                 170                 175

Asp Leu Leu Gln Thr Val Glu Asp Gln Tyr Lys Gln Leu Asn Gln Gln
            180                 185                 190

His Ser Gln Ile Lys Glu Ile Glu Asn Gln Leu Arg Arg Thr Ser Ile
        195                 200                 205

Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro Arg
    210                 215                 220
```

```
Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
225                 230                 235                 240

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
                245                 250                 255

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            260                 265                 270

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        275                 280                 285

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    290                 295                 300

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
305                 310                 315                 320

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                325                 330                 335

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
            340                 345                 350

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        355                 360                 365

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    370                 375                 380

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
385                 390                 395                 400

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                405                 410                 415

Tyr Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu
            420                 425                 430

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        435                 440                 445

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    450                 455                 460
```

<210> 14
<211> 253

<212> PRT
<213> Artificial Sequence

<220>
<223> 207-460 K423Q

<400> 14

```
Ile Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro
1               5                  10                  15

Arg Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His
            20                  25                  30

Asp Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His
        35                  40                  45

Thr Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His
    50                  55                  60

Val Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His
65                  70                  75                  80

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

Tyr Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys
            100                 105                 110

Ile Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu
        115                 120                 125

Glu Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu
    130                 135                 140

Gly Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly
145                 150                 155                 160

Asn Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr
                165                 170                 175

Trp Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser
            180                 185                 190

Gly Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly
        195                 200                 205

Lys Tyr Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly
    210                 215                 220
```

```
Leu Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr
225                 230                 235                 240

Lys Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
                245                 250
```

<210> 15
<211> 253
<212> PRT
<213> Artificial Sequence

<220>
<223> 207-460 K423S

<400> 15

```
Ile Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro
1               5                   10                  15

Arg Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His
            20                  25                  30

Asp Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His
        35                  40                  45

Thr Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His
    50                  55                  60

Val Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His
65                  70                  75                  80

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

Tyr Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys
            100                 105                 110

Ile Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu
        115                 120                 125

Glu Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu
    130                 135                 140

Gly Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly
145                 150                 155                 160

Asn Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr
                165                 170                 175
```

```
Trp Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser
            180                 185                 190

Gly Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly
        195                 200                 205

Lys Tyr Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly
    210                 215                 220

Leu Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr
225                 230                 235                 240

Lys Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
                245                 250


<210>  16
<211>  236
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  225-460 K423Q

<400>  16

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                   10                  15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80

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

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125
```

```
Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190

Tyr Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu
        195                 200                 205

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
    210                 215                 220

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230                 235


<210>  17
<211>  236
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  225-460 K423S

<400>  17

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                   10                  15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
                85                  90                  95
```

```
Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190

Tyr Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu
        195                 200                 205

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
    210                 215                 220

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230                 235


<210>  18
<211>  236
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  225-460 S424T

<400>  18

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                   10                  15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60
```

```
Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80

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

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190

Tyr Asn Lys Pro Arg Ala Lys Thr Lys Pro Glu Arg Arg Arg Gly Leu
        195                 200                 205

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
    210                 215                 220

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230                 235


<210>  19
<211>  235
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  226-460 K423Q

<400>  19

Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly
1               5                   10                  15

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
            20                  25                  30
```

```
Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
        35                  40                  45

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
    50                  55                  60

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
65                  70                  75                  80

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
                85                  90                  95

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
            100                 105                 110

Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn
        115                 120                 125

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
    130                 135                 140

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
145                 150                 155                 160

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
                165                 170                 175

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
            180                 185                 190

Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
        195                 200                 205

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
    210                 215                 220

Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230                 235


<210>  20
<211>  235
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  226-460 K423S
```

<400> 20

```
Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly
1               5                  10                  15

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
            20                  25                  30

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
        35                  40                  45

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
    50                  55                  60

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
65                  70                  75                  80

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
                85                  90                  95

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
            100                 105                 110

Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn
        115                 120                 125

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
    130                 135                 140

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
145                 150                 155                 160

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
                165                 170                 175

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
            180                 185                 190

Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
        195                 200                 205

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
    210                 215                 220

Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230                 235
```

<210> 21
<211> 233
<212> PRT
<213> Artificial Sequence

<220>
<223> 228-460 K423Q

<400> 21

```
Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                  10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30

Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140

Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys
        195                 200                 205
```

```
Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220


His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230


<210>  22
<211>  233
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  228-460 K423S

<400>  22

Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                   10                  15


Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30


Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45


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


Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80


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


Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110


Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125


Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140


Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160


Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175
```

```
Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230
```

<210> 23
<211> 233
<212> PRT
<213> Artificial Sequence

<220>
<223> 228-460 S424T

<400> 23

```
Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                   10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30

Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140
```

```
Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Lys Thr Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230


<210>  24
<211>  228
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  233-460 K423Q

<400>  24

Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
1               5                   10                  15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
            20                  25                  30

Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
        35                  40                  45

Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
    50                  55                  60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65                  70                  75                  80

Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
                85                  90                  95

Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
            100                 105                 110
```

```
Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
        115                 120                 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
    130                 135                 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145                 150                 155                 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
                165                 170                 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Gln Ser
            180                 185                 190

Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg
        195                 200                 205

Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp Ser
    210                 215                 220

Glu Ser Phe Glu
225
```

<210> 25
<211> 228
<212> PRT
<213> Artificial Sequence

<220>
<223> 233-460 K423S

<400> 25

```
Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
1               5                   10                  15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
            20                  25                  30

Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
        35                  40                  45

Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
    50                  55                  60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65                  70                  75                  80
```

```
Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
                85                  90                  95

Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
            100                 105                 110

Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
        115                 120                 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
    130                 135                 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145                 150                 155                 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
                165                 170                 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Ser Ser
            180                 185                 190

Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg
        195                 200                 205

Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp Ser
    210                 215                 220

Glu Ser Phe Glu
225
```

<210> 26
<211> 220
<212> PRT
<213> Artificial Sequence

<220>
<223> 241-460 K423Q

<400> 26

```
Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                   10                  15

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45
```

```
Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175

Tyr Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu
            180                 185                 190

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        195                 200                 205

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    210                 215                 220


<210>  27
<211>  220
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  241-460 K423S

<400>  27

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                   10                  15

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30
```

```
Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175

Tyr Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu
            180                 185                 190

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        195                 200                 205

Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    210                 215                 220


<210>  28
<211>  219
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  242-460 K423Q

<400>  28

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
1               5                   10                  15
```

```
Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
            20                  25                  30

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
        35                  40                  45

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
    50                  55                  60

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
65                  70                  75                  80

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
                85                  90                  95

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

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
        115                 120                 125

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
    130                 135                 140

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
145                 150                 155                 160

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                165                 170                 175

Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
            180                 185                 190

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        195                 200                 205

Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    210                 215
```

<210> 29
<211> 219
<212> PRT
<213> Artificial Sequence

<220>
<223> 242-460 K423S

<400> 29

```
Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
1               5                   10                  15

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
            20                  25                  30

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
        35                  40                  45

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
    50                  55                  60

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
65                  70                  75                  80

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
                85                  90                  95

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

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
        115                 120                 125

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
    130                 135                 140

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
145                 150                 155                 160

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                165                 170                 175

Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
            180                 185                 190

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        195                 200                 205

Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    210                 215
```

<210> 30
<211> 231
<212> PRT
<213> Artificial Sequence

<220>

<223> 225-455 K423Q

<400> 30

```
Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                  10                  15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80

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

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190

Tyr Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu
        195                 200                 205

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
    210                 215                 220

Met Leu Ile His Pro Thr Asp
225                 230
```

<210> 31
<211> 231
<212> PRT
<213> Artificial Sequence

<220>
<223> 225-455 K423S

<400> 31

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1 5 10 15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
20 25 30

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
35 40 45

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
50 55 60

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65 70 75 80

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

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
100 105 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
115 120 125

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
130 135 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145 150 155 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
165 170 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
180 185 190

Tyr Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu
195 200 205

```
Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
    210                 215                 220

Met Leu Ile His Pro Thr Asp
225                 230
```

<210> 32
<211> 230
<212> PRT
<213> Artificial Sequence

<220>
<223> 226-455 K423Q

<400> 32

```
Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly
1               5                   10                  15

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
            20                  25                  30

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
        35                  40                  45

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
    50                  55                  60

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
65                  70                  75                  80

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
                85                  90                  95

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
            100                 105                 110

Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn
        115                 120                 125

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
    130                 135                 140

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
145                 150                 155                 160

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
                165                 170                 175
```

```
Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
            180                 185                 190

Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
        195                 200                 205

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
    210                 215                 220

Leu Ile His Pro Thr Asp
225                 230


<210>  33
<211>  230
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  226-455 K423S

<400>  33

Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly
1               5                   10                  15

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
            20                  25                  30

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
        35                  40                  45

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
    50                  55                  60

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
65                  70                  75                  80

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
                85                  90                  95

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
            100                 105                 110

Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn
        115                 120                 125

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
    130                 135                 140
```

```
Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
145                 150                 155                 160

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
                165                 170                 175

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
            180                 185                 190

Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
        195                 200                 205

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
    210                 215                 220

Leu Ile His Pro Thr Asp
225                 230


<210>  34
<211>  228
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  228-455 K423Q

<400>  34

Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                   10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30

Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110
```

```
Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140

Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Thr Asp
225

<210>  35
<211>  228
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  228-455 K423S

<400>  35

Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                   10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30

Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80
```

```
Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile
                85                  90                  95

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140

Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Thr Asp
225
```

<210> 36
<211> 223
<212> PRT
<213> Artificial Sequence

<220>
<223> 233-455 K423Q

<400> 36

```
Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
1               5                   10                  15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
            20                  25                  30

Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
        35                  40                  45
```

```
Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
    50                  55                  60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65                  70                  75                  80

Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
                85                  90                  95

Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
            100                 105                 110

Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
        115                 120                 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
    130                 135                 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145                 150                 155                 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
                165                 170                 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Gln Ser
            180                 185                 190

Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg
        195                 200                 205

Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp
    210                 215                 220


<210>  37
<211>  223
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  233-455 K423S

<400>  37

Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
1               5                   10                  15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
            20                  25                  30
```

```
Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
        35                  40                  45

Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
    50                  55                  60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65                  70                  75                  80

Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
                85                  90                  95

Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
            100                 105                 110

Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
        115                 120                 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
    130                 135                 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145                 150                 155                 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
                165                 170                 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Ser Ser
            180                 185                 190

Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg
        195                 200                 205

Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp
    210                 215                 220


<210>  38
<211>  215
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  241-455 K423Q

<400>  38

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                   10                  15
```

```
Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175

Tyr Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu
            180                 185                 190

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        195                 200                 205

Met Leu Ile His Pro Thr Asp
    210                 215
```

<210> 39
<211> 215
<212> PRT
<213> Artificial Sequence

<220>
<223> 241-455 K423S

<400> 39

```
Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                  10                  15

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175

Tyr Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu
            180                 185                 190

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
        195                 200                 205

Met Leu Ile His Pro Thr Asp
    210                 215
```

<210> 40
<211> 214
<212> PRT
<213> Artificial Sequence

<220>
<223> 242-455 K423Q

<400> 40

```
Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
1               5                  10                  15

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
            20                  25                  30

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
        35                  40                  45

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
    50                  55                  60

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
65                  70                  75                  80

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
                85                  90                  95

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

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
        115                 120                 125

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
    130                 135                 140

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
145                 150                 155                 160

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                165                 170                 175

Asn Lys Pro Arg Ala Gln Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
            180                 185                 190

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        195                 200                 205

Leu Ile His Pro Thr Asp
    210
```

<210> 41
<211> 214
<212> PRT
<213> Artificial Sequence

<220>
<223> 242-455 K423S

<400> 41

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Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
1               5                  10                  15

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
            20                  25                  30

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
        35                  40                  45

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
    50                  55                  60

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
65                  70                  75                  80

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
                85                  90                  95

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

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
        115                 120                 125

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
    130                 135                 140

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
145                 150                 155                 160

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                165                 170                 175

Asn Lys Pro Arg Ala Ser Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
            180                 185                 190

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        195                 200                 205
```

```
Leu Ile His Pro Thr Asp
    210


<210>  42
<211>  233
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  canine 227 K423Q

<400>  42

Phe Leu His Leu Asn Glu Thr Lys Asn Val Glu His Asn Asp Ile Pro
1               5                  10                  15


Ala Asn Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Ile
            20                  25                  30


Tyr Ser Ile Arg Pro Ser Asn Ser Gln Val Phe Asn Val Tyr Cys Asp
        35                  40                  45


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


Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Arg Tyr Gly Phe Gly
65                  70                  75                  80


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


Val Lys Gln Ser Asn Tyr Ile Leu Arg Ile Glu Leu Glu Asp Trp Asn
            100                 105                 110


Asp Asn Lys His Tyr Ile Glu Tyr Phe Phe His Leu Gly Asn His Glu
        115                 120                 125


Thr Asn Tyr Thr Leu His Leu Val Glu Ile Thr Gly Asn Ile Leu Asn
    130                 135                 140


Ala Leu Pro Glu His Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160


Ala Lys Gly His Val Asn Cys Pro Glu Ser Tyr Ser Gly Gly Trp Trp
                165                 170                 175


Trp His Asn Val Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190
```

```
Gln Arg Ala Gln Thr Lys Pro Glu Arg Arg Arg Gly Leu Tyr Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Ile Asp Ser Glu Ser Ser Glu
225                 230

<210>  43
<211>  233
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  canine 227 K423S

<400>  43

Phe Leu His Leu Asn Glu Thr Lys Asn Val Glu His Asn Asp Ile Pro
1               5                   10                  15

Ala Asn Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Ile
            20                  25                  30

Tyr Ser Ile Arg Pro Ser Asn Ser Gln Val Phe Asn Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Arg Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Ile Leu Arg Ile Glu Leu Glu Asp Trp Asn
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Phe Phe His Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Glu Ile Thr Gly Asn Ile Leu Asn
    130                 135                 140

Ala Leu Pro Glu His Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160
```

```
Ala Lys Gly His Val Asn Cys Pro Glu Ser Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asn Val Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Gln Arg Ala Ser Thr Lys Pro Glu Arg Arg Arg Gly Leu Tyr Trp Lys
        195                 200                 205

Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile
    210                 215                 220

His Pro Ile Asp Ser Glu Ser Ser Glu
225                 230
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<210> 44
<211> 708
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 225WT

<400> 44
actactccct ttcttcagtt gaatgaaata agaaatgtaa aacatgatgg cattcctgct 60

gaatgtacca ccatttataa cagaggtgaa catacaagtg gcatgtatgc catcagaccc 120

agcaactctc aagtttttca tgtctactgt gatgttatat caggtagtcc atggacatta 180

attcaacatc gaatagatgg atcacaaaac ttcaatgaaa cgtgggagaa ctacaaatat 240

ggttttggga ggcttgatgg agaattttgg ttgggcctag agaagatata ctccatagtg 300

aagcaatcta attatgtttt acgaattgag ttggaagact ggaaagacaa caaacattat 360

attgaatatt ctttttactt gggaaatcac gaaaccaact atacgctaca tctagttgcg 420

attactggca atgtccccaa tgcaatcccg gaaaacaaag atttggtgtt ttctacttgg 480

gatcacaaag caaaaggaca cttcaactgt ccagagggtt attcaggagg ctggtggtgg 540

catgatgagt gtggagaaaa caacctaaat ggtaaatata acaaaccaag agcaaaatct 600

aagccagaga ggagaagagg attatcttgg aagtctcaaa atggaaggtt atactctata 660

aaatcaacca aaatgttgat ccatccaaca gattcagaaa gctttgaa 708

<210> 45
<211> 708
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 225 K423Q

<400> 45
actactccct ttcttcagtt gaatgaaata agaaatgtaa aacatgatgg cattcctgct 60

gaatgtacca ccatttataa cagaggtgaa catacaagtg gcatgtatgc catcagaccc 120

agcaactctc aagtttttca tgtctactgt gatgttatat caggtagtcc atggacatta 180

attcaacatc gaatagatgg atcacaaaac ttcaatgaaa cgtgggagaa ctacaaatat 240

ggttttggga ggcttgatgg agaattttgg ttgggcctag agaagatata ctccatagtg 300

aagcaatcta attatgtttt acgaattgag ttggaagact ggaaagacaa caaacattat 360

attgaatatt ctttttactt gggaaatcac gaaaccaact atacgctaca tctagttgcg 420

attactggca atgtccccaa tgcaatcccg gaaaacaaag atttggtgtt ttctacttgg 480

gatcacaaag caaaaggaca cttcaactgt ccagagggtt attcaggagg ctggtggtgg 540

catgatgagt gtggagaaaa caacctaaat ggtaaatata acaaaccaag agcacaatct 600

aagccagaga ggagaagagg attatcttgg aagtctcaaa atggaaggtt atactctata 660

aaatcaacca aaatgttgat ccatccaaca gattcagaaa gctttgaa 708

<210> 46
<211> 708
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 225 K423S

<400> 46
actactccct ttcttcagtt gaatgaaata agaaatgtaa aacatgatgg cattcctgct 60

gaatgtacca ccatttataa cagaggtgaa catacaagtg gcatgtatgc catcagaccc 120

agcaactctc aagtttttca tgtctactgt gatgttatat caggtagtcc atggacatta 180

attcaacatc gaatagatgg atcacaaaac ttcaatgaaa cgtgggagaa ctacaaatat 240

ggttttggga ggcttgatgg agaattttgg ttgggcctag agaagatata ctccatagtg 300

aagcaatcta attatgtttt acgaattgag ttggaagact ggaaagacaa caaacattat 360

attgaatatt ctttttactt gggaaatcac gaaaccaact atacgctaca tctagttgcg 420

attactggca atgtccccaa tgcaatcccg gaaaacaaag atttggtgtt ttctacttgg 480

gatcacaaag caaaaggaca cttcaactgt ccagagggtt attcaggagg ctggtggtgg 540

catgatgagt gtggagaaaa caacctaaat ggtaaatata acaaaccaag agcaagctct 600

aagccagaga ggagaagagg attatcttgg aagtctcaaa atggaaggtt atactctata 660

aaatcaacca aaatgttgat ccatccaaca gattcagaaa gctttgaa 708

<210> 47
<211> 705

<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 226 K423Q

<400> 47
actccctttc ttcagttgaa tgaaataaga aatgtaaaac atgatggcat tcctgctgaa 60

tgtaccacca tttataacag aggtgaacat acaagtggca tgtatgccat cagacccagc 120

aactctcaag tttttcatgt ctactgtgat gttatatcag gtagtccatg gacattaatt 180

caacatcgaa tagatggatc acaaaacttc aatgaaacgt gggagaacta caaatatggt 240

tttgggaggc ttgatggaga attttggttg ggcctagaga agatatactc catagtgaag 300

caatctaatt atgttttacg aattgagttg gaagactgga aagacaacaa acattatatt 360

gaatattctt tttacttggg aaatcacgaa accaactata cgctacatct agttgcgatt 420

actggcaatg tccccaatgc aatcccggaa aacaaagatt tggtgttttc tacttgggat 480

cacaaagcaa aaggacactt caactgtcca gagggttatt caggaggctg gtggtggcat 540

gatgagtgtg gagaaaacaa cctaaatggt aaatataaca aaccaagagc acaatctaag 600

ccagagagga gaagaggatt atcttggaag tctcaaaatg gaaggttata ctctataaaa 660

tcaaccaaaa tgttgatcca tccaacagat tcagaaagct ttgaa 705

<210> 48
<211> 705
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 226 K423S

<400> 48
actccctttc ttcagttgaa tgaaataaga aatgtaaaac atgatggcat tcctgctgaa 60

tgtaccacca tttataacag aggtgaacat acaagtggca tgtatgccat cagacccagc 120

aactctcaag tttttcatgt ctactgtgat gttatatcag gtagtccatg gacattaatt 180

caacatcgaa tagatggatc acaaaacttc aatgaaacgt gggagaacta caaatatggt 240

tttgggaggc ttgatggaga attttggttg ggcctagaga agatatactc catagtgaag 300

caatctaatt atgttttacg aattgagttg gaagactgga aagacaacaa acattatatt 360

gaatattctt tttacttggg aaatcacgaa accaactata cgctacatct agttgcgatt 420

actggcaatg tccccaatgc aatcccggaa aacaaagatt tggtgttttc tacttgggat 480

cacaaagcaa aaggacactt caactgtcca gagggttatt caggaggctg gtggtggcat 540

gatgagtgtg gagaaaacaa cctaaatggt aaatataaca aaccaagagc aagctctaag 600

ccagagagga gaagaggatt atcttggaag tctcaaaatg gaaggttata ctctataaaa 660

tcaaccaaaa tgttgatcca tccaacagat tcagaaagct ttgaa 705

<210> 49
<211> 699
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 228 K423Q

<400> 49
tttcttcagt tgaatgaaat aagaaatgta aaacatgatg gcattcctgc tgaatgtacc 60

accatttata acagaggtga acatacaagt ggcatgtatg ccatcagacc cagcaactct 120

caagtttttc atgtctactg tgatgttata tcaggtagtc catggacatt aattcaacat 180

cgaatagatg gatcacaaaa cttcaatgaa acgtgggaga actacaaata tggttttggg 240

aggcttgatg gagaattttg gttgggccta gagaagatat actccatagt gaagcaatct 300

aattatgttt tacgaattga gttggaagac tggaaagaca acaaacatta tattgaatat 360

tctttttact tgggaaatca cgaaaccaac tatacgctac atctagttgc gattactggc 420

aatgtcccca atgcaatccc ggaaaacaaa gatttggtgt tttctacttg ggatcacaaa 480

gcaaaaggac acttcaactg tccagagggt tattcaggag gctggtggtg gcatgatgag 540

tgtggagaaa acaacctaaa tggtaaatat aacaaaccaa gagcacaatc taagccagag 600

aggagaagag gattatcttg gaagtctcaa aatggaaggt tatactctat aaaatcaacc 660

aaaatgttga tccatccaac agattcagaa agctttgaa 699

<210> 50
<211> 699
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 228 K423S

<400> 50
tttcttcagt tgaatgaaat aagaaatgta aaacatgatg gcattcctgc tgaatgtacc 60

accatttata acagaggtga acatacaagt ggcatgtatg ccatcagacc cagcaactct 120

caagtttttc atgtctactg tgatgttata tcaggtagtc catggacatt aattcaacat 180

cgaatagatg gatcacaaaa cttcaatgaa acgtgggaga actacaaata tggttttggg 240

aggcttgatg gagaattttg gttgggccta gagaagatat actccatagt gaagcaatct 300

aattatgttt tacgaattga gttggaagac tggaaagaca acaaacatta tattgaatat 360

tctttttact tgggaaatca cgaaaccaac tatacgctac atctagttgc gattactggc 420

aatgtcccca atgcaatccc ggaaaacaaa gatttggtgt tttctacttg ggatcacaaa 480

gcaaaaggac acttcaactg tccagagggt tattcaggag gctggtggtg gcatgatgag 540

tgtggagaaa acaacctaaa tggtaaatat aacaaaccaa gagcaagctc taagccagag 600

aggagaagag gattatcttg gaagtctcaa aatggaaggt tatactctat aaaatcaacc 660

aaaatgttga tccatccaac agattcagaa agctttgaa 699

<210> 51
<211> 684
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 233 K423Q

<400> 51
gaaataagaa atgtaaaaca tgatggcatt cctgctgaat gtaccaccat ttataacaga 60

ggtgaacata caagtggcat gtatgccatc agacccagca actctcaagt ttttcatgtc 120

tactgtgatg ttatatcagg tagtccatgg acattaattc aacatcgaat agatggatca 180

caaaacttca atgaaacgtg ggagaactac aaatatggtt ttgggaggct tgatggagaa 240

ttttggttgg gcctagagaa gatatactcc atagtgaagc aatctaatta tgttttacga 300

attgagttgg aagactggaa agacaacaaa cattatattg aatattcttt ttacttggga 360

aatcacgaaa ccaactatac gctacatcta gttgcgatta ctggcaatgt ccccaatgca 420

atcccggaaa acaaagattt ggtgtttttct acttgggatc acaaagcaaa aggacacttc 480

aactgtccag agggttattc aggaggctgg tggtggcatg atgagtgtgg agaaaacaac 540

ctaaatggta aatataacaa accaagagca caatctaagc cagagaggag aagaggatta 600

tcttggaagt ctcaaaatgg aaggttatac tctataaaat caaccaaaat gttgatccat 660

ccaacagatt cagaaagctt tgaa 684

<210> 52
<211> 684
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 233 K423S

<400> 52
gaaataagaa atgtaaaaca tgatggcatt cctgctgaat gtaccaccat ttataacaga 60

ggtgaacata caagtggcat gtatgccatc agacccagca actctcaagt ttttcatgtc 120

tactgtgatg ttatatcagg tagtccatgg acattaattc aacatcgaat agatggatca 180

caaaacttca atgaaacgtg ggagaactac aaatatggtt ttgggaggct tgatggagaa 240

ttttggttgg gcctagagaa gatatactcc atagtgaagc aatctaatta tgttttacga 300

attgagttgg aagactggaa agacaacaaa cattatattg aatattcttt ttacttggga 360

aatcacgaaa ccaactatac gctacatcta gttgcgatta ctggcaatgt ccccaatgca 420

atcccggaaa acaaagattt ggtgtttttct acttgggatc acaaagcaaa aggacacttc 480

aactgtccag agggttattc aggaggctgg tggtggcatg atgagtgtgg agaaaacaac 540

ctaaatggta aatataacaa accaagagca agctctaagc cagagaggag aagaggatta 600

tcttggaagt ctcaaaatgg aaggttatac tctataaaat caaccaaaat gttgatccat 660

ccaacagatt cagaaagctt tgaa 684

<210> 53
<211> 660
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 241 K423Q

<400> 53
ggcattcctg ctgaatgtac caccatttat aacagaggtg aacatacaag tggcatgtat 60

gccatcagac ccagcaactc tcaagttttt catgtctact gtgatgttat atcaggtagt 120

ccatggacat taattcaaca tcgaatagat ggatcacaaa acttcaatga aacgtgggag 180

aactacaaat atggttttgg gaggcttgat ggagaatttt ggttgggcct agagaagata 240

tactccatag tgaagcaatc taattatgtt ttacgaattg agttggaaga ctggaaagac 300

aacaaacatt atattgaata ttctttttac ttgggaaatc acgaaaccaa ctatacgcta 360

catctagttg cgattactgg caatgtcccc aatgcaatcc cggaaaacaa agatttggtg 420

ttttctactt gggatcacaa agcaaaagga cacttcaact gtccagaggg ttattcagga 480

ggctggtggt ggcatgatga gtgtggagaa aacaacctaa atggtaaata taacaaacca 540

agagcacaat ctaagccaga gaggagaaga ggattatctt ggaagtctca aaatggaagg 600

ttatactcta taaaatcaac caaaatgttg atccatccaa cagattcaga aagctttgaa 660

<210> 54
<211> 660
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 241 K423S

<400> 54
ggcattcctg ctgaatgtac caccatttat aacagaggtg aacatacaag tggcatgtat 60

gccatcagac ccagcaactc tcaagttttt catgtctact gtgatgttat atcaggtagt 120

ccatggacat taattcaaca tcgaatagat ggatcacaaa acttcaatga aacgtgggag 180

aactacaaat atggttttgg gaggcttgat ggagaatttt ggttgggcct agagaagata 240

tactccatag tgaagcaatc taattatgtt ttacgaattg agttggaaga ctggaaagac 300

aacaaacatt atattgaata ttctttttac ttgggaaatc acgaaaccaa ctatacgcta 360

catctagttg cgattactgg caatgtcccc aatgcaatcc cggaaaacaa agatttggtg 420

ttttctactt gggatcacaa agcaaaagga cacttcaact gtccagaggg ttattcagga 480

ggctggtggt ggcatgatga gtgtggagaa aacaacctaa atggtaaata taacaaacca 540

agagcaagct ctaagccaga gaggagaaga ggattatctt ggaagtctca aaatggaagg 600

ttatactcta taaaatcaac caaaatgttg atccatccaa cagattcaga aagctttgaa 660

<210> 55
<211> 657
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 242 K423Q

<400> 55
attcctgctg aatgtaccac catttataac agaggtgaac atacaagtgg catgtatgcc 60

atcagaccca gcaactctca agtttttcat gtctactgtg atgttatatc aggtagtcca 120

tggacattaa ttcaacatcg aatagatgga tcacaaaact tcaatgaaac gtgggagaac 180

tacaaatatg gttttgggag gcttgatgga gaattttggt tgggcctaga gaagatatac 240

tccatagtga agcaatctaa ttatgtttta cgaattgagt tggaagactg gaaagacaac 300

aaacattata ttgaatattc tttttacttg ggaaatcacg aaaccaacta tacgctacat 360

ctagttgcga ttactggcaa tgtccccaat gcaatcccgg aaaacaaaga tttggtgttt 420

tctacttggg atcacaaagc aaaaggacac ttcaactgtc cagagggtta ttcaggaggc 480

tggtggtggc atgatgagtg tggagaaaac aacctaaatg gtaaatataa caaaccaaga 540

gcacaatcta agccagagag gagaagagga ttatcttgga agtctcaaaa tggaaggtta 600

tactctataa aatcaaccaa aatgttgatc catccaacag attcagaaag ctttgaa 657

<210> 56
<211> 657
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid encoding 242 K423S

<400> 56
attcctgctg aatgtaccac catttataac agaggtgaac atacaagtgg catgtatgcc 60

atcagaccca gcaactctca agtttttcat gtctactgtg atgttatatc aggtagtcca 120

tggacattaa ttcaacatcg aatagatgga tcacaaaact tcaatgaaac gtgggagaac 180

tacaaatatg gttttgggag gcttgatgga gaattttggt tgggcctaga gaagatatac 240

tccatagtga agcaatctaa ttatgtttta cgaattgagt tggaagactg gaaagacaac 300

aaacattata ttgaatattc tttttacttg ggaaatcacg aaaccaacta tacgctacat 360

ctagttgcga ttactggcaa tgtccccaat gcaatcccgg aaaacaaaga tttggtgttt 420

tctacttggg atcacaaagc aaaaggacac ttcaactgtc cagagggtta ttcaggaggc 480

tggtggtggc atgatgagtg tggagaaaac aacctaaatg gtaaatataa caaaccaaga 540

gcaagctcta agccagagag gagaagagga ttatcttgga agtctcaaaa tggaaggtta 600

tactctataa aatcaaccaa aatgttgatc catccaacag attcagaaag ctttgaa 657

<210> 57
<211> 699
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleic acid sequence encoding canine 227KQ

<400> 57
tttttgcatc tcaacgaaac gaagaatgtc gaacacaacg acattccggc aaattgcaca 60

actatctaca atagaggcga acatacgtcc ggtatctact ccattagacc ttcaaacagc 120

caggtattca atgtgtactg cgatgtaaag tcaggatcgt catggacact gatccagcat 180

aggatcgacg ggtcccagaa cttcaacgag acatgggaga actaccgcta tggatttgga 240

aggctggatg gggagttctg gttgggactt gagaaaatct acagcattgt gaagcagtcg 300

aactacattc tccggattga actggaggac tggaatgaca acaaacacta catcgagtat 360

ttctttcatc tcggcaacca tgaaacgaat tacaccttgc accttgtgga aatcacgggc 420

aacattttga acgcgctgcc agaacacaaa gacctggtgt tttcgacatg ggatcacaaa 480

gcaaaggggc acgtgaactg tcccgaatca tatagcgggg gatggtggtg gcacaatgtc 540

tgtggtgaga acaatctcaa cgggaaatac aataagcagc gagctcagac gaaacccgag 600

cggcggagag gtctgtattg gaagtcgcag aatggacgcc tgtattcgat caaatcgacg 660

aaaatgctca tccaccccat cgactccgaa tcgtcggag 699

<210> 58
<211> 252
<212> PRT
<213> Artificial Sequence

<220>
<223> 201-460 K423del

<400> 58

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Ile Gln Glu Pro Thr Glu Ile Ser Leu Ser Ser Lys Pro Arg Ala Pro
1               5                  10                  15

Arg Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His
            20                  25                  30

Asp Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His
        35                  40                  45

Thr Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His
    50                  55                  60

Val Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His
65                  70                  75                  80

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

Tyr Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys
            100                 105                 110

Ile Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu
        115                 120                 125

Glu Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu
    130                 135                 140

Gly Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly
145                 150                 155                 160

Asn Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr
                165                 170                 175

Trp Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser
            180                 185                 190

Gly Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly
        195                 200                 205

Lys Tyr Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu
    210                 215                 220

Ser Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys
225                 230                 235                 240
```

```
Met Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
                245                 250


<210>  59
<211>  235
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  225-460 K423del

<400>  59

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                   10                  15


Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30


Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45


Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60


Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80


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


Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110


Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125


Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140


Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160


Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175


Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190
```

```
Tyr Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
        195                 200                 205

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
    210                 215                 220

Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230                 235

<210>  60
<211>  234
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  226-460 K423del

<400>  60

Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly
1               5                   10                  15

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
            20                  25                  30

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
        35                  40                  45

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
    50                  55                  60

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
65                  70                  75                  80

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
                85                  90                  95

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
            100                 105                 110

Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn
        115                 120                 125

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
    130                 135                 140

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
145                 150                 155                 160
```

```
His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
                165                 170                 175

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
            180                 185                 190

Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp
        195                 200                 205

Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu
    210                 215                 220

Ile His Pro Thr Asp Ser Glu Ser Phe Glu
225                 230


<210>  61
<211>  232
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  228-460 K423del

<400>  61

Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                   10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30

Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125
```

```
Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140

Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser
        195                 200                 205

Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His
    210                 215                 220

Pro Thr Asp Ser Glu Ser Phe Glu
225                 230


<210>  62
<211>  227
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  233-460 K423del

<400>  62

Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
1               5                   10                  15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
            20                  25                  30

Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
        35                  40                  45

Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
    50                  55                  60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65                  70                  75                  80

Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
                85                  90                  95
```

```
Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
            100                 105                 110

Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
        115                 120                 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
    130                 135                 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145                 150                 155                 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
                165                 170                 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Ser Lys
            180                 185                 190

Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg Leu
        195                 200                 205

Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp Ser Glu
    210                 215                 220

Ser Phe Glu
225
```

<210> 63
<211> 219
<212> PRT
<213> Artificial Sequence

<220>
<223> 241-460 K423del

<400> 63

```
Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                   10                  15

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60
```

```
Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175

Tyr Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
            180                 185                 190

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        195                 200                 205

Leu Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    210                 215


<210>  64
<211>  218
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  242-460 K423del

<400>  64

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
1               5                   10                  15

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
            20                  25                  30

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
        35                  40                  45
```

```
Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
    50                  55                  60

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
65                  70                  75                  80

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
                85                  90                  95

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

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
        115                 120                 125

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
    130                 135                 140

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
145                 150                 155                 160

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                165                 170                 175

Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp
            180                 185                 190

Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu
        195                 200                 205

Ile His Pro Thr Asp Ser Glu Ser Phe Glu
    210                 215


<210>  65
<211>  230
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  225-455 K423del

<400>  65

Thr Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp
1               5                   10                  15

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
            20                  25                  30
```

```
Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
        35                  40                  45

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
    50                  55                  60

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
65                  70                  75                  80

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

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
            100                 105                 110

Asp Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly
        115                 120                 125

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
    130                 135                 140

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
145                 150                 155                 160

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
                165                 170                 175

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
            180                 185                 190

Tyr Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
        195                 200                 205

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
    210                 215                 220

Leu Ile His Pro Thr Asp
225                 230
```

<210> 66
<211> 229
<212> PRT
<213> Artificial Sequence

<220>
<223> 226-455 K423del

<400> 66

```
Thr Pro Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly
1               5                   10                  15

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
            20                  25                  30

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
        35                  40                  45

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
    50                  55                  60

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
65                  70                  75                  80

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
                85                  90                  95

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
            100                 105                 110

Trp Lys Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn
        115                 120                 125

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
    130                 135                 140

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
145                 150                 155                 160

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
                165                 170                 175

Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
            180                 185                 190

Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp
        195                 200                 205

Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu
    210                 215                 220

Ile His Pro Thr Asp
225

<210>  67
<211>  227
```

<212> PRT
<213> Artificial Sequence

<220>
<223> 228-455 K423del

<400> 67

```
Phe Leu Gln Leu Asn Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro
1               5                  10                  15

Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met
            20                  25                  30

Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp
        35                  40                  45

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

Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly
65                  70                  75                  80

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

Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys
            100                 105                 110

Asp Asn Lys His Tyr Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu
        115                 120                 125

Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val Pro Asn
    130                 135                 140

Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys
145                 150                 155                 160

Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp
                165                 170                 175

Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys
            180                 185                 190

Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser
        195                 200                 205

Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His
    210                 215                 220
```

Pro Thr Asp
225

<210> 68
<211> 222
<212> PRT
<213> Artificial Sequence

<220>
<223> 233-455 K423del

<400> 68

Glu Ile Arg Asn Val Lys His Asp Gly Ile Pro Ala Glu Cys Thr Thr
1 5 10 15

Ile Tyr Asn Arg Gly Glu His Thr Ser Gly Met Tyr Ala Ile Arg Pro
20 25 30

Ser Asn Ser Gln Val Phe His Val Tyr Cys Asp Val Ile Ser Gly Ser
35 40 45

Pro Trp Thr Leu Ile Gln His Arg Ile Asp Gly Ser Gln Asn Phe Asn
50 55 60

Glu Thr Trp Glu Asn Tyr Lys Tyr Gly Phe Gly Arg Leu Asp Gly Glu
65 70 75 80

Phe Trp Leu Gly Leu Glu Lys Ile Tyr Ser Ile Val Lys Gln Ser Asn
85 90 95

Tyr Val Leu Arg Ile Glu Leu Glu Asp Trp Lys Asp Asn Lys His Tyr
100 105 110

Ile Glu Tyr Ser Phe Tyr Leu Gly Asn His Glu Thr Asn Tyr Thr Leu
115 120 125

His Leu Val Ala Ile Thr Gly Asn Val Pro Asn Ala Ile Pro Glu Asn
130 135 140

Lys Asp Leu Val Phe Ser Thr Trp Asp His Lys Ala Lys Gly His Phe
145 150 155 160

Asn Cys Pro Glu Gly Tyr Ser Gly Gly Trp Trp Trp His Asp Glu Cys
165 170 175

Gly Glu Asn Asn Leu Asn Gly Lys Tyr Asn Lys Pro Arg Ala Ser Lys
180 185 190

```
Pro Glu Arg Arg Arg Gly Leu Ser Trp Lys Ser Gln Asn Gly Arg Leu
        195                 200                 205

Tyr Ser Ile Lys Ser Thr Lys Met Leu Ile His Pro Thr Asp
    210                 215                 220


<210>  69
<211>  214
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  241-455 K423del

<400>  69

Gly Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr
1               5                   10                  15

Ser Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val
            20                  25                  30

Tyr Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg
        35                  40                  45

Ile Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr
    50                  55                  60

Gly Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile
65                  70                  75                  80

Tyr Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu
                85                  90                  95

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

Asn His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn
        115                 120                 125

Val Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp
    130                 135                 140

Asp His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly
145                 150                 155                 160

Gly Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys
                165                 170                 175
```

```
Tyr Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser
            180                 185                 190

Trp Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met
        195                 200                 205

Leu Ile His Pro Thr Asp
    210


<210>  70
<211>  213
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  242-455 K423del

<400>  70

Ile Pro Ala Glu Cys Thr Thr Ile Tyr Asn Arg Gly Glu His Thr Ser
1               5                   10                  15

Gly Met Tyr Ala Ile Arg Pro Ser Asn Ser Gln Val Phe His Val Tyr
            20                  25                  30

Cys Asp Val Ile Ser Gly Ser Pro Trp Thr Leu Ile Gln His Arg Ile
        35                  40                  45

Asp Gly Ser Gln Asn Phe Asn Glu Thr Trp Glu Asn Tyr Lys Tyr Gly
    50                  55                  60

Phe Gly Arg Leu Asp Gly Glu Phe Trp Leu Gly Leu Glu Lys Ile Tyr
65                  70                  75                  80

Ser Ile Val Lys Gln Ser Asn Tyr Val Leu Arg Ile Glu Leu Glu Asp
                85                  90                  95

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

His Glu Thr Asn Tyr Thr Leu His Leu Val Ala Ile Thr Gly Asn Val
        115                 120                 125

Pro Asn Ala Ile Pro Glu Asn Lys Asp Leu Val Phe Ser Thr Trp Asp
    130                 135                 140

His Lys Ala Lys Gly His Phe Asn Cys Pro Glu Gly Tyr Ser Gly Gly
145                 150                 155                 160
```

```
Trp Trp Trp His Asp Glu Cys Gly Glu Asn Asn Leu Asn Gly Lys Tyr
                165                 170                 175

Asn Lys Pro Arg Ala Ser Lys Pro Glu Arg Arg Arg Gly Leu Ser Trp
            180                 185                 190

Lys Ser Gln Asn Gly Arg Leu Tyr Ser Ile Lys Ser Thr Lys Met Leu
        195                 200                 205

Ile His Pro Thr Asp
    210
```

<210> 71
<211> 491
<212> PRT
<213> Homo sapiens

<400> 71

```
Met Lys Thr Phe Thr Trp Thr Leu Gly Val Leu Phe Phe Leu Leu Val
1               5                   10                  15

Asp Thr Gly His Cys Arg Gly Gly Gln Phe Lys Ile Lys Lys Ile Asn
            20                  25                  30

Gln Arg Arg Tyr Pro Arg Ala Thr Asp Gly Lys Glu Glu Ala Lys Lys
        35                  40                  45

Cys Ala Tyr Thr Phe Leu Val Pro Glu Gln Arg Ile Thr Gly Pro Ile
    50                  55                  60

Cys Val Asn Thr Lys Gly Gln Asp Ala Ser Thr Ile Lys Asp Met Ile
65                  70                  75                  80

Thr Arg Met Asp Leu Glu Asn Leu Lys Asp Val Leu Ser Arg Gln Lys
                85                  90                  95

Arg Glu Ile Asp Val Leu Gln Leu Val Val Asp Val Asp Gly Asn Ile
            100                 105                 110

Val Asn Glu Val Lys Leu Leu Arg Lys Glu Ser Arg Asn Met Asn Ser
        115                 120                 125

Arg Val Thr Gln Leu Tyr Met Gln Leu Leu His Glu Ile Ile Arg Lys
    130                 135                 140

Arg Asp Asn Ser Leu Glu Leu Ser Gln Leu Glu Asn Lys Ile Leu Asn
```

```
145                 150                 155                 160

Val Thr Thr Glu Met Leu Lys Met Ala Thr Arg Tyr Arg Glu Leu Glu
                165                 170                 175

Val Lys Tyr Ala Ser Leu Thr Asp Leu Val Asn Asn Gln Ser Val Met
            180                 185                 190

Ile Thr Leu Leu Glu Glu Gln Cys Leu Arg Ile Phe Ser Arg Gln Asp
        195                 200                 205

Thr His Val Ser Pro Pro Leu Val Gln Val Val Pro Gln His Ile Pro
    210                 215                 220

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

Arg Asp Pro Gly Tyr Pro Arg Asp Leu Met Pro Pro Pro Asp Leu Ala
                245                 250                 255

Thr Ser Pro Thr Lys Ser Pro Phe Lys Ile Pro Pro Val Thr Phe Ile
            260                 265                 270

Asn Glu Gly Pro Phe Lys Asp Cys Gln Gln Ala Lys Glu Ala Gly His
        275                 280                 285

Ser Val Ser Gly Ile Tyr Met Ile Lys Pro Glu Asn Ser Asn Gly Pro
    290                 295                 300

Met Gln Leu Trp Cys Glu Asn Ser Leu Asp Pro Gly Gly Trp Thr Val
305                 310                 315                 320

Ile Gln Lys Arg Thr Asp Gly Ser Val Asn Phe Phe Arg Asn Trp Glu
                325                 330                 335

Asn Tyr Lys Lys Gly Phe Gly Asn Ile Asp Gly Glu Tyr Trp Leu Gly
            340                 345                 350

Leu Glu Asn Ile Tyr Met Leu Ser Asn Gln Asp Asn Tyr Lys Leu Leu
        355                 360                 365

Ile Glu Leu Glu Asp Trp Ser Asp Lys Lys Val Tyr Ala Glu Tyr Ser
    370                 375                 380

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

```
Thr Tyr Gln Gly Asn Ala Gly Asp Ser Met Met Trp His Asn Gly Lys
                405                 410                 415

Gln Phe Thr Thr Leu Asp Arg Asp Lys Asp Met Tyr Ala Gly Asn Cys
            420                 425                 430

Ala His Phe His Lys Gly Gly Trp Trp Tyr Asn Ala Cys Ala His Ser
        435                 440                 445

Asn Leu Asn Gly Val Trp Tyr Arg Gly Gly His Tyr Arg Ser Lys His
    450                 455                 460

Gln Asp Gly Ile Phe Trp Ala Glu Tyr Arg Gly Gly Ser Tyr Ser Leu
465                 470                 475                 480

Arg Ala Val Gln Met Met Ile Lys Pro Ile Asp
                485                 490


<210>  72
<211>  221
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Cterminal hANGPTL1 271-491

<400>  72

Phe Ile Asn Glu Gly Pro Phe Lys Asp Cys Gln Gln Ala Lys Glu Ala
1               5                   10                  15

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

Gly Pro Met Gln Leu Trp Cys Glu Asn Ser Leu Asp Pro Gly Gly Trp
        35                  40                  45

Thr Val Ile Gln Lys Arg Thr Asp Gly Ser Val Asn Phe Phe Arg Asn
    50                  55                  60

Trp Glu Asn Tyr Lys Lys Gly Phe Gly Asn Ile Asp Gly Glu Tyr Trp
65                  70                  75                  80

Leu Gly Leu Glu Asn Ile Tyr Met Leu Ser Asn Gln Asp Asn Tyr Lys
                85                  90                  95

Leu Leu Ile Glu Leu Glu Asp Trp Ser Asp Lys Lys Val Tyr Ala Glu
            100                 105                 110
```

```
Tyr Ser Ser Phe Arg Leu Glu Pro Glu Ser Glu Phe Tyr Arg Leu Arg
        115                 120                 125

Leu Gly Thr Tyr Gln Gly Asn Ala Gly Asp Ser Met Met Trp His Asn
    130                 135                 140

Gly Lys Gln Phe Thr Thr Leu Asp Arg Asp Lys Asp Met Tyr Ala Gly
145                 150                 155                 160

Asn Cys Ala His Phe His Lys Gly Gly Trp Trp Tyr Asn Ala Cys Ala
                165                 170                 175

His Ser Asn Leu Asn Gly Val Trp Tyr Arg Gly Gly His Tyr Arg Ser
            180                 185                 190

Lys His Gln Asp Gly Ile Phe Trp Ala Glu Tyr Arg Gly Gly Ser Tyr
        195                 200                 205

Ser Leu Arg Ala Val Gln Met Met Ile Lys Pro Ile Asp
    210                 215                 220


<210>  73
<211>  406
<212>  PRT
<213>  Homo sapiens

<400>  73

Met Ser Gly Ala Pro Thr Ala Gly Ala Ala Leu Met Leu Cys Ala Ala
1               5                   10                  15

Thr Ala Val Leu Leu Ser Ala Gln Gly Gly Pro Val Gln Ser Lys Ser
            20                  25                  30

Pro Arg Phe Ala Ser Trp Asp Glu Met Asn Val Leu Ala His Gly Leu
        35                  40                  45

Leu Gln Leu Gly Gln Gly Leu Arg Glu His Ala Glu Arg Thr Arg Ser
    50                  55                  60

Gln Leu Ser Ala Leu Glu Arg Arg Leu Ser Ala Cys Gly Ser Ala Cys
65                  70                  75                  80

Gln Gly Thr Glu Gly Ser Thr Asp Leu Pro Leu Ala Pro Glu Ser Arg
                85                  90                  95

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

```
Asn Ser Arg Ile Gln Gln Leu Phe His Lys Val Ala Gln Gln Gln Arg
        115                 120                 125

His Leu Glu Lys Gln His Leu Arg Ile Gln His Leu Gln Ser Gln Phe
    130                 135                 140

Gly Leu Leu Asp His Lys His Leu Asp His Glu Val Ala Lys Pro Ala
145                 150                 155                 160

Arg Arg Lys Arg Leu Pro Glu Met Ala Gln Pro Val Asp Pro Ala His
                165                 170                 175

Asn Val Ser Arg Leu His Arg Leu Pro Arg Asp Cys Gln Glu Leu Phe
            180                 185                 190

Gln Val Gly Glu Arg Gln Ser Gly Leu Phe Glu Ile Gln Pro Gln Gly
        195                 200                 205

Ser Pro Pro Phe Leu Val Asn Cys Lys Met Thr Ser Asp Gly Gly Trp
    210                 215                 220

Thr Val Ile Gln Arg Arg His Asp Gly Ser Val Asp Phe Asn Arg Pro
225                 230                 235                 240

Trp Glu Ala Tyr Lys Ala Gly Phe Gly Asp Pro His Gly Glu Phe Trp
                245                 250                 255

Leu Gly Leu Glu Lys Val His Ser Ile Thr Gly Asp Arg Asn Ser Arg
            260                 265                 270

Leu Ala Val Gln Leu Arg Asp Trp Asp Gly Asn Ala Glu Leu Leu Gln
        275                 280                 285

Phe Ser Val His Leu Gly Gly Glu Asp Thr Ala Tyr Ser Leu Gln Leu
    290                 295                 300

Thr Ala Pro Val Ala Gly Gln Leu Gly Ala Thr Thr Val Pro Pro Ser
305                 310                 315                 320

Gly Leu Ser Val Pro Phe Ser Thr Trp Asp Gln Asp His Asp Leu Arg
                325                 330                 335

Arg Asp Lys Asn Cys Ala Lys Ser Leu Ser Gly Gly Trp Trp Phe Gly
            340                 345                 350
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Thr Cys Ser His Ser Asn Leu Asn Gly Gln Tyr Phe Arg Ser Ile Pro
        355                 360                 365

Gln Gln Arg Gln Lys Leu Lys Lys Gly Ile Phe Trp Lys Thr Trp Arg
    370                 375                 380

Gly Arg Tyr Tyr Pro Leu Gln Ala Thr Thr Met Leu Ile Gln Pro Met
385                 390                 395                 400

Ala Ala Glu Ala Ala Ser
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Gly Glu Arg Gln Ser Gly Leu Phe Glu Ile Gln Pro Gln Gly Ser Pro
            20                  25                  30

Pro Phe Leu Val Asn Cys Lys Met Thr Ser Asp Gly Gly Trp Thr Val
        35                  40                  45

Ile Gln Arg Arg His Asp Gly Ser Val Asp Phe Asn Arg Pro Trp Glu
    50                  55                  60

Ala Tyr Lys Ala Gly Phe Gly Asp Pro His Gly Glu Phe Trp Leu Gly
65                  70                  75                  80

Leu Glu Lys Val His Ser Ile Thr Gly Asp Arg Asn Ser Arg Leu Ala
                85                  90                  95

Val Gln Leu Arg Asp Trp Asp Gly Asn Ala Glu Leu Leu Gln Phe Ser
            100                 105                 110

Val His Leu Gly Gly Glu Asp Thr Ala Tyr Ser Leu Gln Leu Thr Ala
        115                 120                 125

Pro Val Ala Gly Gln Leu Gly Ala Thr Thr Val Pro Pro Ser Gly Leu
    130                 135                 140
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Ser Val Pro Phe Ser Thr Trp Asp Gln Asp His Asp Leu Arg Arg Asp
145                 150                 155                 160

Lys Asn Cys Ala Lys Ser Leu Ser Gly Gly Trp Trp Phe Gly Thr Cys
                165                 170                 175

Ser His Ser Asn Leu Asn Gly Gln Tyr Phe Arg Ser Ile Pro Gln Gln
            180                 185                 190

Arg Gln Lys Leu Lys Lys Gly Ile Phe Trp Lys Thr Trp Arg Gly Arg
        195                 200                 205

Tyr Tyr Pro Leu Gln Ala Thr Thr Met Leu Ile Gln Pro Met Ala Ala
    210                 215                 220

Glu Ala Ala Ser
225
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