SEQUENCE LISTING

<110> Novozymes Biopharma DK A/S

<120> Albumin variants and conjugates

<130> 11527-US-PCT

<150> US 61/154,555
<151> 2009-02-23

<150> EP 09152625.1
<151> 2009-02-11

<150> EP 09152686.3
<151> 2009-02-12

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<223> Human serum albumin (mature protein)

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Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
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Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110
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Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
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Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
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Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365
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Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
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Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
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Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
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Ala Ala Ser Gln Ala Ala Leu Gly Leu
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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtcagctgaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gcttcgtctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg cttgaatgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg cagatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

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gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

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aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

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<212> DNA
<213> Artificial Sequence

<220>
<223> Polynucleotide coding sequence (codon optimised for expression in yeast) for human serum albumin

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aagttggtca acgaagttac cgaattcgct aagacttgtg ttgctgacga atctgctgaa 180

aactgtgaca agtccttgca caccttgttc ggtgataagt tgtgtactgt tgctaccttg 240

agagaaacct acggtgaaat ggctgactgt tgtgctaagc aagaaccaga aagaaacgaa 300

tgtttcttgc aacacaagga cgacaaccca aacttgccaa gattggttag accagaagtt 360

gacgtcatgt gtactgcttt ccacgacaac gaagaaacct tcttgaagaa gtacttgtac 420

gaaattgcta gaagacaccc atacttctac gctccagaat tgttgttctt cgctaagaga 480

tacaaggctg ctttcaccga atgttgtcaa gctgctgata aggctgcttg tttgttgcca 540

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caaagattcc caaaggctga attcgctgaa gtttctaagt tggttactga cttgactaag 720

gttcacactg aatgttgtca cggtgacttg ttggaatgtg ctgatgacag agctgacttg 780

gctaagtaca tctgtgaaaa ccaagactct atctcttcca agttgaagga atgttgtgaa 840

aagccattgt tggaaaagtc tcactgtatt gctgaagttg aaaacgatga aatgccagct 900

gacttgccat ctttggctgc tgacttcgtt gaatctaagg acgtttgtaa gaactacgct 960

gaagctaagg acgtcttctt gggtatgttc ttgtacgaat acgctagaag acacccagac 1020

tactccgttg tcttgttgtt gagattggct aagacctacg aaactacctt ggaaaagtgt 1080

tgtgctgctg ctgacccaca cgaatgttac gctaaggttt tcgatgaatt caagccattg 1140

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ccaactttgg ttgaagtctc tagaaacttg ggtaaggtcg gttctaagtg ttgtaagcac 1320

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tgtgttttgc acgaaaagac cccagtctct gatagagtca ccaagtgttg tactgaatct 1440

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gaattcaacg ctgaaacttt caccttccac gctgatatct gtaccttgtc cgaaaaggaa 1560

agacaaatta agaagcaaac tgctttggtt gaattggtca agcacaagcc aaaggctact 1620

aaggaacaat tgaaggctgt catggatgat ttcgctgctt tcgttgaaaa gtgttgtaag 1680

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gctgctttgg gtttgtaa 1758

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<223> HA mutated to introduce restriction enzyme sites

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

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aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

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gctgccttag gcttataa 1758

<210> 5
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<212> DNA
<213> Artificial sequence

<220>
<223> TA1: HA with A2C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

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gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

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aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

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<212> DNA
<213> Artificial sequence

<220>
<223> TA2: HA with D1C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

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gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

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<212> DNA
<213> Artificial sequence

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<223> TA3: HA with C75S

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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<212> DNA
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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcatgtctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

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tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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<223> TA6: HA with E86C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggttgtat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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gctgccttag gcttataa 1758

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<211> 1758
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<223> TA7: HA with C124S

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gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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gctgccttag gcttataa 1758

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<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA8: HA with C168S

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atcttgccaa gctgctgata aagctgcctg cctgttgcca 540

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cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

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gctgccttag gcttataa 1758

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<212> DNA
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<223> TA9: HA with C169S

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aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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<210> 14
<211> 1758
<212> DNA
<213> Artificial sequence

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<223> TA10: HA with C91S

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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<212> DNA
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<223> TA11: HA with D121C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

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gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcattgtaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

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<223> TA13: HA with S270C

<400> 17

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

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tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

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gctgccttag gcttataa 1758

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<211> 1758
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<223> TA14:HA with C316A

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

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gctgccttag gcttataa 1758

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<211> 1758
<212> DNA
<213> Artificial sequence

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<223> TA16: HA with C360S

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gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

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gctgccttag gcttataa 1758

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<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA17: HA with C361A

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

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gctgccttag gcttataa 1758

<210> 21
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA18: HA with C361S

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gctgccttag gcttataa 1758

<210> 22
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA19: HA with A364C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

<210> 23
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA20: HA with Q397C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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<223> TA24: HA with C558S

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<223> TA25: HA with C567S

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<211> 1758
<212> DNA
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<223> TA27: HA with D562C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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<210> 31
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<213> Artificial sequence

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<223> TA28: HA with E505C

<400> 31
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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

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gagtttaatg cttgtacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

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aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

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<210> 32
<211> 1758
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<223> TA29: HA with L585C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

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gctgccttag gctgttaa 1758

<210> 33
<211> 1758

<212> DNA
<213> Artificial sequence

<220>
<223> TA33: HA with A2C and L585C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

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cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

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aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

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gctgccttag gctgttaa 1758

<210> 34
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA34: HA with A2C and A504C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

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aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

<210> 35
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA35: HA with A2C, A364C and D562C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

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cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

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gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

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gctgccttag gcttataa 1758

<210> 36
<211> 1758
<212> DNA
<213> Artificial sequence

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<223> TA36: HA with A2C, C34A, A364C and D562C

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aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

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gctgccttag gcttataa 1758

<210> 37
<211> 1758
<212> DNA
<213> Artificial sequence

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<223> TA38: HA withA2C, A364C, D562C and L585C

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gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

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gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gcttgtgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gctgttaa 1758

<210> 38
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA39: HA with C34A, A504C and E505C.

<400> 38
gatgcacaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagg ctccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatt gttgtacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

<210> 39
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA41: HA with S270C and A581C

<400> 39
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gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattgt atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

tgtgccttag gcttataa 1758

<210> 40
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA43: HA with D129C, S270C and A581C

<400> 40
gatgcacaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcattgtaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattgt atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

tgtgccttag gcttataa 1758

<210> 41
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA46: HA with C169S

<400> 41
gatgcacaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttctcaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgttgctaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

<210> 42
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA47: HA with D129C, C360S and L585C

<400> 42
gatgcacaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcattgtaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtct 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gctgttaa 1758

<210> 43
<211> 1761
<212> DNA
<213> Artificial sequence

<220>
<223> TA51: HA with A2C and a cysteine immediately before the stop codon

<400> 43
gattgtcaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttatgtta a 1761

<210> 44
<211> 1761
<212> DNA
<213> Artificial sequence

<220>
<223> TA57: HA with A2C and a Cys insertion between G584 and L585

<400> 44
gattgtcaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gctgtttata a 1761

<210> 45
<211> 1755
<212> DNA
<213> Artificial sequence

<220>
<223> TA60: HA with A2C deltion of C316

<400> 45
gattgtcaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgttaaaaa ctatgctgag 960

gcaaaggatg tcttcctggg catgtttttg tatgaatatg caagaaggca tcctgattac 1020

tctgtcgtgc tgctgctgag acttgccaag acatatgaaa ccactctaga gaagtgctgt 1080

gccgctgctg atcctcatga atgctatgcc aaagtgttcg atgaatttaa acctcttgtg 1140

gaagagcctc agaatttaat caaacaaaat tgtgagcttt ttgagcagct tggagagtac 1200

aaattccaga atgcgctatt agttcgttac accaagaaag taccccaagt gtcaactcca 1260

actcttgtag aggtctcaag aaacctagga aaagtgggat ccaaatgttg taaacatcct 1320

gaagcaaaaa gaatgccctg tgcagaagac tatctatccg tggtcctgaa ccagttatgt 1380

gtgttgcatg agaaaacgcc agtaagtgac agagtcacca aatgctgcac agaatccttg 1440

gtgaacaggc gaccatgctt ttcagctctg gaagtcgacg aaacatacgt tcccaaagag 1500

tttaatgctg aaacattcac cttccatgca gatatatgca cactttctga gaaggagaga 1560

caaatcaaga aacaaactgc acttgttgag ctcgtgaaac acaagcccaa ggcaacaaaa 1620

gagcaactga aagctgttat ggatgatttc gcagcttttg tagagaagtg ctgcaaggct 1680

gacgataagg agacctgctt tgccgaggag ggtaaaaaac ttgttgctgc aagtcaagct 1740

gccttaggct tataa 1755

<210> 46
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA63: HA with H39C and C253P

<400> 46
gatgcacaca agagtgaggt tgctcatcgg tttaaagatt tgggagaaga aaatttcaaa 60

gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agattgtgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctg cctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagccag ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

<210> 47
<211> 1758
<212> DNA
<213> Artificial sequence

<220>
<223> TA64: HA with C177F

<400> 47
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gccttggtgt tgattgcctt tgctcagtat cttcagcagt gtccatttga agatcatgta 120

aaattagtga atgaagtaac tgaatttgca aaaacatgtg ttgctgatga gtccgcggaa 180

aattgtgaca aatcacttca tacccttttt ggagacaaat tatgcacagt tgcaactctt 240

cgtgaaacct atggtgaaat ggctgactgc tgtgcaaaac aagaacctga gagaaatgaa 300

tgcttcttgc aacacaaaga tgacaaccca aacctccccc gattggtgag accagaggtt 360

gatgtgatgt gcactgcttt tcatgacaat gaagagacat ttttgaaaaa atacttatat 420

gaaattgcca gaagacatcc ttacttttat gccccggaac tccttttctt tgctaaaagg 480

tataaagctg cttttacaga atgttgccaa gctgctgata aagctgcctt tctgttgcca 540

aagctcgatg aacttcggga tgaagggaag gctagctctg ccaaacagag actcaagtgt 600

gccagtctcc aaaaatttgg agaaagagct ttcaaagcat gggcagtagc tcgcctgagc 660

cagagatttc ccaaagctga gtttgcagaa gtttccaagt tagtgacaga tcttaccaaa 720

gtccacacgg aatgctgcca tggagatctg ctcgagtgtg ctgatgacag ggcggacctt 780

gccaagtata tctgtgaaaa tcaagattcg atctccagta aactgaagga atgctgtgaa 840

aaacctctgt tggaaaaatc ccactgcatt gccgaagtgg aaaatgatga gatgcctgct 900

gacttgcctt cattagctgc tgattttgtt gaaagtaagg atgtttgcaa aaactatgct 960

gaggcaaagg atgtcttcct gggcatgttt ttgtatgaat atgcaagaag gcatcctgat 1020

tactctgtcg tgctgctgct gagacttgcc aagacatatg aaaccactct agagaagtgc 1080

tgtgccgctg ctgatcctca tgaatgctat gccaaagtgt tcgatgaatt taaacctctt 1140

gtggaagagc ctcagaattt aatcaaacaa aattgtgagc tttttgagca gcttggagag 1200

tacaaattcc agaatgcgct attagttcgt tacaccaaga aagtacccca agtgtcaact 1260

ccaactcttg tagaggtctc aagaaaccta ggaaaagtgg gatccaaatg ttgtaaacat 1320

cctgaagcaa aaagaatgcc ctgtgcagaa gactatctat ccgtggtcct gaaccagtta 1380

tgtgtgttgc atgagaaaac gccagtaagt gacagagtca ccaaatgctg cacagaatcc 1440

ttggtgaaca ggcgaccatg cttttcagct ctggaagtcg acgaaacata cgttcccaaa 1500

gagtttaatg ctgaaacatt caccttccat gcagatatat gcacactttc tgagaaggag 1560

agacaaatca agaaacaaac tgcacttgtt gagctcgtga aacacaagcc caaggcaaca 1620

aaagagcaac tgaaagctgt tatggatgat ttcgcagctt ttgtagagaa gtgctgcaag 1680

gctgacgata aggagacctg ctttgccgag gagggtaaaa aacttgttgc tgcaagtcaa 1740

gctgccttag gcttataa 1758

<210> 48
<211> 1767
<212> DNA
<213> Artificial sequence

<220>
<223> TA65: HA with a Cys at the N-terminus and an Ala-Cys extension at the C-terminus

<400> 48
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aaagccttgg tgttgattgc ctttgctcag tatcttcagc agtgtccatt tgaagatcat 120

gtaaaattag tgaatgaagt aactgaattt gcaaaaacat gtgttgctga tgagtccgcg 180

gaaaattgtg acaaatcact tcataccctt tttggagaca aattatgcac agttgcaact 240

cttcgtgaaa cctatggtga aatggctgac tgctgtgcaa aacaagaacc tgagagaaat 300

gaatgcttct tgcaacacaa agatgacaac ccaaacctcc cccgattggt gagaccagag 360

gttgatgtga tgtgcactgc ttttcatgac aatgaagaga catttttgaa aaaatactta 420

tatgaaattg ccagaagaca tccttacttt tatgccccgg aactcctttt ctttgctaaa 480

aggtataaag ctgcttttac agaatgttgc caagctgctg ataaagctgc ctgcctgttg 540

ccaaagctcg atgaacttcg ggatgaaggg aaggctagct ctgccaaaca gagactcaag 600

tgtgccagtc tccaaaaatt tggagaaaga gctttcaaag catgggcagt agctcgcctg 660

agccagagat ttcccaaagc tgagtttgca gaagtttcca agttagtgac agatcttacc 720

aaagtccaca cggaatgctg ccatggagat ctgctcgagt gtgctgatga cagggcggac 780

cttgccaagt atatctgtga aaatcaagat tcgatctcca gtaaactgaa ggaatgctgt 840

gaaaaacctc tgttggaaaa atcccactgc attgccgaag tggaaaatga tgagatgcct 900

gctgacttgc cttcattagc tgctgatttt gttgaaagta aggatgtttg caaaaactat 960

gctgaggcaa aggatgtctt cctgggcatg tttttgtatg aatatgcaag aaggcatcct 1020

gattactctg tcgtgctgct gctgagactt gccaagacat atgaaaccac tctagagaag 1080

tgctgtgccg ctgctgatcc tcatgaatgc tatgccaaag tgttcgatga atttaaacct 1140

cttgtggaag agcctcagaa tttaatcaaa caaaattgtg agcttttga gcagcttgga 1200

gagtacaaat tccagaatgc gctattagtt cgttacacca agaaagtacc ccaagtgtca 1260

actccaactc ttgtagaggt ctcaagaaac ctaggaaaag tgggatccaa atgttgtaaa 1320

catcctgaag caaaaagaat gccctgtgca gaagactatc tatccgtggt cctgaaccag 1380

ttatgtgtgt tgcatgagaa aacgccagta agtgacagag tcaccaaatg ctgcacagaa 1440

tccttggtga acaggcgacc atgcttttca gctctggaag tcgacgaaac atacgttccc 1500

aaagagttta atgctgaaac attcaccttc catgcagata tatgcacact ttctgagaag 1560

gagagacaaa tcaagaaaca aactgcactt gttgagctcg tgaaacacaa gcccaaggca 1620

acaaaagagc aactgaaagc tgttatggat gatttcgcag cttttgtaga gaagtgctgc 1680

aaggctgacg ataaggagac ctgctttgcc gaggagggta aaaaacttgt tgctgcaagt 1740

caagctgcct taggcttagc ttgttaa 1767

<210> 49
<211> 609
<212> PRT
<213> Artificial Sequence

<220>
<223> HA with fusion leader sequence

<400> 49

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

Tyr Ser Arg Ser Leu Asp Lys Arg Asp Ala His Lys Ser Glu Val Ala
20 25 30

His Arg Phe Lys Asp Leu Gly Glu Glu Asn Phe Lys Ala Leu Val Leu
35 40 45

Ile Ala Phe Ala Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
50 55 60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65 70 75 80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
85 90 95

Lys Leu Cys Thr Val Ala Thr Leu Arg Glu Thr Tyr Gly Glu Met Ala
100 105 110

Asp Cys Cys Ala Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
115 120 125

His Lys Asp Asp Asn Pro Asn Leu Pro Arg Leu Val Arg Pro Glu Val
130 135 140

Asp Val Met Cys Thr Ala Phe His Asp Asn Glu Glu Thr Phe Leu Lys
145 150 155 160

Lys Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
165 170 175

Glu Leu Leu Phe Phe Ala Lys Arg Tyr Lys Ala Ala Phe Thr Glu Cys
180 185 190

```
Cys Gln Ala Ala Asp Lys Ala Ala Cys Leu Leu Pro Lys Leu Asp Glu
        195                 200                 205

Leu Arg Asp Glu Gly Lys Ala Ser Ser Ala Lys Gln Arg Leu Lys Cys
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Leu Ser Gln Arg Phe Pro Lys Ala Glu Phe Ala Glu Val Ser
                245                 250                 255

Lys Leu Val Thr Asp Leu Thr Lys Val His Thr Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile
        275                 280                 285

Cys Glu Asn Gln Asp Ser Ile Ser Ser Lys Leu Lys Glu Cys Cys Glu
    290                 295                 300

Lys Pro Leu Leu Glu Lys Ser His Cys Ile Ala Glu Val Glu Asn Asp
305                 310                 315                 320

Glu Met Pro Ala Asp Leu Pro Ser Leu Ala Ala Asp Phe Val Glu Ser
                325                 330                 335

Lys Asp Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Met Phe Leu Tyr Glu Tyr Ala Arg Arg His Pro Asp Tyr Ser Val Val
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Thr Tyr Glu Thr Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Ala Ala Asp Pro His Glu Cys Tyr Ala Lys Val Phe Asp Glu
385                 390                 395                 400

Phe Lys Pro Leu Val Glu Glu Pro Gln Asn Leu Ile Lys Gln Asn Cys
                405                 410                 415

Glu Leu Phe Glu Gln Leu Gly Glu Tyr Lys Phe Gln Asn Ala Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445
```

```
Glu Val Ser Arg Asn Leu Gly Lys Val Gly Ser Lys Cys Cys Lys His
    450                 455                 460

Pro Glu Ala Lys Arg Met Pro Cys Ala Glu Asp Tyr Leu Ser Val Val
465                 470                 475                 480

Leu Asn Gln Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Asp Arg
                485                 490                 495

Val Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Glu Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Asn Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Ser Glu Lys Glu
    530                 535                 540

Arg Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Lys Glu Gln Leu Lys Ala Val Met Asp Asp Phe Ala
                565                 570                 575

Ala Phe Val Glu Lys Cys Cys Lys Ala Asp Asp Lys Glu Thr Cys Phe
            580                 585                 590

Ala Glu Glu Gly Lys Lys Leu Val Ala Ala Ser Gln Ala Ala Leu Gly
        595                 600                 605

Leu
```

<210> 50
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA1: HA with A2C

<400> 50

```
Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30
```

```
Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270
```

```
Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525
```

```
Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 51
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA2: HA with D1C

<400> 51

```
Cys Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140
```

```
Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380
```

```
Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 52
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA3: HA with C75S

<400> 52

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                  10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Ser Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255
```

```
Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495
```

```
Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 53
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA4: HA with T79C

<400> 53

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Cys Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110
```

```
Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365
```

```
Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 54
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA5: HA with E82C

<400> 54

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1 5 10 15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
20 25 30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
35 40 45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
50 55 60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65 70 75 80

Arg Cys Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
85 90 95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
100 105 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
115 120 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
130 135 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145 150 155 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
165 170 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
195 200 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
210 215 220

```
Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480
```

```
Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 55
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA6: HA with E86C

<400> 55

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Cys Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95
```

```
Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335
```

```
Arg His Pro Asp Tyr Ser Val Val Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 56
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA7: HA with C124S

<400> 56

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                  10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Ser Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205
```

```
Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445
```

```
Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 57
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA8: HA with C168S

<400> 57

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60
```

```
Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Ser Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320
```

```
Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560
```

```
Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575


Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585


<210>  58
<211>  585
<212>  PRT
<213>  Artificial sequence

<220>
<223>  TA9: HA with C169S

<400>  58

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15


Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30


Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45


Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60


Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80


Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95


Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110


Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125


Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140


Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160


Tyr Lys Ala Ala Phe Thr Glu Cys Ser Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175
```

```
Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala Ser
            180                 185                 190

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430
```

```
Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 59
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA10: HA with C91S

<400> 59

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45
```

```
Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Ser Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285
```

```
Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540
```

```
Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 60
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA11: HA with D121C

<400> 60

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Cys Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160
```

```
Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400
```

```
Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 61
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA12: HA with D129C

<400> 61

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15
```

```
Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Cys Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270
```

```
Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510
```

```
Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 62
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA13: HA with S270C

<400> 62

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125
```

```
Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Cys Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380
```

```
Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 63
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA14: HA with C316A

<400> 63

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                  10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240
```

```
Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Ala Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495
```

```
Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 64
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA16: HA with C360S

<400> 64

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110
```

```
Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350
```

```
Tyr Glu Thr Thr Leu Glu Lys Ser Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 65
<211> 585

<212> PRT
<213> Artificial sequence

<220>
<223> TA17: HA with C361A

<400> 65

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1 5 10 15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
20 25 30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
35 40 45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
50 55 60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65 70 75 80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
85 90 95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
100 105 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
115 120 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
130 135 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145 150 155 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
165 170 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
195 200 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
210 215 220

```
Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Ala Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460
```

```
Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 66
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA18: HA with C361S

<400> 66

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80
```

```
Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335
```

```
Arg His Pro Asp Tyr Ser Val Val Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Ser Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575
```

```
Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585


<210>  67
<211>  585
<212>  PRT
<213>  Artificial sequence

<220>
<223>  TA19: HA with A364C

<400>  67

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15


Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30


Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45


Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60


Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80


Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95


Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110


Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125


Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140


Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160


Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175


Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala Ser
            180                 185                 190
```

```
Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Cys Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445
```

```
Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 68
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA20: HA with Q397C

<400> 68

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60
```

```
Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300
```

```
Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Cys Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560
```

```
Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 69
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA21: HA with A504C

<400> 69

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175
```

```
Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala Ser
            180                 185                 190

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415
```

```
Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Cys Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 70
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA22: HA with A578C

<400> 70

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30
```

```
Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285
```

```
Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525
```

```
Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Cys Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 71
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA23: HA with A581C

<400> 71

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140
```

```
Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400
```

```
Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Cys Ala Leu Gly Leu
            580                 585
```

<210> 72
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA24: HA with C558S

<400> 72

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15
```

```
Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255
```

```
Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510
```

```
Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Ser Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 73
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA25: HA with C567S

<400> 73

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125
```

```
Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365
```

```
Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Ser Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 74
<211> 585
<212> PRT
<213> Artificial sequence

<220>

<223> TA26: HA with D549C

<400> 74

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240
```

```
Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480
```

```
Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Cys Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 75
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA27: HA with D562C

<400> 75

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95
```

```
Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350
```

```
Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Cys Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 76
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA28: HA with E505C

<400> 76

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1 5 10 15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
20 25 30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
35 40 45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
50 55 60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65 70 75 80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
85 90 95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
100 105 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
115 120 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
130 135 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145 150 155 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
165 170 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
195 200 205

```
Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460
```

```
Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Cys Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 77
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA29: HA with L585C

<400> 77

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80
```

```
Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320
```

```
Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575
```

```
Ala Ala Ser Gln Ala Ala Leu Gly Cys
            580                 585


<210>  78
<211>  585
<212>  PRT
<213>  Artificial sequence

<220>
<223>  TA33: HA with A2C and L585C

<400>  78

Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15


Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30


Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45


Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60


Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80


Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95


Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110


Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125


Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140


Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160


Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175


Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala Ser
            180                 185                 190
```

```
Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430
```

```
Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Cys
            580                 585


<210>  79
<211>  585
<212>  PRT
<213>  Artificial sequence

<220>
<223>  TA34: HA with A2C and A504C

<400>  79

Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45
```

```
Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300
```

```
Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Cys Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540
```

```
Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560


Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575


Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585


<210>  80
<211>  585
<212>  PRT
<213>  Artificial sequence

<220>
<223>  TA35: HA with A2C, A364C and D562C

<400>  80

Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15


Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30


Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45


Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60


Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80


Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95


Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110


Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125


Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140


Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160
```

```
Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Cys Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415
```

```
Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Cys Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 81
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA36: HA with A2C, A364C and D562C

<400> 81

```
Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30
```

```
Gln Ala Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270
```

```
Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Cys Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525
```

```
Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Cys Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 82
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA38: HA with A2C, A364C, D562C and L585C

<400> 82

```
Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140
```

```
Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Cys Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380
```

```
Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Cys Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Cys
            580                 585
```

<210> 83
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA39: HA with C34A, A504C and E505C.

<400> 83

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                  10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Ala Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255
```

```
Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495
```

```
Tyr Val Pro Lys Glu Phe Asn Cys Cys Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585


<210>  84
<211>  585
<212>  PRT
<213>  Artificial sequence

<220>
<223>  TA41: HA with S270C and A581C

<400>  84

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110
```

```
Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Cys Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365
```

```
Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Cys Ala Leu Gly Leu
            580                 585
```

<210> 85
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA43: HA with D129C, S270C and A581C

<400> 85

Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1   5   10   15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20   25   30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35   40   45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50   55   60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65   70   75   80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85   90   95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100   105   110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115   120   125

Cys Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130   135   140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145   150   155   160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165   170   175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195   200   205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210   215   220

```
Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Cys Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480
```

```
Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Cys Ala Leu Gly Leu
            580                 585
```

<210> 86
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA46: HA with C169S

<400> 86

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95
```

```
Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Ser Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Ala Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335
```

```
Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 87
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA47: HA with D129C and L585C

<400> 87

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                  10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Cys Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205
```

```
Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Ser Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445
```

```
Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Cys
            580                 585
```

<210> 88
<211> 586
<212> PRT
<213> Artificial sequence

<220>
<223> TA51: HA with A2C and a cysteine immediately before the stop codon

<400> 88

```
Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60
```

```
Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
```

```
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560
```

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
565 570 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu Cys
580 585

<210> 89
<211> 586
<212> PRT
<213> Artificial sequence

<220>
<223> TA57: HA with A2C and an insertion between G584 and L585

<400> 89

Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1 5 10 15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
20 25 30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
35 40 45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
50 55 60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65 70 75 80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
85 90 95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
100 105 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
115 120 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
130 135 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145 150 155 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
165 170 175

```
Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala Ser
            180                 185                 190

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
```

```
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Cys Leu
            580                 585
```

<210> 90
<211> 584
<212> PRT
<213> Artificial sequence

<220>
<223> TA60: HA with A2C and deletion of C316

<400> 90

```
Asp Cys His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
```

```
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285
```

```
Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Lys Asn Tyr Ala Glu
305                 310                 315                 320

Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg Arg
                325                 330                 335

His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr Tyr
            340                 345                 350

Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu Cys
        355                 360                 365

Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro Gln
    370                 375                 380

Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu Tyr
385                 390                 395                 400

Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro Gln
                405                 410                 415

Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys Val
            420                 425                 430

Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys Ala
        435                 440                 445

Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His Glu
    450                 455                 460

Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser Leu
465                 470                 475                 480

Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr Tyr
                485                 490                 495

Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp Ile
            500                 505                 510

Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala Leu
        515                 520                 525

Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu Lys
```

```
    530                 535                 540

Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys Ala
545                 550                 555                 560

Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val Ala
                565                 570                 575

Ala Ser Gln Ala Ala Leu Gly Leu
            580
```

<210> 91
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA63: HA with H39C and C253P

<400> 91

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp Cys Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
```

```
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Pro Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400
```

```
Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510

Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 92
<211> 585
<212> PRT
<213> Artificial sequence

<220>
<223> TA64: HA with C177F

<400> 92

```
Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
1               5                   10                  15
```

```
Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu Gln
            20                  25                  30

Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
            100                 105                 110

Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
        115                 120                 125

Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala Arg
    130                 135                 140

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys Arg
145                 150                 155                 160

Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
                165                 170                 175

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

Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Glu
        195                 200                 205

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe Pro
    210                 215                 220

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
225                 230                 235                 240

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
                245                 250                 255

Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile Ser
```

```
            260                 265                 270

Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser His
        275                 280                 285

Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
    290                 295                 300

Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
305                 310                 315                 320

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
                325                 330                 335

Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys Thr
            340                 345                 350

Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
        355                 360                 365

Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu Pro
    370                 375                 380

Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
385                 390                 395                 400

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
                405                 410                 415

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
            420                 425                 430

Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro Cys
        435                 440                 445

Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu His
    450                 455                 460

Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu Ser
465                 470                 475                 480

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu Thr
                485                 490                 495

Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
            500                 505                 510
```

```
Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr Ala
        515                 520                 525

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
    530                 535                 540

Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
545                 550                 555                 560

Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu Val
                565                 570                 575

Ala Ala Ser Gln Ala Ala Leu Gly Leu
            580                 585
```

<210> 93
<211> 588
<212> PRT
<213> Artificial sequence

<220>
<223> TA65: HA with a Cys at the N-terminus and an Ala-Cys extension at the C-terminus of HA

<400> 93

```
Cys Asp Ala His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly
1               5                   10                  15

Glu Glu Asn Phe Lys Ala Leu Val Leu Ile Ala Phe Ala Gln Tyr Leu
            20                  25                  30

Gln Gln Cys Pro Phe Glu Asp His Val Lys Leu Val Asn Glu Val Thr
        35                  40                  45

Glu Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp
    50                  55                  60

Lys Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr
65                  70                  75                  80

Leu Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu
                85                  90                  95

Pro Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn
            100                 105                 110

Leu Pro Arg Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe
        115                 120                 125
```

```
His Asp Asn Glu Glu Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Ile Ala
    130                 135                 140

Arg Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Lys
145                 150                 155                 160

Arg Tyr Lys Ala Ala Phe Thr Glu Cys Cys Gln Ala Ala Asp Lys Ala
                165                 170                 175

Ala Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala
            180                 185                 190

Ser Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly
        195                 200                 205

Glu Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Arg Phe
    210                 215                 220

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

Lys Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp
                245                 250                 255

Asp Arg Ala Asp Leu Ala Lys Tyr Ile Cys Glu Asn Gln Asp Ser Ile
            260                 265                 270

Ser Ser Lys Leu Lys Glu Cys Cys Glu Lys Pro Leu Leu Glu Lys Ser
        275                 280                 285

His Cys Ile Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro
    290                 295                 300

Ser Leu Ala Ala Asp Phe Val Glu Ser Lys Asp Val Cys Lys Asn Tyr
305                 310                 315                 320

Ala Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala
                325                 330                 335

Arg Arg His Pro Asp Tyr Ser Val Val Leu Leu Leu Arg Leu Ala Lys
            340                 345                 350

Thr Tyr Glu Thr Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His
        355                 360                 365
```

```
Glu Cys Tyr Ala Lys Val Phe Asp Glu Phe Lys Pro Leu Val Glu Glu
    370                 375                 380

Pro Gln Asn Leu Ile Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly
385                 390                 395                 400

Glu Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val
                405                 410                 415

Pro Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly
            420                 425                 430

Lys Val Gly Ser Lys Cys Cys Lys His Pro Glu Ala Lys Arg Met Pro
        435                 440                 445

Cys Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Gln Leu Cys Val Leu
    450                 455                 460

His Glu Lys Thr Pro Val Ser Asp Arg Val Thr Lys Cys Cys Thr Glu
465                 470                 475                 480

Ser Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Val Asp Glu
                485                 490                 495

Thr Tyr Val Pro Lys Glu Phe Asn Ala Glu Thr Phe Thr Phe His Ala
            500                 505                 510

Asp Ile Cys Thr Leu Ser Glu Lys Glu Arg Gln Ile Lys Lys Gln Thr
        515                 520                 525

Ala Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln
    530                 535                 540

Leu Lys Ala Val Met Asp Asp Phe Ala Ala Phe Val Glu Lys Cys Cys
545                 550                 555                 560

Lys Ala Asp Asp Lys Glu Thr Cys Phe Ala Glu Glu Gly Lys Lys Leu
                565                 570                 575

Val Ala Ala Ser Gln Ala Ala Leu Gly Leu Ala Cys
            580                 585
```

<210> 94
<211> 607
<212> PRT
<213> Bos taurus

<400> 94

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

Tyr Ser Arg Gly Val Phe Arg Arg Asp Thr His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Lys Asp Leu Gly Glu Glu His Phe Lys Gly Leu Val Leu
        35                  40                  45

Ile Ala Phe Ser Gln Tyr Leu Gln Gln Cys Pro Phe Asp Glu His Val
    50                  55                  60

Lys Leu Val Asn Glu Leu Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65                  70                  75                  80

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

Glu Leu Cys Lys Val Ala Ser Leu Arg Glu Thr Tyr Gly Asp Met Ala
            100                 105                 110

Asp Cys Cys Glu Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Ser
        115                 120                 125

His Lys Asp Asp Ser Pro Asp Leu Pro Lys Leu Lys Pro Asp Pro Asn
    130                 135                 140

Thr Leu Cys Asp Glu Phe Lys Ala Asp Glu Lys Lys Phe Trp Gly Lys
145                 150                 155                 160

Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro Glu
                165                 170                 175

Leu Leu Tyr Tyr Ala Asn Lys Tyr Asn Gly Val Phe Gln Glu Cys Cys
            180                 185                 190

Gln Ala Glu Asp Lys Gly Ala Cys Leu Leu Pro Lys Ile Glu Thr Met
        195                 200                 205

Arg Glu Lys Val Leu Ala Ser Ser Ala Arg Gln Arg Leu Arg Cys Ala
    210                 215                 220

Ser Ile Gln Lys Phe Gly Glu Arg Ala Leu Lys Ala Trp Ser Val Ala
225                 230                 235                 240

Arg Leu Ser Gln Lys Phe Pro Lys Ala Glu Phe Val Glu Val Thr Lys
```

```
                245                 250                 255

Leu Val Thr Asp Leu Thr Lys Val His Lys Glu Cys Cys His Gly Asp
            260                 265                 270

Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile Cys
        275                 280                 285

Asp Asn Gln Asp Thr Ile Ser Ser Lys Leu Lys Glu Cys Cys Asp Lys
    290                 295                 300

Pro Leu Leu Glu Lys Ser His Cys Ile Ala Glu Val Glu Lys Asp Ala
305                 310                 315                 320

Ile Pro Glu Asn Leu Pro Pro Leu Thr Ala Asp Phe Ala Glu Asp Lys
                325                 330                 335

Asp Val Cys Lys Asn Tyr Gln Glu Ala Lys Asp Ala Phe Leu Gly Ser
            340                 345                 350

Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Glu Tyr Ala Val Ser Val
        355                 360                 365

Leu Leu Arg Leu Ala Lys Glu Tyr Glu Ala Thr Leu Glu Glu Cys Cys
    370                 375                 380

Ala Lys Asp Asp Pro His Ala Cys Tyr Ser Thr Val Phe Asp Lys Leu
385                 390                 395                 400

Lys His Leu Val Asp Glu Pro Gln Asn Leu Ile Lys Gln Asn Cys Asp
                405                 410                 415

Gln Phe Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Leu Ile Val
            420                 425                 430

Arg Tyr Thr Arg Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val Glu
        435                 440                 445

Val Ser Arg Ser Leu Gly Lys Val Gly Thr Arg Cys Cys Thr Lys Pro
    450                 455                 460

Glu Ser Glu Arg Met Pro Cys Thr Glu Asp Tyr Leu Ser Leu Ile Leu
465                 470                 475                 480

Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys Val
                485                 490                 495
```

```
Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe Ser
            500                 505                 510

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

Leu Phe Thr Phe His Ala Asp Ile Cys Thr Leu Pro Asp Thr Glu Lys
    530                 535                 540

Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Leu Lys His Lys Pro
545                 550                 555                 560

Lys Ala Thr Glu Glu Gln Leu Lys Thr Val Met Glu Asn Phe Val Ala
                565                 570                 575

Phe Val Asp Lys Cys Cys Ala Ala Asp Asp Lys Glu Ala Cys Phe Ala
            580                 585                 590

Val Glu Gly Pro Lys Leu Val Val Ser Thr Gln Thr Ala Leu Ala
        595                 600                 605
```

<210> 95
<211> 608
<212> PRT
<213> Felis catus

<400> 95

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

Tyr Ser Arg Gly Val Thr Arg Arg Glu Ala His Gln Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Asn Asp Leu Gly Glu Glu His Phe Arg Gly Leu Val Leu
        35                  40                  45

Val Ala Phe Ser Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Gly Cys Val Ala Asp
65                  70                  75                  80

Gln Ser Ala Ala Asn Cys Glu Lys Ser Leu His Glu Leu Leu Gly Asp
                85                  90                  95

Lys Leu Cys Thr Val Ala Ser Leu Arg Asp Lys Tyr Gly Glu Met Ala
            100                 105                 110
```

```
Asp Cys Cys Glu Lys Lys Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
        115                 120                 125

His Lys Asp Asp Asn Pro Gly Phe Gly Gln Leu Val Thr Pro Glu Ala
    130                 135                 140

Asp Ala Met Cys Thr Ala Phe His Glu Asn Glu Gln Arg Phe Leu Gly
145                 150                 155                 160

Lys Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Tyr Tyr Ala Glu Glu Tyr Lys Gly Val Phe Thr Glu Cys
            180                 185                 190

Cys Glu Ala Ala Asp Lys Ala Ala Cys Leu Thr Pro Lys Val Asp Ala
        195                 200                 205

Leu Arg Glu Lys Val Leu Ala Ser Ser Ala Lys Glu Arg Leu Lys Cys
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ser Val
225                 230                 235                 240

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

Lys Leu Val Thr Asp Leu Ala Lys Ile His Lys Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile
        275                 280                 285

Cys Glu Asn Gln Asp Ser Ile Ser Thr Lys Leu Lys Glu Cys Cys Gly
    290                 295                 300

Lys Pro Val Leu Glu Lys Ser His Cys Ile Ser Glu Val Glu Arg Asp
305                 310                 315                 320

Glu Leu Pro Ala Asp Leu Pro Pro Leu Ala Val Asp Phe Val Glu Asp
                325                 330                 335

Lys Glu Val Cys Lys Asn Tyr Gln Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350
```

```
Thr Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Glu Tyr Ser Val Ser
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Glu Tyr Glu Ala Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Thr Asp Asp Pro Pro Ala Cys Tyr Ala His Val Phe Asp Glu
385                 390                 395                 400

Phe Lys Pro Leu Val Glu Glu Pro His Asn Leu Val Lys Thr Asn Cys
                405                 410                 415

Glu Leu Phe Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Val Ser Arg Ser Leu Gly Lys Val Gly Ser Lys Cys Cys Thr His
    450                 455                 460

Pro Glu Ala Glu Arg Leu Ser Cys Ala Glu Asp Tyr Leu Ser Val Val
465                 470                 475                 480

Leu Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Arg
                485                 490                 495

Val Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Gln Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Ser Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ala Asp Leu Cys Thr Leu Pro Glu Ala Glu
    530                 535                 540

Lys Gln Ile Lys Lys Gln Ser Ala Leu Val Glu Leu Leu Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Glu Glu Gln Leu Lys Thr Val Met Gly Asp Phe Gly
                565                 570                 575

Ser Phe Val Asp Lys Cys Cys Ala Ala Glu Asp Lys Glu Ala Cys Phe
            580                 585                 590

Ala Glu Glu Gly Pro Lys Leu Val Ala Ala Ala Gln Ala Ala Leu Ala
        595                 600                 605
```

<210> 96
<211> 608
<212> PRT
<213> Canis lupus familaris

<400> 96

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

Tyr Ser Arg Gly Leu Val Arg Arg Glu Ala Tyr Lys Ser Glu Ile Ala
20 25 30

His Arg Tyr Asn Asp Leu Gly Glu Glu His Phe Arg Gly Leu Val Leu
35 40 45

Val Ala Phe Ser Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
50 55 60

Lys Leu Ala Lys Glu Val Thr Glu Phe Ala Lys Ala Cys Ala Ala Glu
65 70 75 80

Glu Ser Gly Ala Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
85 90 95

Lys Leu Cys Thr Val Ala Ser Leu Arg Asp Lys Tyr Gly Asp Met Ala
100 105 110

Asp Cys Cys Glu Lys Gln Glu Pro Asp Arg Asn Glu Cys Phe Leu Ala
115 120 125

His Lys Asp Asp Asn Pro Gly Phe Pro Pro Leu Val Ala Pro Glu Pro
130 135 140

Asp Ala Leu Cys Ala Ala Phe Gln Asp Asn Glu Gln Leu Phe Leu Gly
145 150 155 160

Lys Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
165 170 175

Glu Leu Leu Tyr Tyr Ala Gln Gln Tyr Lys Gly Val Phe Ala Glu Cys
180 185 190

Cys Gln Ala Ala Asp Lys Ala Ala Cys Leu Gly Pro Lys Ile Glu Ala
195 200 205

Leu Arg Glu Lys Val Leu Leu Ser Ser Ala Lys Glu Arg Phe Lys Cys

```
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Asp Arg Ala Phe Lys Ala Trp Ser Val
225                 230                 235                 240

Ala Arg Leu Ser Gln Arg Phe Pro Lys Ala Asp Phe Ala Glu Ile Ser
                245                 250                 255

Lys Val Val Thr Asp Leu Thr Lys Val His Lys Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Met
        275                 280                 285

Cys Glu Asn Gln Asp Ser Ile Ser Thr Lys Leu Lys Glu Cys Cys Asp
    290                 295                 300

Lys Pro Val Leu Glu Lys Ser Gln Cys Leu Ala Glu Val Glu Arg Asp
305                 310                 315                 320

Glu Leu Pro Gly Asp Leu Pro Ser Leu Ala Ala Asp Phe Val Glu Asp
                325                 330                 335

Lys Glu Val Cys Lys Asn Tyr Gln Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Thr Phe Leu Tyr Glu Tyr Ala Arg Arg His Pro Glu Tyr Ser Val Ser
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Glu Tyr Glu Ala Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Thr Asp Asp Pro Pro Thr Cys Tyr Ala Lys Val Leu Asp Glu
385                 390                 395                 400

Phe Lys Pro Leu Val Asp Glu Pro Gln Asn Leu Val Lys Thr Asn Cys
                405                 410                 415

Glu Leu Phe Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Val Ser Arg Lys Leu Gly Lys Val Gly Thr Lys Cys Cys Lys Lys
    450                 455                 460
```

```
Pro Glu Ser Glu Arg Met Ser Cys Ala Glu Asp Phe Leu Ser Val Val
465                 470                 475                 480

Leu Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Arg
                485                 490                 495

Val Thr Lys Cys Cys Ser Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

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

Glu Thr Phe Thr Phe His Ala Asp Leu Cys Thr Leu Pro Glu Ala Glu
    530                 535                 540

Lys Gln Val Lys Lys Gln Thr Ala Leu Val Glu Leu Leu Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Asp Glu Gln Leu Lys Thr Val Met Gly Asp Phe Gly
                565                 570                 575

Ala Phe Val Glu Lys Cys Cys Ala Ala Glu Asn Lys Glu Gly Cys Phe
            580                 585                 590

Ser Glu Glu Gly Pro Lys Leu Val Ala Ala Ala Gln Ala Ala Leu Val
        595                 600                 605
```

<210> 97
<211> 607
<212> PRT
<213> Equus asinus

<400> 97

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

Tyr Phe Arg Gly Val Leu Arg Arg Asp Thr His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Asn Asp Leu Gly Glu Lys His Phe Lys Gly Leu Val Leu
        35                  40                  45

Val Ala Phe Ser Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Lys Cys Ala Ala Asp
65                  70                  75                  80
```

```
Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Thr Val Ala Thr Leu Arg Ala Thr Tyr Gly Glu Leu Ala
            100                 105                 110

Asp Cys Cys Glu Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Thr
        115                 120                 125

His Lys Asp Asp His Pro Asn Leu Pro Lys Leu Lys Pro Glu Pro Asp
    130                 135                 140

Ala Gln Cys Ala Ala Phe Gln Glu Asp Pro Asp Lys Phe Leu Gly Lys
145                 150                 155                 160

Tyr Leu Tyr Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Gly Pro Glu
                165                 170                 175

Leu Leu Phe His Ala Glu Glu Tyr Lys Ala Asp Phe Thr Glu Cys Cys
            180                 185                 190

Pro Ala Asp Asp Lys Ala Gly Cys Leu Ile Pro Lys Leu Asp Ala Leu
        195                 200                 205

Lys Glu Arg Ile Leu Leu Ser Ser Ala Lys Glu Arg Leu Lys Cys Ser
    210                 215                 220

Ser Phe Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ser Val Ala
225                 230                 235                 240

Arg Leu Ser Gln Lys Phe Pro Lys Ala Asp Phe Ala Glu Val Ser Lys
                245                 250                 255

Ile Val Thr Asp Leu Thr Lys Val His Lys Glu Cys Cys His Gly Asp
            260                 265                 270

Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Thr Lys Tyr Ile Cys
        275                 280                 285

Glu His Gln Asp Ser Ile Ser Gly Lys Leu Lys Ala Cys Cys Asp Lys
    290                 295                 300

Pro Leu Leu Gln Lys Ser His Cys Ile Ala Glu Val Lys Glu Asp Asp
305                 310                 315                 320
```

```
Leu Pro Ser Asp Leu Pro Ala Leu Ala Ala Asp Phe Ala Glu Asp Lys
                325                 330                 335

Glu Ile Cys Lys His Tyr Lys Asp Ala Lys Asp Val Phe Leu Gly Thr
            340                 345                 350

Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Asp Tyr Ser Val Ser Leu
        355                 360                 365

Leu Leu Arg Ile Ala Lys Thr Tyr Glu Ala Thr Leu Glu Lys Cys Cys
    370                 375                 380

Ala Glu Ala Asp Pro Pro Ala Cys Tyr Ala Thr Val Phe Asp Gln Phe
385                 390                 395                 400

Thr Pro Leu Val Glu Glu Pro Lys Ser Leu Val Lys Lys Asn Cys Asp
                405                 410                 415

Leu Phe Glu Glu Val Gly Glu Tyr Asp Phe Gln Asn Ala Leu Ile Val
            420                 425                 430

Arg Tyr Thr Lys Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val Glu
        435                 440                 445

Ile Gly Arg Thr Leu Gly Lys Val Gly Ser Arg Cys Cys Lys Leu Pro
    450                 455                 460

Glu Ser Glu Arg Leu Pro Cys Ser Glu Asn His Leu Ala Leu Ala Leu
465                 470                 475                 480

Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys Ile
                485                 490                 495

Thr Lys Cys Cys Thr Asp Ser Leu Ala Glu Arg Arg Pro Cys Phe Ser
            500                 505                 510

Ala Leu Glu Leu Asp Glu Gly Tyr Ile Pro Lys Glu Phe Lys Ala Glu
        515                 520                 525

Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Pro Glu Asp Glu Lys
    530                 535                 540

Gln Ile Lys Lys Gln Ser Ala Leu Ala Glu Leu Val Lys His Lys Pro
545                 550                 555                 560

Lys Ala Thr Lys Glu Gln Leu Lys Thr Val Leu Gly Asn Phe Ser Ala
                565                 570                 575
```

```
Phe Val Ala Lys Cys Cys Gly Ala Glu Asp Lys Glu Ala Cys Phe Ala
            580                 585                 590

Glu Glu Gly Pro Lys Leu Val Ala Ser Ser Gln Leu Ala Leu Ala
        595                 600                 605
```

<210> 98
<211> 609
<212> PRT
<213> Meriones unguiculatus

<400> 98

```
Met Lys Trp Val Thr Phe Leu Leu Leu Leu Phe Val Ser Gly Ser Ala
1               5                   10                  15

Phe Ser Arg Gly Val Phe Arg Arg Asp Ala Ala His Lys Ser Glu Ile
            20                  25                  30

Ala His Arg Tyr Lys Asp Leu Gly Glu Lys Tyr Phe Lys Gly Leu Val
        35                  40                  45

Leu Tyr Thr Phe Ser Gln Tyr Leu Gln Lys Cys Ser Tyr Glu Glu His
    50                  55                  60

Val Lys Leu Val Arg Glu Val Thr Asp Phe Ala Ser Asn Cys Ala Lys
65                  70                  75                  80

Asp Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly
                85                  90                  95

Asp Lys Leu Cys Ser Leu Pro Asn Phe Gly Glu Lys Tyr Ala Glu Met
            100                 105                 110

Ala Asp Cys Cys Ala Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu
        115                 120                 125

Gln His Lys Asp Asp Asn Pro Gln Leu Pro Pro Phe Lys Arg Ala Glu
    130                 135                 140

Pro Asp Ala Met Cys Thr Ala Phe Gln Glu Asn Ala Glu Ala Phe Met
145                 150                 155                 160

Gly His Tyr Leu His Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Gly
                165                 170                 175

Pro Glu Leu Leu Tyr Leu Ala Asp Lys Tyr Thr Ala Val Leu Thr Glu
```

```
            180                 185                 190

Cys Cys Ala Ala Asp Asp Lys Gly Ala Cys Leu Thr Pro Lys Leu Asp
        195                 200                 205

Ala Leu Lys Glu Lys Ala Leu Val Ser Ala Val Arg Gln Arg Leu Lys
    210                 215                 220

Cys Ser Ser Met Lys Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala
225                 230                 235                 240

Val Ala Arg Met Ser Gln Thr Phe Pro Asn Ala Asp Phe Ala Glu Ile
                245                 250                 255

Thr Lys Leu Ala Thr Asp Leu Thr Lys Val Thr Gln Glu Cys Cys His
            260                 265                 270

Gly Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Glu Leu Ala Lys Tyr
        275                 280                 285

Met Cys Glu Asn Gln Ala Ser Ile Ser Ser Lys Leu Gln Ala Cys Cys
    290                 295                 300

Asp Lys Glu Met Leu Gln Lys Ser Gln Cys Leu Ala Glu Val Glu His
305                 310                 315                 320

Asp Asp Met Pro Ala Asp Leu Pro Ala Leu Thr Ala Asp Phe Val Glu
                325                 330                 335

Asp Lys Asp Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu
            340                 345                 350

Gly Thr Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Glu Tyr Ser Val
        355                 360                 365

Ser Leu Leu Leu Arg Leu Ala Lys Lys Tyr Glu Ala Thr Leu Glu Lys
    370                 375                 380

Cys Cys Ala Glu Ala Asp Pro His Ala Cys Tyr Gly His Val Phe Asp
385                 390                 395                 400

Glu Phe Lys Pro Leu Val Glu Glu Pro Gln Asn Leu Val Lys Ser Asn
                405                 410                 415

Cys Glu Leu Tyr Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Val
            420                 425                 430
```

```
Leu Val Arg Tyr Thr Lys Lys Ala Pro Gln Val Ser Thr Pro Thr Leu
        435                 440                 445

Val Glu Ala Ala Arg Ser Leu Gly Arg Val Gly Thr His Cys Cys Ala
    450                 455                 460

Leu Pro Glu Lys Lys Arg Leu Pro Cys Val Glu Asp Tyr Leu Ser Ala
465                 470                 475                 480

Ile Leu Asn Arg Val Cys Leu Leu His Glu Lys Thr Pro Val Ser Glu
                485                 490                 495

Gln Val Thr Lys Cys Cys Ser Gly Ser Leu Val Glu Arg Arg Pro Cys
            500                 505                 510

Phe Ser Ala Leu Pro Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Lys
        515                 520                 525

Ala Glu Thr Phe Thr Phe His Ala Asn Ile Cys Thr Leu Pro Glu Lys
    530                 535                 540

Glu Lys Gln Met Glu Lys Gln Thr Ala Leu Ala Glu Leu Val Lys His
545                 550                 555                 560

Lys Pro Gln Ala Thr Glu Glu Gln Leu Lys Lys Val Met Gly Asp Phe
                565                 570                 575

Ala Glu Phe Leu Glu Lys Cys Cys Lys Gln Glu Asp Lys Glu Ala Cys
            580                 585                 590

Phe Ser Thr Glu Gly Pro Lys Leu Val Ala Glu Ser Gln Lys Ala Leu
        595                 600                 605

Ala
```

<210> 99
<211> 583
<212> PRT
<213> Capra hircus

<400> 99

```
Asp Thr His Lys Ser Glu Ile Ala His Arg Phe Asn Asp Leu Gly Glu
1               5                   10                  15

Glu Asn Phe Gln Gly Leu Val Leu Ile Ala Phe Ser Gln Tyr Leu Gln
            20                  25                  30
```

```
Gln Cys Pro Phe Asp Glu His Val Lys Leu Val Lys Glu Leu Thr Glu
        35                  40                  45

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser His Ala Gly Cys Asp Lys
    50                  55                  60

Ser Leu His Thr Leu Phe Gly Asp Glu Leu Cys Lys Val Ala Thr Leu
65                  70                  75                  80

Arg Glu Thr Tyr Gly Asp Met Ala Asp Cys Cys Glu Lys Gln Glu Pro
                85                  90                  95

Glu Arg Asn Glu Cys Phe Leu Lys His Lys Asp Asp Ser Pro Asp Leu
            100                 105                 110

Pro Lys Leu Lys Pro Glu Pro Asp Thr Leu Cys Ala Glu Phe Lys Ala
        115                 120                 125

Asp Glu Lys Lys Phe Trp Gly Lys Tyr Leu Tyr Glu Val Ala Arg Arg
    130                 135                 140

His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Tyr Tyr Ala Asn Lys Tyr
145                 150                 155                 160

Asn Gly Val Phe Gln Glu Cys Cys Gln Ala Glu Asp Lys Gly Ala Cys
                165                 170                 175

Leu Leu Pro Lys Ile Glu Thr Met Arg Glu Lys Val Leu Ala Ser Ser
            180                 185                 190

Ala Arg Gln Arg Leu Arg Cys Ala Ser Ile Gln Lys Phe Gly Glu Arg
        195                 200                 205

Ala Leu Lys Ala Trp Ser Val Ala Arg Leu Ser Gln Lys Phe Pro Lys
    210                 215                 220

Ala Asp Phe Thr Asp Val Thr Lys Ile Val Thr Asp Leu Thr Lys Val
225                 230                 235                 240

His Lys Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp Arg
                245                 250                 255

Ala Asp Leu Ala Lys Tyr Ile Cys Asp His Gln Asp Thr Leu Ser Ser
            260                 265                 270
```

```
Lys Leu Lys Glu Cys Cys Asp Lys Pro Val Leu Glu Lys Ser His Cys
        275                 280                 285

Ile Ala Glu Ile Asp Lys Asp Ala Val Pro Glu Asn Leu Pro Pro Leu
    290                 295                 300

Thr Ala Asp Phe Ala Glu Asp Lys Glu Val Cys Lys Asn Tyr Gln Glu
305                 310                 315                 320

Ala Lys Asp Val Phe Leu Gly Ser Phe Leu Tyr Glu Tyr Ser Arg Arg
                325                 330                 335

His Pro Glu Tyr Ala Val Ser Val Leu Leu Arg Leu Ala Lys Glu Tyr
            340                 345                 350

Glu Ala Thr Leu Glu Asp Cys Cys Ala Lys Glu Asp Pro His Ala Cys
        355                 360                 365

Tyr Ala Thr Val Phe Asp Lys Leu Lys His Leu Val Asp Glu Pro Gln
    370                 375                 380

Asn Leu Ile Lys Lys Asn Cys Glu Leu Phe Glu Lys His Gly Glu Tyr
385                 390                 395                 400

Gly Phe Gln Asn Ala Leu Ile Val Arg Tyr Thr Arg Lys Ala Pro Gln
                405                 410                 415

Val Ser Thr Pro Thr Leu Val Glu Ile Ser Arg Ser Leu Gly Lys Val
            420                 425                 430

Gly Thr Lys Cys Cys Ala Lys Pro Glu Ser Glu Arg Met Pro Cys Thr
        435                 440                 445

Glu Asp Tyr Leu Ser Leu Ile Leu Asn Arg Leu Cys Val Leu His Glu
    450                 455                 460

Lys Thr Pro Val Ser Glu Lys Val Thr Lys Cys Cys Thr Glu Ser Leu
465                 470                 475                 480

Val Asn Arg Arg Pro Cys Phe Ser Asp Leu Thr Leu Asp Glu Thr Tyr
                485                 490                 495

Val Pro Lys Pro Phe Asp Gly Glu Ser Phe Thr Phe His Ala Asp Ile
            500                 505                 510

Cys Thr Leu Pro Asp Thr Glu Lys Gln Ile Lys Lys Gln Thr Ala Leu
        515                 520                 525
```

```
Val Glu Leu Leu Lys His Lys Pro Lys Ala Thr Asp Glu Gln Leu Lys
    530                 535                 540

Thr Val Met Glu Asn Phe Val Ala Phe Val Asp Lys Cys Cys Ala Ala
545                 550                 555                 560

Asp Asp Lys Glu Gly Cys Phe Leu Leu Glu Gly Pro Lys Leu Val Ala
                565                 570                 575

Ser Thr Gln Ala Ala Leu Ala
            580
```

<210> 100
<211> 608
<212> PRT
<213> Cavia porcellus

<400> 100

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

Tyr Ser Arg Gly Val Phe Arg Arg Glu Ala His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Asn Asp Leu Gly Glu Gly His Phe Lys Gly Leu Val Leu
        35                  40                  45

Ile Thr Leu Ser Gln His Leu Gln Lys Ser Pro Phe Glu Glu His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Asp Phe Ala Lys Ala Cys Val Ala Asp
65                  70                  75                  80

Glu Ser Ala Gln Asn Cys Gly Lys Ala Ile Ala Thr Leu Phe Gly Asp
                85                  90                  95

Lys Val Cys Ala Ile Pro Ser Leu Arg Glu Thr Tyr Gly Glu Leu Ala
            100                 105                 110

Asp Cys Cys Ala Lys Glu Asp Pro Asp Arg Val Glu Cys Phe Leu Gln
        115                 120                 125

His Lys Asp Asp Asn Pro Asn Leu Pro Pro Phe Glu Arg Pro Glu Pro
    130                 135                 140

Glu Ala Leu Cys Thr Ala Phe Lys Glu Asn Asn Asp Arg Phe Ile Gly
```

```
145                 150                 155                 160

His Tyr Leu Tyr Glu Val Ser Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Tyr Tyr Ala Glu Lys Tyr Lys Asn Ala Leu Thr Glu Cys
            180                 185                 190

Cys Glu Ala Ala Asp Lys Ala Ala Cys Leu Thr Pro Lys Leu Asp Ala
        195                 200                 205

Ile Lys Glu Lys Ala Leu Val Ser Ser Ala Gln Gln Arg Leu Lys Cys
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ser Val
225                 230                 235                 240

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

Thr Ile Val Thr Ser Leu Thr Lys Val Thr Lys Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Gln Glu Leu Ala Lys Tyr Met
        275                 280                 285

Cys Glu His Gln Asp Ser Ile Ser Ser Lys Leu Lys Glu Cys Cys Val
    290                 295                 300

Lys Pro Thr Leu Gln Lys Ala His Cys Ile Leu Glu Ile Gln Arg Asp
305                 310                 315                 320

Glu Leu Pro Thr Glu Leu Pro Asp Leu Ala Val Asp Phe Val Glu Asp
                325                 330                 335

Lys Glu Val Cys Lys Asn Phe Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Thr Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Glu Tyr Ser Ile Gly
        355                 360                 365

Met Leu Leu Arg Ile Ala Lys Gly Tyr Glu Ala Lys Leu Glu Lys Cys
    370                 375                 380

Cys Ala Glu Ala Asp Pro His Ala Cys Tyr Ala Lys Val Phe Asp Glu
385                 390                 395                 400
```

```
Leu Gln Pro Leu Ile Asp Glu Pro Lys Lys Leu Val Gln Gln Asn Cys
                405                 410                 415

Glu Leu Phe Asp Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Leu Ala
            420                 425                 430

Val Arg Tyr Thr Gln Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Tyr Ala Arg Lys Leu Gly Ser Val Gly Thr Lys Cys Cys Ser Leu
    450                 455                 460

Pro Glu Thr Glu Arg Leu Ser Cys Thr Glu Asn Tyr Leu Ala Leu Ile
465                 470                 475                 480

Leu Asn Arg Leu Cys Ile Leu His Glu Lys Thr Pro Val Ser Glu Arg
                485                 490                 495

Val Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu His Val Asp Glu Thr Tyr Val Pro Lys Pro Phe His Ala
        515                 520                 525

Asp Ser Phe Thr Phe His Ala Asp Ile Cys Thr Leu Pro Glu Lys Glu
    530                 535                 540

Lys Gln Val Lys Lys Gln Met Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Ser Glu Glu Gln Met Lys Thr Val Met Gly Asp Phe Ala
                565                 570                 575

Ala Phe Leu Lys Lys Cys Cys Asp Ala Asp Asn Lys Glu Ala Cys Phe
            580                 585                 590

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

<210> 101
<211> 607
<212> PRT
<213> Equus caballus

<400> 101

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

```
Tyr Ser Arg Gly Val Leu Arg Arg Asp Thr His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Asn Asp Leu Gly Glu Lys His Phe Lys Gly Leu Val Leu
        35                  40                  45

Val Ala Phe Ser Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Lys Cys Ala Ala Asp
65                  70                  75                  80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Thr Val Ala Thr Leu Arg Ala Thr Tyr Gly Glu Leu Ala
            100                 105                 110

Asp Cys Cys Glu Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Thr
        115                 120                 125

His Lys Asp Asp His Pro Asn Leu Pro Lys Leu Lys Pro Glu Pro Asp
    130                 135                 140

Ala Gln Cys Ala Ala Phe Gln Glu Asp Pro Asp Lys Phe Leu Gly Lys
145                 150                 155                 160

Tyr Leu Tyr Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Gly Pro Glu
                165                 170                 175

Leu Leu Phe His Ala Glu Glu Tyr Lys Ala Asp Phe Thr Glu Cys Cys
            180                 185                 190

Pro Ala Asp Asp Lys Leu Ala Cys Leu Ile Pro Lys Leu Asp Ala Leu
        195                 200                 205

Lys Glu Arg Ile Leu Leu Ser Ser Ala Lys Glu Arg Leu Lys Cys Ser
    210                 215                 220

Ser Phe Gln Asn Phe Gly Glu Arg Ala Val Lys Ala Trp Ser Val Ala
225                 230                 235                 240

Arg Leu Ser Gln Lys Phe Pro Lys Ala Asp Phe Ala Glu Val Ser Lys
                245                 250                 255
```

```
Ile Val Thr Asp Leu Thr Lys Val His Lys Glu Cys Cys His Gly Asp
            260                 265                 270

Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile Cys
        275                 280                 285

Glu His Gln Asp Ser Ile Ser Gly Lys Leu Lys Ala Cys Cys Asp Lys
    290                 295                 300

Pro Leu Leu Gln Lys Ser His Cys Ile Ala Glu Val Lys Glu Asp Asp
305                 310                 315                 320

Leu Pro Ser Asp Leu Pro Ala Leu Ala Ala Asp Phe Ala Glu Asp Lys
                325                 330                 335

Glu Ile Cys Lys His Tyr Lys Asp Ala Lys Asp Val Phe Leu Gly Thr
            340                 345                 350

Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Asp Tyr Ser Val Ser Leu
        355                 360                 365

Leu Leu Arg Ile Ala Lys Thr Tyr Glu Ala Thr Leu Glu Lys Cys Cys
    370                 375                 380

Ala Glu Ala Asp Pro Pro Ala Cys Tyr Arg Thr Val Phe Asp Gln Phe
385                 390                 395                 400

Thr Pro Leu Val Glu Glu Pro Lys Ser Leu Val Lys Lys Asn Cys Asp
                405                 410                 415

Leu Phe Glu Glu Val Gly Glu Tyr Asp Phe Gln Asn Ala Leu Ile Val
            420                 425                 430

Arg Tyr Thr Lys Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val Glu
        435                 440                 445

Ile Gly Arg Thr Leu Gly Lys Val Gly Ser Arg Cys Cys Lys Leu Pro
    450                 455                 460

Glu Ser Glu Arg Leu Pro Cys Ser Glu Asn His Leu Ala Leu Ala Leu
465                 470                 475                 480

Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys Ile
                485                 490                 495

Thr Lys Cys Cys Thr Asp Ser Leu Ala Glu Arg Arg Pro Cys Phe Ser
            500                 505                 510
```

```
Ala Leu Glu Leu Asp Glu Gly Tyr Val Pro Lys Glu Phe Lys Ala Glu
        515                 520                 525

Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Pro Glu Asp Glu Lys
    530                 535                 540

Gln Ile Lys Lys Gln Ser Ala Leu Ala Glu Leu Val Lys His Lys Pro
545                 550                 555                 560

Lys Ala Thr Lys Glu Gln Leu Lys Thr Val Leu Gly Asn Phe Ser Ala
                565                 570                 575

Phe Val Ala Lys Cys Cys Gly Arg Glu Asp Lys Glu Ala Cys Phe Ala
            580                 585                 590

Glu Glu Gly Pro Lys Leu Val Ala Ser Ser Gln Leu Ala Leu Ala
        595                 600                 605
```

<210> 102
<211> 609
<212> PRT
<213> Homo sapiens

<400> 102

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

Tyr Ser Arg Gly Val Phe Arg Arg Asp Ala His Lys Ser Glu Val Ala
            20                  25                  30

His Arg Phe Lys Asp Leu Gly Glu Glu Asn Phe Lys Ala Leu Val Leu
        35                  40                  45

Ile Ala Phe Ala Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65                  70                  75                  80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Thr Val Ala Thr Leu Arg Glu Thr Tyr Gly Glu Met Ala
            100                 105                 110

Asp Cys Cys Ala Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
```

```
        115                 120                 125

His Lys Asp Asp Asn Pro Asn Leu Pro Arg Leu Val Arg Pro Glu Val
    130                 135                 140

Asp Val Met Cys Thr Ala Phe His Asp Asn Glu Glu Thr Phe Leu Lys
145                 150                 155                 160

Lys Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Phe Phe Ala Lys Arg Tyr Lys Ala Ala Phe Thr Glu Cys
            180                 185                 190

Cys Gln Ala Ala Asp Lys Ala Ala Cys Leu Leu Pro Lys Leu Asp Glu
        195                 200                 205

Leu Arg Asp Glu Gly Lys Ala Ser Ser Ala Lys Gln Arg Leu Lys Cys
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Leu Ser Gln Arg Phe Pro Lys Ala Glu Phe Ala Glu Val Ser
                245                 250                 255

Lys Leu Val Thr Asp Leu Thr Lys Val His Thr Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile
        275                 280                 285

Cys Glu Asn Gln Asp Ser Ile Ser Ser Lys Leu Lys Glu Cys Cys Glu
    290                 295                 300

Lys Pro Leu Leu Glu Lys Ser His Cys Ile Ala Glu Val Glu Asn Asp
305                 310                 315                 320

Glu Met Pro Ala Asp Leu Pro Ser Leu Ala Ala Asp Phe Val Glu Ser
                325                 330                 335

Lys Asp Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Met Phe Leu Tyr Glu Tyr Ala Arg Arg His Pro Asp Tyr Ser Val Val
        355                 360                 365
```

```
Leu Leu Leu Arg Leu Ala Lys Thr Tyr Glu Thr Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Ala Ala Asp Pro His Glu Cys Tyr Ala Lys Val Phe Asp Glu
385                 390                 395                 400

Phe Lys Pro Leu Val Glu Glu Pro Gln Asn Leu Ile Lys Gln Asn Cys
                405                 410                 415

Glu Leu Phe Glu Gln Leu Gly Glu Tyr Lys Phe Gln Asn Ala Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Val Ser Arg Asn Leu Gly Lys Val Gly Ser Lys Cys Cys Lys His
    450                 455                 460

Pro Glu Ala Lys Arg Met Pro Cys Ala Glu Asp Tyr Leu Ser Val Val
465                 470                 475                 480

Leu Asn Gln Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Asp Arg
                485                 490                 495

Val Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Glu Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Asn Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Ser Glu Lys Glu
    530                 535                 540

Arg Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Lys Glu Gln Leu Lys Ala Val Met Asp Asp Phe Ala
                565                 570                 575

Ala Phe Val Glu Lys Cys Cys Lys Ala Asp Asp Lys Glu Thr Cys Phe
            580                 585                 590

Ala Glu Glu Gly Lys Lys Leu Val Ala Ala Ser Gln Ala Ala Leu Gly
        595                 600                 605

Leu
```

<210> 103
<211> 600
<212> PRT
<213> Macca mulatta

<400> 103

Leu Leu Phe Leu Phe Ser Ser Ala Tyr Ser Arg Gly Val Phe Arg Arg
1 5 10 15

Asp Thr His Lys Ser Glu Val Ala His Arg Phe Lys Asp Leu Gly Glu
20 25 30

Glu His Phe Lys Gly Leu Val Leu Val Ala Phe Ser Gln Tyr Leu Gln
35 40 45

Gln Cys Pro Phe Glu Glu His Val Lys Leu Val Asn Glu Val Thr Glu
50 55 60

Phe Ala Lys Thr Cys Val Ala Asp Glu Ser Ala Glu Asn Cys Asp Lys
65 70 75 80

Ser Leu His Thr Leu Phe Gly Asp Lys Leu Cys Thr Val Ala Thr Leu
85 90 95

Arg Glu Thr Tyr Gly Glu Met Ala Asp Cys Cys Ala Lys Gln Glu Pro
100 105 110

Glu Arg Asn Glu Cys Phe Leu Gln His Lys Asp Asp Asn Pro Asn Leu
115 120 125

Pro Pro Leu Val Arg Pro Glu Val Asp Val Met Cys Thr Ala Phe His
130 135 140

Asp Asn Glu Ala Thr Phe Leu Lys Lys Tyr Leu Tyr Glu Val Ala Arg
145 150 155 160

Arg His Pro Tyr Phe Tyr Ala Pro Glu Leu Leu Phe Phe Ala Ala Arg
165 170 175

Tyr Lys Ala Ala Phe Ala Glu Cys Cys Gln Ala Ala Asp Lys Ala Ala
180 185 190

Cys Leu Leu Pro Lys Leu Asp Glu Leu Arg Asp Glu Gly Lys Ala Ser
195 200 205

```
Ser Ala Lys Gln Arg Leu Lys Cys Ala Ser Leu Gln Lys Phe Gly Asp
    210                 215                 220

Arg Ala Phe Lys Ala Trp Ala Val Ala Arg Leu Ser Gln Lys Phe Pro
225                 230                 235                 240

Lys Ala Glu Phe Ala Glu Val Ser Lys Leu Val Thr Asp Leu Thr Lys
                245                 250                 255

Val His Thr Glu Cys Cys His Gly Asp Leu Leu Glu Cys Ala Asp Asp
            260                 265                 270

Arg Ala Asp Leu Ala Lys Tyr Met Cys Glu Asn Gln Asp Ser Ile Ser
        275                 280                 285

Ser Lys Leu Lys Glu Cys Cys Asp Lys Pro Leu Leu Glu Lys Ser His
    290                 295                 300

Cys Leu Ala Glu Val Glu Asn Asp Glu Met Pro Ala Asp Leu Pro Ser
305                 310                 315                 320

Leu Ala Ala Asp Tyr Val Glu Ser Lys Asp Val Cys Lys Asn Tyr Ala
                325                 330                 335

Glu Ala Lys Asp Val Phe Leu Gly Met Phe Leu Tyr Glu Tyr Ala Arg
            340                 345                 350

Arg His Pro Asp Tyr Ser Val Met Leu Leu Leu Arg Leu Ala Lys Ala
        355                 360                 365

Tyr Glu Ala Thr Leu Glu Lys Cys Cys Ala Ala Ala Asp Pro His Glu
    370                 375                 380

Cys Tyr Ala Lys Val Phe Asp Glu Phe Gln Pro Leu Val Glu Glu Pro
385                 390                 395                 400

Gln Asn Leu Val Lys Gln Asn Cys Glu Leu Phe Glu Gln Leu Gly Glu
                405                 410                 415

Tyr Lys Phe Gln Asn Ala Leu Leu Val Arg Tyr Thr Lys Lys Val Pro
            420                 425                 430

Gln Val Ser Thr Pro Thr Leu Val Glu Val Ser Arg Asn Leu Gly Lys
        435                 440                 445

Val Gly Ala Lys Cys Cys Lys Leu Pro Glu Ala Lys Arg Met Pro Cys
    450                 455                 460
```

```
Ala Glu Asp Tyr Leu Ser Val Val Leu Asn Arg Leu Cys Val Leu His
465                 470                 475                 480

Glu Lys Thr Pro Val Ser Glu Lys Val Thr Lys Cys Cys Thr Glu Ser
                485                 490                 495

Leu Val Asn Arg Arg Pro Cys Phe Ser Ala Leu Glu Leu Asp Glu Ala
            500                 505                 510

Tyr Val Pro Lys Ala Phe Asn Ala Glu Thr Phe Thr Phe His Ala Asp
        515                 520                 525

Met Cys Thr Leu Ser Glu Lys Glu Lys Gln Val Lys Lys Gln Thr Ala
    530                 535                 540

Leu Val Glu Leu Val Lys His Lys Pro Lys Ala Thr Lys Glu Gln Leu
545                 550                 555                 560

Lys Gly Val Met Asp Asn Phe Ala Ala Phe Val Glu Lys Cys Cys Lys
                565                 570                 575

Ala Asp Asp Lys Glu Ala Cys Phe Ala Glu Glu Gly Pro Lys Phe Val
            580                 585                 590

Ala Ala Ser Gln Ala Ala Leu Ala
        595                 600
```

<210> 104
<211> 608
<212> PRT
<213> Mus musculus

<400> 104

```
Met Lys Trp Val Thr Phe Leu Leu Leu Leu Phe Val Ser Gly Ser Ala
1               5                   10                  15

Phe Ser Arg Gly Val Phe Arg Arg Glu Ala His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Tyr Asn Asp Leu Gly Glu Gln His Phe Lys Gly Leu Val Leu
        35                  40                  45

Ile Ala Phe Ser Gln Tyr Leu Gln Lys Cys Ser Tyr Asp Glu His Ala
    50                  55                  60

Lys Leu Val Gln Glu Val Thr Asp Phe Ala Lys Thr Cys Val Ala Asp
```

```
65                  70                  75                  80

Glu Ser Ala Ala Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Ala Ile Pro Asn Leu Arg Glu Asn Tyr Gly Glu Leu Ala
            100                 105                 110

Asp Cys Cys Thr Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
        115                 120                 125

His Lys Asp Asp Asn Pro Ser Leu Pro Pro Phe Glu Arg Pro Glu Ala
    130                 135                 140

Glu Ala Met Cys Thr Ser Phe Lys Glu Asn Pro Thr Thr Phe Met Gly
145                 150                 155                 160

His Tyr Leu His Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Tyr Tyr Ala Glu Gln Tyr Asn Glu Ile Leu Thr Gln Cys
            180                 185                 190

Cys Ala Glu Ala Asp Lys Glu Ser Cys Leu Thr Pro Lys Leu Asp Gly
        195                 200                 205

Val Lys Glu Lys Ala Leu Val Ser Ser Val Arg Gln Arg Met Lys Cys
    210                 215                 220

Ser Ser Met Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Leu Ser Gln Thr Phe Pro Asn Ala Asp Phe Ala Glu Ile Thr
                245                 250                 255

Lys Leu Ala Thr Asp Leu Thr Lys Val Asn Lys Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Glu Leu Ala Lys Tyr Met
        275                 280                 285

Cys Glu Asn Gln Ala Thr Ile Ser Ser Lys Leu Gln Thr Cys Cys Asp
    290                 295                 300

Lys Pro Leu Leu Lys Lys Ala His Cys Leu Ser Glu Val Glu His Asp
305                 310                 315                 320
```

```
Thr Met Pro Ala Asp Leu Pro Ala Ile Ala Ala Asp Phe Val Glu Asp
                325                 330                 335

Gln Glu Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Thr Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Asp Tyr Ser Val Ser
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Lys Tyr Glu Ala Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Glu Ala Asn Pro Pro Ala Cys Tyr Gly Thr Val Leu Ala Glu
385                 390                 395                 400

Phe Gln Pro Leu Val Glu Glu Pro Lys Asn Leu Val Lys Thr Asn Cys
                405                 410                 415

Asp Leu Tyr Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Ile Leu
            420                 425                 430

Val Arg Tyr Thr Gln Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Ala Ala Arg Asn Leu Gly Arg Val Gly Thr Lys Cys Cys Thr Leu
    450                 455                 460

Pro Glu Asp Gln Arg Leu Pro Cys Val Glu Asp Tyr Leu Ser Ala Ile
465                 470                 475                 480

Leu Asn Arg Val Cys Leu Leu His Glu Lys Thr Pro Val Ser Glu His
                485                 490                 495

Val Thr Lys Cys Cys Ser Gly Ser Leu Val Glu Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Thr Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Lys Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ser Asp Ile Cys Thr Leu Pro Glu Lys Glu
    530                 535                 540

Lys Gln Ile Lys Lys Gln Thr Ala Leu Ala Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Ala Glu Gln Leu Lys Thr Val Met Asp Asp Phe Ala
```

565 570 575

Gln Phe Leu Asp Thr Cys Cys Lys Ala Ala Asp Lys Asp Thr Cys Phe
580 585 590

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

<210> 105
<211> 607
<212> PRT
<213> Sus scrofa

<400> 105

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

Tyr Ser Arg Gly Val Phe Arg Arg Asp Thr Tyr Lys Ser Glu Ile Ala
20 25 30

His Arg Phe Lys Asp Leu Gly Glu Gln Tyr Phe Lys Gly Leu Val Leu
35 40 45

Ile Ala Phe Ser Gln His Leu Gln Gln Cys Pro Tyr Glu Glu His Val
50 55 60

Lys Leu Val Arg Glu Val Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65 70 75 80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Ile His Thr Leu Phe Gly Asp
85 90 95

Lys Leu Cys Ala Ile Pro Ser Leu Arg Glu His Tyr Gly Asp Leu Ala
100 105 110

Asp Cys Cys Glu Lys Glu Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
115 120 125

His Lys Asn Asp Asn Pro Asp Ile Pro Lys Leu Lys Pro Asp Pro Val
130 135 140

Ala Leu Cys Ala Asp Phe Gln Glu Asp Glu Gln Lys Phe Trp Gly Lys
145 150 155 160

Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro Glu
165 170 175

```
Leu Leu Tyr Tyr Ala Ile Ile Tyr Lys Asp Val Phe Ser Glu Cys Cys
            180                 185                 190

Gln Ala Ala Asp Lys Ala Ala Cys Leu Leu Pro Lys Ile Glu His Leu
        195                 200                 205

Arg Glu Lys Val Leu Thr Ser Ala Ala Lys Gln Arg Leu Lys Cys Ala
    210                 215                 220

Ser Ile Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ser Leu Ala
225                 230                 235                 240

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

Ile Val Thr Asp Leu Ala Lys Val His Lys Glu Cys Cys His Gly Asp
            260                 265                 270

Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile Cys
        275                 280                 285

Glu Asn Gln Asp Thr Ile Ser Thr Lys Leu Lys Glu Cys Cys Asp Lys
    290                 295                 300

Pro Leu Leu Glu Lys Ser His Cys Ile Ala Glu Ala Lys Arg Asp Glu
305                 310                 315                 320

Leu Pro Ala Asp Leu Asn Pro Leu Glu His Asp Phe Val Glu Asp Lys
                325                 330                 335

Glu Val Cys Lys Asn Tyr Lys Glu Ala Lys His Val Phe Leu Gly Thr
            340                 345                 350

Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Asp Tyr Ser Val Ser Leu
        355                 360                 365

Leu Leu Arg Ile Ala Lys Ile Tyr Glu Ala Thr Leu Glu Asp Cys Cys
    370                 375                 380

Ala Lys Glu Asp Pro Pro Ala Cys Tyr Ala Thr Val Phe Asp Lys Phe
385                 390                 395                 400

Gln Pro Leu Val Asp Glu Pro Lys Asn Leu Ile Lys Gln Asn Cys Glu
                405                 410                 415

Leu Phe Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Leu Ile Val
            420                 425                 430
```

```
Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val Glu
        435                 440                 445

Val Ala Arg Lys Leu Gly Leu Val Gly Ser Arg Cys Cys Lys Arg Pro
    450                 455                 460

Glu Glu Glu Arg Leu Ser Cys Ala Glu Asp Tyr Leu Ser Leu Val Leu
465                 470                 475                 480

Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys Val
                485                 490                 495

Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe Ser
            500                 505                 510

Ala Leu Thr Pro Asp Glu Thr Tyr Lys Pro Lys Glu Phe Val Glu Gly
        515                 520                 525

Thr Phe Thr Phe His Ala Asp Leu Cys Thr Leu Pro Glu Asp Glu Lys
    530                 535                 540

Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Leu Lys His Lys Pro
545                 550                 555                 560

His Ala Thr Glu Glu Gln Leu Arg Thr Val Leu Gly Asn Phe Ala Ala
                565                 570                 575

Phe Val Gln Lys Cys Cys Ala Ala Pro Asp His Glu Ala Cys Phe Ala
            580                 585                 590

Val Glu Gly Pro Lys Phe Val Ile Glu Ile Arg Gly Ile Leu Ala
        595                 600                 605
```

<210> 106
<211> 608
<212> PRT
<213> Oryctolagus cuniculus

<400> 106

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

Tyr Ser Arg Gly Val Phe Arg Arg Glu Ala His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Asn Asp Val Gly Glu Glu His Phe Ile Gly Leu Val Leu
```

```
        35                  40                  45

Ile Thr Phe Ser Gln Tyr Leu Gln Lys Cys Pro Tyr Glu Glu His Ala
    50                  55                  60

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

Glu Ser Ala Ala Asn Cys Asp Lys Ser Leu His Asp Ile Phe Gly Asp
                85                  90                  95

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

Asp Cys Cys Glu Lys Lys Glu Pro Glu Arg Asn Glu Cys Phe Leu His
        115                 120                 125

His Lys Asp Asp Lys Pro Asp Leu Pro Pro Phe Ala Arg Pro Glu Ala
    130                 135                 140

Asp Val Leu Cys Lys Ala Phe His Asp Asp Glu Lys Ala Phe Phe Gly
145                 150                 155                 160

His Tyr Leu Tyr Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Tyr Tyr Ala Gln Lys Tyr Lys Ala Ile Leu Thr Glu Cys
            180                 185                 190

Cys Glu Ala Ala Asp Lys Gly Ala Cys Leu Thr Pro Lys Leu Asp Ala
        195                 200                 205

Leu Glu Gly Lys Ser Leu Ile Ser Ala Ala Gln Glu Arg Leu Arg Cys
    210                 215                 220

Ala Ser Ile Gln Lys Phe Gly Asp Arg Ala Tyr Lys Ala Trp Ala Leu
225                 230                 235                 240

Val Arg Leu Ser Gln Arg Phe Pro Lys Ala Asp Phe Thr Asp Ile Ser
                245                 250                 255

Lys Ile Val Thr Asp Leu Thr Lys Val His Lys Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Met
        275                 280                 285
```

```
Cys Glu His Gln Glu Thr Ile Ser Ser His Leu Lys Glu Cys Cys Asp
    290                 295                 300

Lys Pro Ile Leu Glu Lys Ala His Cys Ile Tyr Gly Leu His Asn Asp
305                 310                 315                 320

Glu Thr Pro Ala Gly Leu Pro Ala Val Ala Glu Glu Phe Val Glu Asp
                325                 330                 335

Lys Asp Val Cys Lys Asn Tyr Glu Glu Ala Lys Asp Leu Phe Leu Gly
            340                 345                 350

Lys Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Asp Tyr Ser Val Val
        355                 360                 365

Leu Leu Leu Arg Leu Gly Lys Ala Tyr Glu Ala Thr Leu Lys Lys Cys
    370                 375                 380

Cys Ala Thr Asp Asp Pro His Ala Cys Tyr Ala Lys Val Leu Asp Glu
385                 390                 395                 400

Phe Gln Pro Leu Val Asp Glu Pro Lys Asn Leu Val Lys Gln Asn Cys
                405                 410                 415

Glu Leu Tyr Glu Gln Leu Gly Asp Tyr Asn Phe Gln Asn Ala Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Ile Ser Arg Ser Leu Gly Lys Val Gly Ser Lys Cys Cys Lys His
    450                 455                 460

Pro Glu Ala Glu Arg Leu Pro Cys Val Glu Asp Tyr Leu Ser Val Val
465                 470                 475                 480

Leu Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys
                485                 490                 495

Val Thr Lys Cys Cys Ser Glu Ser Leu Val Asp Arg Arg Pro Cys Phe
            500                 505                 510

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

Glu Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Pro Glu Thr Glu
```

```
    530                 535                 540

Arg Lys Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro His Ala Thr Asn Asp Gln Leu Lys Thr Val Val Gly Glu Phe Thr
                565                 570                 575

Ala Leu Leu Asp Lys Cys Cys Ser Ala Glu Asp Lys Glu Ala Cys Phe
            580                 585                 590

Ala Val Glu Gly Pro Lys Leu Val Glu Ser Ser Lys Ala Thr Leu Gly
        595                 600                 605


<210>  107
<211>  608
<212>  PRT
<213>  Rattus norvegicus

<400>  107

Met Lys Trp Val Thr Phe Leu Leu Leu Leu Phe Ile Ser Gly Ser Ala
1               5                   10                  15

Phe Ser Arg Gly Val Phe Arg Arg Glu Ala His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Lys Asp Leu Gly Glu Gln His Phe Lys Gly Leu Val Leu
        35                  40                  45

Ile Ala Phe Ser Gln Tyr Leu Gln Lys Cys Pro Tyr Glu Glu His Ile
    50                  55                  60

Lys Leu Val Gln Glu Val Thr Asp Phe Ala Lys Thr Cys Val Ala Asp
65                  70                  75                  80

Glu Asn Ala Glu Asn Cys Asp Lys Ser Ile His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Ala Ile Pro Lys Leu Arg Asp Asn Tyr Gly Glu Leu Ala
            100                 105                 110

Asp Cys Cys Ala Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
        115                 120                 125

His Lys Asp Asp Asn Pro Asn Leu Pro Pro Phe Gln Arg Pro Glu Ala
    130                 135                 140
```

```
Glu Ala Met Cys Thr Ser Phe Gln Glu Asn Pro Thr Ser Phe Leu Gly
145                 150                 155                 160

His Tyr Leu His Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Tyr Tyr Ala Glu Lys Tyr Asn Glu Val Leu Thr Gln Cys
            180                 185                 190

Cys Thr Glu Ser Asp Lys Ala Ala Cys Leu Thr Pro Lys Leu Asp Ala
        195                 200                 205

Val Lys Glu Lys Ala Leu Val Ala Ala Val Arg Gln Arg Met Lys Cys
    210                 215                 220

Ser Ser Met Gln Arg Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Met Ser Gln Arg Phe Pro Asn Ala Glu Phe Ala Glu Ile Thr
                245                 250                 255

Lys Leu Ala Thr Asp Val Thr Lys Ile Asn Lys Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Glu Leu Ala Lys Tyr Met
        275                 280                 285

Cys Glu Asn Gln Ala Thr Ile Ser Ser Lys Leu Gln Ala Cys Cys Asp
    290                 295                 300

Lys Pro Val Leu Gln Lys Ser Gln Cys Leu Ala Glu Ile Glu His Asp
305                 310                 315                 320

Asn Ile Pro Ala Asp Leu Pro Ser Ile Ala Ala Asp Phe Val Glu Asp
                325                 330                 335

Lys Glu Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Thr Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Asp Tyr Ser Val Ser
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Lys Tyr Glu Ala Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Glu Gly Asp Pro Pro Ala Cys Tyr Gly Thr Val Leu Ala Glu
385                 390                 395                 400
```

```
Phe Gln Pro Leu Val Glu Glu Pro Lys Asn Leu Val Lys Thr Asn Cys
                405                 410                 415

Glu Leu Tyr Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Val Leu
            420                 425                 430

Val Arg Tyr Thr Gln Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Ala Ala Arg Asn Leu Gly Arg Val Gly Thr Lys Cys Cys Thr Leu
    450                 455                 460

Pro Glu Ala Gln Arg Leu Pro Cys Val Glu Asp Tyr Leu Ser Ala Ile
465                 470                 475                 480

Leu Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys
                485                 490                 495

Val Thr Lys Cys Cys Ser Gly Ser Leu Val Glu Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Thr Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Lys Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ser Asp Ile Cys Thr Leu Pro Asp Lys Glu
    530                 535                 540

Lys Gln Ile Lys Lys Gln Thr Ala Leu Ala Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Glu Asp Gln Leu Lys Thr Val Met Gly Asp Phe Ala
                565                 570                 575

Gln Phe Val Asp Lys Cys Cys Lys Ala Ala Asp Lys Asp Asn Cys Phe
            580                 585                 590

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

<210> 108
<211> 607
<212> PRT
<213> Ovis aries

<400> 108

```
Met Lys Trp Val Thr Phe Ile Ser Leu Leu Leu Leu Phe Ser Ser Ala
```

```
1               5                   10                  15

Tyr Ser Arg Gly Val Phe Arg Arg Asp Thr His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Asn Asp Leu Gly Glu Glu Asn Phe Gln Gly Leu Val Leu
        35                  40                  45

Ile Ala Phe Ser Gln Tyr Leu Gln Gln Cys Pro Phe Asp Glu His Val
    50                  55                  60

Lys Leu Val Lys Glu Leu Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65                  70                  75                  80

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

Glu Leu Cys Lys Val Ala Thr Leu Arg Glu Thr Tyr Gly Asp Met Ala
            100                 105                 110

Asp Cys Cys Glu Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Asn
        115                 120                 125

His Lys Asp Asp Ser Pro Asp Leu Pro Lys Leu Lys Pro Glu Pro Asp
    130                 135                 140

Thr Leu Cys Ala Glu Phe Lys Ala Asp Glu Lys Lys Phe Trp Gly Lys
145                 150                 155                 160

Tyr Leu Tyr Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro Glu
                165                 170                 175

Leu Leu Tyr Tyr Ala Asn Lys Tyr Asn Gly Val Phe Gln Glu Cys Cys
            180                 185                 190

Gln Ala Glu Asp Lys Gly Ala Cys Leu Leu Pro Lys Ile Asp Ala Met
        195                 200                 205

Arg Glu Lys Val Leu Ala Ser Ser Ala Arg Gln Arg Leu Arg Cys Ala
    210                 215                 220

Ser Ile Gln Lys Phe Gly Glu Arg Ala Leu Lys Ala Trp Ser Val Ala
225                 230                 235                 240

Arg Leu Ser Gln Lys Phe Pro Lys Ala Asp Phe Thr Asp Val Thr Lys
                245                 250                 255
```

```
Ile Val Thr Asp Leu Thr Lys Val His Lys Glu Cys Cys His Gly Asp
            260                 265                 270

Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile Cys
        275                 280                 285

Asp His Gln Asp Ala Leu Ser Ser Lys Leu Lys Glu Cys Cys Asp Lys
    290                 295                 300

Pro Val Leu Glu Lys Ser His Cys Ile Ala Glu Val Asp Lys Asp Ala
305                 310                 315                 320

Val Pro Glu Asn Leu Pro Pro Leu Thr Ala Asp Phe Ala Glu Asp Lys
                325                 330                 335

Glu Val Cys Lys Asn Tyr Gln Glu Ala Lys Asp Val Phe Leu Gly Ser
            340                 345                 350

Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Glu Tyr Ala Val Ser Val
        355                 360                 365

Leu Leu Arg Leu Ala Lys Glu Tyr Glu Ala Thr Leu Glu Asp Cys Cys
    370                 375                 380

Ala Lys Glu Asp Pro His Ala Cys Tyr Ala Thr Val Phe Asp Lys Leu
385                 390                 395                 400

Lys His Leu Val Asp Glu Pro Gln Asn Leu Ile Lys Lys Asn Cys Glu
                405                 410                 415

Leu Phe Glu Lys His Gly Glu Tyr Gly Phe Gln Asn Ala Leu Ile Val
            420                 425                 430

Arg Tyr Thr Arg Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val Glu
        435                 440                 445

Ile Ser Arg Ser Leu Gly Lys Val Gly Thr Lys Cys Cys Ala Lys Pro
    450                 455                 460

Glu Ser Glu Arg Met Pro Cys Thr Glu Asp Tyr Leu Ser Leu Ile Leu
465                 470                 475                 480

Asn Arg Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Lys Val
                485                 490                 495

Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe Ser
```

```
            500                 505                 510

Asp Leu Thr Leu Asp Glu Thr Tyr Val Pro Lys Pro Phe Asp Glu Lys
        515                 520                 525

Phe Phe Thr Phe His Ala Asp Ile Cys Thr Leu Pro Asp Thr Glu Lys
    530                 535                 540

Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Leu Lys His Lys Pro
545                 550                 555                 560

Lys Ala Thr Asp Glu Gln Leu Lys Thr Val Met Glu Asn Phe Val Ala
                565                 570                 575

Phe Val Asp Lys Cys Cys Ala Ala Asp Asp Lys Glu Gly Cys Phe Val
            580                 585                 590

Leu Glu Gly Pro Lys Leu Val Ala Ser Thr Gln Ala Ala Leu Ala
        595                 600                 605
```

<210> 109
<211> 609
<212> PRT
<213> Homo sapiens

<400> 109

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

Tyr Ser Arg Gly Val Phe Arg Arg Asp Ala His Lys Ser Glu Val Ala
            20                  25                  30

His Arg Phe Lys Asp Leu Gly Glu Glu Asn Phe Lys Ala Leu Val Leu
        35                  40                  45

Ile Ala Phe Ala Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65                  70                  75                  80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Thr Val Ala Thr Leu Arg Glu Thr Tyr Gly Glu Met Ala
            100                 105                 110
```

```
Asp Cys Cys Ala Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
        115                 120                 125

His Lys Asp Asp Asn Pro Asn Leu Pro Arg Leu Val Arg Pro Glu Val
    130                 135                 140

Asp Val Met Cys Thr Ala Phe His Asp Asn Glu Glu Thr Phe Leu Lys
145                 150                 155                 160

Lys Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Phe Phe Ala Lys Arg Tyr Lys Ala Ala Phe Thr Glu Cys
            180                 185                 190

Cys Gln Ala Ala Asp Lys Ala Ala Cys Leu Leu Pro Lys Leu Asp Glu
        195                 200                 205

Leu Arg Asp Glu Gly Lys Ala Ser Ser Ala Lys Gln Arg Leu Lys Cys
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Leu Ser Gln Arg Phe Pro Lys Ala Glu Phe Ala Glu Val Ser
                245                 250                 255

Lys Leu Val Thr Asp Leu Thr Lys Val His Thr Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile
        275                 280                 285

Cys Glu Asn Gln Asp Ser Ile Ser Ser Lys Leu Lys Glu Cys Cys Glu
    290                 295                 300

Lys Pro Leu Leu Glu Lys Ser His Cys Ile Ala Glu Val Glu Asn Asp
305                 310                 315                 320

Glu Met Pro Ala Asp Leu Pro Ser Leu Ala Ala Asp Phe Val Glu Ser
                325                 330                 335

Lys Asp Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Met Phe Leu Tyr Glu Tyr Ala Arg Arg His Pro Asp Tyr Ser Val Val
        355                 360                 365
```

```
Leu Leu Leu Arg Leu Ala Lys Thr Tyr Glu Thr Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Ala Ala Asp Pro His Glu Cys Tyr Ala Lys Val Phe Asp Glu
385                 390                 395                 400

Phe Lys Pro Leu Val Glu Glu Pro Gln Asn Leu Ile Lys Gln Asn Cys
                405                 410                 415

Glu Leu Phe Glu Gln Leu Gly Glu Tyr Lys Phe Gln Asn Ala Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Val Ser Arg Asn Leu Gly Lys Val Gly Ser Lys Cys Cys Lys His
    450                 455                 460

Pro Glu Ala Lys Arg Met Pro Cys Ala Glu Asp Tyr Leu Ser Val Val
465                 470                 475                 480

Leu Asn Gln Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Asp Arg
                485                 490                 495

Val Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Glu Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Asn Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Ser Glu Lys Glu
    530                 535                 540

Arg Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Lys Glu Gln Leu Lys Ala Val Met Asp Asp Phe Ala
                565                 570                 575

Ala Phe Val Glu Lys Cys Cys Lys Ala Asp Asp Lys Glu Thr Cys Phe
            580                 585                 590

Ala Glu Glu Gly Lys Lys Leu Val Ala Ala Ser Gln Ala Ala Leu Gly
        595                 600                 605
```

Leu

<210> 110
<211> 609
<212> PRT
<213> Pongo abelii

<400> 110

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

Tyr Ser Arg Gly Val Phe Arg Arg Asp Ala His Lys Ser Glu Val Ala
20 25 30

His Arg Phe Lys Asp Leu Gly Glu Glu Lys Phe Lys Ala Leu Val Leu
35 40 45

Ile Ala Phe Ala Gln Tyr Leu Gln Gln Cys Pro Phe Glu Asp His Val
50 55 60

Lys Leu Val Asn Glu Val Thr Glu Phe Ala Lys Thr Cys Val Ala Asp
65 70 75 80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
85 90 95

Lys Leu Cys Thr Val Ala Thr Leu Arg Glu Thr Tyr Gly Glu Met Ala
100 105 110

Asp Cys Cys Ala Lys Gln Glu Pro Glu Arg Asn Glu Cys Phe Leu Gln
115 120 125

His Lys Asp Asp Asn Pro Asn Leu Pro Arg Leu Val Arg Pro Glu Val
130 135 140

Asp Val Met Cys Thr Ala Phe His Asp Asn Glu Glu Thr Phe Leu Lys
145 150 155 160

Lys Tyr Leu Tyr Glu Ile Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
165 170 175

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

Cys Gln Ala Ala Asp Lys Ala Ala Cys Leu Leu Pro Lys Leu Asp Glu
195 200 205

```
Leu Arg Asp Glu Gly Lys Ala Ser Ser Ala Lys Gln Arg Leu Lys Cys
    210                 215                 220

Ala Ser Leu Gln Lys Phe Gly Glu Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Leu Ser Gln Arg Phe Pro Lys Ala Glu Phe Ala Glu Val Ser
                245                 250                 255

Lys Leu Val Thr Asp Leu Thr Lys Val His Thr Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Asp Leu Ala Lys Tyr Ile
        275                 280                 285

Cys Glu Asn Gln Asp Ser Ile Ser Ser Lys Leu Lys Glu Cys Cys Glu
    290                 295                 300

Lys Pro Leu Leu Glu Lys Ser His Cys Leu Ala Glu Val Glu Asn Asp
305                 310                 315                 320

Glu Met Pro Ala Asp Leu Pro Ser Leu Ala Ala Asp Phe Val Glu Ser
                325                 330                 335

Lys Asp Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Met Phe Leu Tyr Glu Tyr Ala Arg Arg His Pro Asp Tyr Ser Val Val
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Thr Tyr Glu Thr Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Ala Ala Asp Pro His Glu Cys Tyr Ala Lys Val Phe Asp Glu
385                 390                 395                 400

Phe Lys Pro Leu Val Glu Glu Pro Gln Asn Leu Ile Lys Gln Asn Cys
                405                 410                 415

Glu Leu Phe Glu Gln Leu Gly Glu Tyr Lys Phe Gln Asn Glu Leu Leu
            420                 425                 430

Val Arg Tyr Thr Lys Lys Val Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Val Ser Arg Asn Leu Gly Lys Val Gly Ser Lys Cys Cys Lys His
```

```
    450                 455                 460

Pro Glu Pro Lys Arg Met Pro Cys Ala Glu Asp Tyr Leu Ser Val Val
465                 470                 475                 480

Leu Asn Gln Leu Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Arg
                485                 490                 495

Val Thr Lys Cys Cys Thr Glu Ser Leu Val Asn Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Glu Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Asn Ala
        515                 520                 525

Asp Thr Phe Thr Phe His Ala Asp Ile Cys Thr Leu Ser Glu Lys Glu
    530                 535                 540

Arg Gln Ile Lys Lys Gln Thr Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Lys Glu Gln Leu Lys Thr Val Met Glu Asp Phe Ala
                565                 570                 575

Ala Phe Val Glu Lys Cys Cys Lys Ala Asp Asp Lys Glu Thr Cys Phe
            580                 585                 590

Ala Glu Glu Gly Lys Lys Leu Val Ala Ala Ser Gln Ala Ala Leu Gly
        595                 600                 605

Leu
```

<210> 111
<211> 615
<212> PRT
<213> Gallus gallus

<400> 111

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

Thr Ser Arg Asn Leu Gln Arg Phe Ala Arg Asp Ala Glu His Lys Ser
            20                  25                  30

Glu Ile Ala His Arg Tyr Asn Asp Leu Lys Glu Glu Thr Phe Lys Ala
        35                  40                  45
```

```
Val Ala Met Ile Thr Phe Ala Gln Tyr Leu Gln Arg Cys Ser Tyr Glu
    50                  55                  60

Gly Leu Ser Lys Leu Val Lys Asp Val Val Asp Leu Ala Gln Lys Cys
65                  70                  75                  80

Val Ala Asn Glu Asp Ala Pro Glu Cys Ser Lys Pro Leu Pro Ser Ile
                85                  90                  95

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

Ala Met Ala Asp Cys Cys Ser Lys Ala Asp Pro Glu Arg Asn Glu Cys
        115                 120                 125

Phe Leu Ser Phe Lys Val Ser Gln Pro Asp Phe Val Gln Pro Tyr Gln
    130                 135                 140

Arg Pro Ala Ser Asp Val Ile Cys Gln Glu Tyr Gln Asp Asn Arg Val
145                 150                 155                 160

Ser Phe Leu Gly His Phe Ile Tyr Ser Val Ala Arg Arg His Pro Phe
                165                 170                 175

Leu Tyr Ala Pro Ala Ile Leu Ser Phe Ala Val Asp Phe Glu His Ala
            180                 185                 190

Leu Gln Ser Cys Cys Lys Glu Ser Asp Val Gly Ala Cys Leu Asp Thr
        195                 200                 205

Lys Glu Ile Val Met Arg Glu Lys Ala Lys Gly Val Ser Val Lys Gln
    210                 215                 220

Gln Tyr Phe Cys Gly Ile Leu Lys Gln Phe Gly Asp Arg Val Phe Gln
225                 230                 235                 240

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

Ser Glu Val Ser Lys Phe Val His Asp Ser Ile Gly Val His Lys Glu
            260                 265                 270

Cys Cys Glu Gly Asp Met Val Glu Cys Met Asp Asp Met Ala Arg Met
        275                 280                 285

Met Ser Asn Leu Cys Ser Gln Gln Asp Val Phe Ser Gly Lys Ile Lys
    290                 295                 300
```

```
Asp Cys Cys Glu Lys Pro Ile Val Glu Arg Ser Gln Cys Ile Met Glu
305                 310                 315                 320

Ala Glu Phe Asp Glu Lys Pro Ala Asp Leu Pro Ser Leu Val Glu Lys
                325                 330                 335

Tyr Ile Glu Asp Lys Glu Val Cys Lys Ser Phe Glu Ala Gly His Asp
            340                 345                 350

Ala Phe Met Ala Glu Phe Val Tyr Glu Tyr Ser Arg Arg His Pro Glu
        355                 360                 365

Phe Ser Ile Gln Leu Ile Met Arg Ile Ala Lys Gly Tyr Glu Ser Leu
    370                 375                 380

Leu Glu Lys Cys Cys Lys Thr Asp Asn Pro Ala Glu Cys Tyr Ala Asn
385                 390                 395                 400

Ala Gln Glu Gln Leu Asn Gln His Ile Lys Glu Thr Gln Asp Val Val
                405                 410                 415

Lys Thr Asn Cys Asp Leu Leu His Asp His Gly Glu Ala Asp Phe Leu
            420                 425                 430

Lys Ser Ile Leu Ile Arg Tyr Thr Lys Lys Met Pro Gln Val Pro Thr
        435                 440                 445

Asp Leu Leu Leu Glu Thr Gly Lys Lys Met Thr Thr Ile Gly Thr Lys
    450                 455                 460

Cys Cys Gln Leu Gly Glu Asp Arg Arg Met Ala Cys Ser Glu Gly Tyr
465                 470                 475                 480

Leu Ser Ile Val Ile His Asp Thr Cys Arg Lys Gln Glu Thr Thr Pro
                485                 490                 495

Ile Asn Asp Asn Val Ser Gln Cys Cys Ser Gln Leu Tyr Ala Asn Arg
            500                 505                 510

Arg Pro Cys Phe Thr Ala Met Gly Val Asp Thr Lys Tyr Val Pro Pro
        515                 520                 525

Pro Phe Asn Pro Asp Met Phe Ser Phe Asp Glu Lys Leu Cys Ser Ala
    530                 535                 540
```

```
Pro Ala Glu Glu Arg Glu Val Gly Gln Met Lys Leu Leu Ile Asn Leu
545                 550                 555                 560

Ile Lys Arg Lys Pro Gln Met Thr Glu Glu Gln Ile Lys Thr Ile Ala
                565                 570                 575

Asp Gly Phe Thr Ala Met Val Asp Lys Cys Cys Lys Gln Ser Asp Ile
            580                 585                 590

Asn Thr Cys Phe Gly Glu Glu Gly Ala Asn Leu Ile Val Gln Ser Arg
        595                 600                 605

Ala Thr Leu Gly Ile Gly Ala
    610                 615
```

<210> 112
<211> 386
<212> PRT
<213> Gallus gallus

<400> 112

```
Met Gly Ser Ile Gly Ala Ala Ser Met Glu Phe Cys Phe Asp Val Phe
1               5                   10                  15

Lys Glu Leu Lys Val His His Ala Asn Glu Asn Ile Phe Tyr Cys Pro
            20                  25                  30

Ile Ala Ile Met Ser Ala Leu Ala Met Val Tyr Leu Gly Ala Lys Asp
        35                  40                  45

Ser Thr Arg Thr Gln Ile Asn Lys Val Val Arg Phe Asp Lys Leu Pro
    50                  55                  60

Gly Phe Gly Asp Ser Ile Glu Ala Gln Cys Gly Thr Ser Val Asn Val
65                  70                  75                  80

His Ser Ser Leu Arg Asp Ile Leu Asn Gln Ile Thr Lys Pro Asn Asp
                85                  90                  95

Val Tyr Ser Phe Ser Leu Ala Ser Arg Leu Tyr Ala Glu Glu Arg Tyr
            100                 105                 110

Pro Ile Leu Pro Glu Tyr Leu Gln Cys Val Lys Glu Leu Tyr Arg Gly
        115                 120                 125

Gly Leu Glu Pro Ile Asn Phe Gln Thr Ala Ala Asp Gln Ala Arg Glu
    130                 135                 140
```

```
Leu Ile Asn Ser Trp Val Glu Ser Gln Thr Asn Gly Ile Ile Arg Asn
145                 150                 155                 160

Val Leu Gln Pro Ser Ser Val Asp Ser Gln Thr Ala Met Val Leu Val
                165                 170                 175

Asn Ala Ile Val Phe Lys Gly Leu Trp Glu Lys Ala Phe Lys Asp Glu
            180                 185                 190

Asp Thr Gln Ala Met Pro Phe Arg Val Thr Glu Gln Glu Ser Lys Pro
        195                 200                 205

Val Gln Met Met Tyr Gln Ile Gly Leu Phe Arg Val Ala Ser Met Ala
    210                 215                 220

Ser Glu Lys Met Lys Ile Leu Glu Leu Pro Phe Ala Ser Gly Thr Met
225                 230                 235                 240

Ser Met Leu Val Leu Leu Pro Asp Glu Val Ser Gly Leu Glu Gln Leu
                245                 250                 255

Glu Ser Ile Ile Asn Phe Glu Lys Leu Thr Glu Trp Thr Ser Ser Asn
            260                 265                 270

Val Met Glu Glu Arg Lys Ile Lys Val Tyr Leu Pro Arg Met Lys Met
        275                 280                 285

Glu Glu Lys Tyr Asn Leu Thr Ser Val Leu Met Ala Met Gly Ile Thr
    290                 295                 300

Asp Val Phe Ser Ser Ser Ala Asn Leu Ser Gly Ile Ser Ser Ala Glu
305                 310                 315                 320

Ser Leu Lys Ile Ser Gln Ala Val His Ala Ala His Ala Glu Ile Asn
                325                 330                 335

Glu Ala Gly Arg Glu Val Val Gly Ser Ala Glu Ala Gly Val Asp Ala
            340                 345                 350

Ala Ser Val Ser Glu Glu Phe Arg Ala Asp His Pro Phe Leu Phe Cys
        355                 360                 365

Ile Lys His Ile Ala Thr Asn Ala Val Leu Phe Phe Gly Arg Cys Val
    370                 375                 380

Ser Pro
```

385

<210> 113
<211> 386
<212> PRT
<213> Maleagris gallopavo

<400> 113

Met Gly Ser Ile Gly Ala Val Ser Met Glu Phe Cys Phe Asp Val Phe
1 5 10 15

Lys Glu Leu Lys Val His His Ala Asn Glu Asn Ile Phe Tyr Ser Pro
20 25 30

Phe Thr Ile Ile Ser Ala Leu Ala Met Val Tyr Leu Gly Ala Lys Asp
35 40 45

Ser Thr Arg Thr Gln Ile Asn Lys Val Val Arg Phe Asp Lys Leu Pro
50 55 60

Gly Phe Gly Asp Ser Val Glu Ala Gln Cys Gly Thr Ser Val Asn Val
65 70 75 80

His Ser Ser Leu Arg Asp Ile Leu Asn Gln Ile Thr Lys Pro Asn Asp
85 90 95

Val Tyr Ser Phe Ser Leu Ala Ser Arg Leu Tyr Ala Glu Glu Thr Tyr
100 105 110

Pro Ile Leu Pro Glu Tyr Leu Gln Cys Val Lys Glu Leu Tyr Arg Gly
115 120 125

Gly Leu Glu Ser Ile Asn Phe Gln Thr Ala Ala Asp Gln Ala Arg Gly
130 135 140

Leu Ile Asn Ser Trp Val Glu Ser Gln Thr Asn Gly Met Ile Lys Asn
145 150 155 160

Val Leu Gln Pro Ser Ser Val Asp Ser Gln Thr Ala Met Val Leu Val
165 170 175

Asn Ala Ile Val Phe Lys Gly Leu Trp Glu Lys Ala Phe Lys Asp Glu
180 185 190

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

```
Val Gln Met Met Tyr Gln Ile Gly Leu Phe Lys Val Ala Ser Met Ala
    210                 215                 220

Ser Glu Lys Met Lys Ile Leu Glu Leu Pro Phe Ala Ser Gly Thr Met
225                 230                 235                 240

Ser Met Trp Val Leu Leu Pro Asp Glu Val Ser Gly Leu Glu Gln Leu
                245                 250                 255

Glu Thr Thr Ile Ser Phe Glu Lys Met Thr Glu Trp Ile Ser Ser Asn
            260                 265                 270

Ile Met Glu Glu Arg Arg Ile Lys Val Tyr Leu Pro Arg Met Lys Met
        275                 280                 285

Glu Glu Lys Tyr Asn Leu Thr Ser Val Leu Met Ala Met Gly Ile Thr
    290                 295                 300

Asp Leu Phe Ser Ser Ser Ala Asn Leu Ser Gly Ile Ser Ser Ala Gly
305                 310                 315                 320

Ser Leu Lys Ile Ser Gln Ala Ala His Ala Ala Tyr Ala Glu Ile Tyr
                325                 330                 335

Glu Ala Gly Arg Glu Val Ile Gly Ser Ala Glu Ala Gly Ala Asp Ala
            340                 345                 350

Thr Ser Val Ser Glu Glu Phe Arg Val Asp His Pro Phe Leu Tyr Cys
        355                 360                 365

Ile Lys His Asn Leu Thr Asn Ser Ile Leu Phe Phe Gly Arg Cys Ile
    370                 375                 380

Ser Pro
385
```

<210> 114
<211> 551
<212> PRT
<213> Petromyzon marinus

<400> 114

```
Thr Met Gly Asp Cys Cys Gly Lys Glu Asn Ala Ala Gly Cys Leu Leu
1               5                   10                  15

His His Arg Tyr Leu Phe Gln Asp Glu Leu Cys Glu Gly Val Ser Ser
            20                  25                  30
```

```
Ile Pro Ser Ala Ala Ser Cys Cys Ser Leu Ala Asn Glu Glu Asp Arg
        35                  40                  45

Ala Asp Cys Leu Val Ser Leu Arg Gly Asn Leu Ser Ile His Ser Val
    50                  55                  60

Pro Leu Ala Pro Ala Ser Gln Leu Cys His Asp Arg Arg Trp Lys Ser
65                  70                  75                  80

His Glu Ser Phe Ala Ser Leu Leu Trp Glu Phe Gly Arg Arg His Pro
                85                  90                  95

Arg Ala Ala Asp Ser Gln Val Glu Glu Leu Ala Glu Arg Phe Ser Lys
            100                 105                 110

Ile Gly Asp Ala Cys Cys Asp Leu Ala Asp Glu Lys Glu Cys Ile Thr
        115                 120                 125

Arg Gly Arg Glu Ala Ile His Gln Glu Val Ser Ala Ala Tyr Ala Asp
    130                 135                 140

Ala Ala Gln Leu Cys Ser Ser Leu Gln Ala Leu Gly Ala Gln Lys Phe
145                 150                 155                 160

Leu Gly Arg Met Val Leu Val Phe Ser Gln Arg Ala Pro Asn Ala Thr
                165                 170                 175

Phe Asp Gln Ile Ser Lys Leu Ser His Arg Phe His Ser Tyr Ala Gln
            180                 185                 190

Thr Cys Cys Gly Glu Gly Trp Ser Pro Gly Cys Phe Ala Glu Gln Arg
        195                 200                 205

His Leu Ile His Asp Glu Met Cys His Asp Met Glu Ala Leu Ser Arg
    210                 215                 220

Val Pro Ala Met Ala Lys Cys Cys Gln Ile Ser Gly Ser Ala Arg Ala
225                 230                 235                 240

Lys Cys Met Glu Thr Ile Pro Arg Gly Lys Pro Val Leu Asp Val Ala
                245                 250                 255

Leu Ala Arg Phe Asp Gly His Lys Val Cys Gln Met Asn Ala Glu Ala
            260                 265                 270

Pro Gln Glu Leu Leu Gly Arg Met Leu Tyr Glu Phe Gly Arg Arg His
```

```
        275                 280                 285

Thr Asp Ala Ser Val Gly Glu Ala Lys Lys Ile Ile Thr Glu Trp Met
    290                 295                 300

Asp Gly Val Lys Asp Cys Cys Ala Gly Asn His Ser Glu Glu Gln Ala
305                 310                 315                 320

Cys Leu Val Ser Lys Lys Ala Ala Ile Ser Val Lys Ile Gly Glu Glu
                325                 330                 335

Gln Ala Lys Ser His Lys Ile Cys Glu Gln Leu Gln Lys Asp Gly His
            340                 345                 350

Glu Val Phe Glu Glu Met Val Leu Ile Asp Phe Ala Ile Glu Ala Arg
        355                 360                 365

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

His Ala Ile Arg Cys Cys Ala His Gln Ala His Cys Leu Leu Asp Glu
385                 390                 395                 400

Asn Leu His Leu Phe Ser Ser Leu Cys Ser Asp Leu Ser Tyr Leu Ala
                405                 410                 415

Ala His Asp Gly Tyr Arg Lys Cys Cys Arg Leu Ala Pro Ser Glu Ala
            420                 425                 430

Val Ser Cys His Val Glu His Glu Arg Ala His Glu Ala Glu Arg Ala
        435                 440                 445

Thr Glu Glu Val Glu Asn His Gly Lys Glu Arg Val Glu His Gln Ala
    450                 455                 460

Lys Val Glu Ala Val Glu Ala Val Glu Ala Pro Phe Ala Glu Glu Gly
465                 470                 475                 480

Ala Ala Arg Ser Cys Leu Arg Phe Arg Gln Leu Pro Gly Lys Tyr Leu
                485                 490                 495

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

His Ser Arg Ile Arg Leu Gln Val His His Phe Val Glu Val Thr Ala
        515                 520                 525
```

Lys Cys Cys Arg Ala Tyr Asp Lys Ser Glu Cys Phe Ser His Glu Ile
530 535 540

Lys Glu Met Lys Asn Ser Pro
545 550

<210> 115
<211> 1423
<212> PRT
<213> Petromyzon marinus

<400> 115

Met Gly Lys Ala Met Leu Lys Leu Cys Ile Thr Leu Met Val Leu Val
1 5 10 15

Phe Ser Gly Thr Ala Glu Ser Lys Gly Val Met Arg Arg Glu Asp Glu
20 25 30

Ser Phe Pro His Leu Lys Ser Arg Leu Cys Gly Gly Leu Asn Gly Leu
35 40 45

Gly Glu Asp Ala Tyr Arg Ser His Cys Val Val Tyr Tyr Thr Lys Arg
50 55 60

Met Gly Val Val Ser Leu Asp His Val Glu Glu Leu Ala Asn His Cys
65 70 75 80

Leu Arg Ile Val Lys Gln Cys Cys Ala Glu Gly Ala Ala Asp Asp Cys
85 90 95

Leu Gln Thr Glu Leu Ala Ala Val Gln Glu Gln Val Cys Thr Arg Met
100 105 110

Ser Glu Ala Lys Asp Val Pro Leu Val Gly Arg Cys Cys Ala Leu Ala
115 120 125

Gly Ser Glu Arg His Asp Cys Phe His His Ala Gly Gly Val Ala Glu
130 135 140

Gly Glu Gly Ala Trp Pro His Ala Leu Pro Val Thr Ser Pro Pro Glu
145 150 155 160

Tyr Asp Ser Val Thr Val Cys Ala Leu His Ala Thr Ala Asn Ala Arg
165 170 175

Leu Tyr Asp Thr Leu Leu Trp Glu Phe Ser Arg Arg Tyr Pro Ser Ala
180 185 190

```
Ser Asp Ser His Leu Ile Ala Leu Ala Asn Glu Phe Ile Thr Gly Leu
        195                 200                 205

Thr Thr Cys Cys Leu Val Glu Glu Glu His Gly Ala Cys Leu Ala Thr
    210                 215                 220

Leu Arg Glu Asp Phe Lys His Lys Leu Thr Glu Ala Ser His Lys Ser
225                 230                 235                 240

Gln Asn Leu Cys Lys Ala Leu Lys Ser Leu Gly Lys Glu Lys Phe Glu
                245                 250                 255

Asp Arg Ile Ile Val Arg Phe Thr Gln Arg Ala Pro Gln Ala Pro Phe
            260                 265                 270

Glu Leu Ile Gln Lys Leu Ala His Arg Phe Glu Val Leu Ala Glu Lys
        275                 280                 285

Cys Cys Glu Leu Gly His Ser Asp Arg Cys Leu Val Glu Glu Arg Tyr
    290                 295                 300

Thr Val Asp Asp Glu Leu Cys Leu Glu Gln Ser Phe Val Ala Thr Cys
305                 310                 315                 320

Pro Arg Leu Ser Ser Cys Cys Ser Leu Ser Gly Ser Ser Arg Ala Gln
                325                 330                 335

Cys Leu Glu Thr Val Pro Val Leu Glu Thr Ser Asp Lys Ala Ser Pro
            340                 345                 350

Ala Thr Pro Thr Leu Pro Ile Ser Glu Gln Cys Thr Leu Trp Ala Gly
        355                 360                 365

Lys Pro Val Glu Phe His Lys Arg Val Val Trp Gln Ile Ser His Arg
    370                 375                 380

Tyr Pro Thr Thr Gly Val Ala Gln Val Glu Ala Leu Ala His His Tyr
385                 390                 395                 400

Leu Glu His Leu Thr Ile Cys Cys Ala Ser Glu Asp Lys Asp Thr Cys
                405                 410                 415

Ile Ala Thr Glu Val Ala Glu Phe Lys Ser Glu Val Glu Lys Val His
            420                 425                 430
```

```
Thr Lys Ser Asp Trp Trp Cys Arg Met Ser Asp Leu Leu Gly Thr Asp
        435                 440                 445

Arg Phe Asn Leu Leu Leu Ile Val Thr Tyr Ser Gln Arg Val Pro Gln
    450                 455                 460

Ala Thr Phe Glu Gln Val Glu Glu Ile Ser His His Phe Ala Leu Ile
465                 470                 475                 480

Thr Arg Lys Cys Cys Ser His Arg Lys Asn Gly Ser Cys Phe Leu Glu
                485                 490                 495

Glu Arg Tyr Ala Leu His Asp Ala Ile Cys Arg Asp Glu Ala Trp Leu
            500                 505                 510

Ser Gly Leu Ala Glu Val Ser Arg Cys Cys Ala Met Asp Gly Arg Ala
        515                 520                 525

Arg Ile Leu Cys Phe Asp Glu Leu Ser Ser His Leu Asn Ala Ser Val
    530                 535                 540

Glu Glu Arg Pro Glu Leu Cys Ser Thr Ser Leu Cys Ser Lys Tyr His
545                 550                 555                 560

Asp Leu Gly Phe Glu Phe Lys Gln Arg Val Ala Tyr Gly Phe Gly Gln
                565                 570                 575

Arg Phe Pro Lys Ala Ala Met Gly Gln Met Arg Asp Leu Ile Ser Lys
            580                 585                 590

Tyr Leu Ala Met Val Gln Arg Cys Cys Asp Ala Met Ser Asp Phe Lys
        595                 600                 605

Met Asp Val Glu Glu Val Glu Leu Arg Ala His Arg Leu Cys Leu Asp
    610                 615                 620

Ala His Gln Leu Gly Glu Glu Lys Leu Ala Asp Arg Ile Met Ile Gly
625                 630                 635                 640

Leu Ala Gln Arg Ile Ser Val Ala Ser Phe Val Asn Ile Ser Ser Val
                645                 650                 655

Ala Leu His Phe Ala Gln Ser Val Ile Lys Cys Cys Asp Ala Asp His
            660                 665                 670

Glu Lys Thr Cys Phe Met Glu Gln Glu Phe Ala Leu Glu Asp Gln Val
        675                 680                 685
```

```
Cys Ser Asp Ser Glu Ala Leu Ser His Ile Pro Ser Val Ser Arg Cys
    690                 695                 700

Cys Glu Leu His Pro Phe Asp Arg Ser Val Cys Phe His Ser Leu Arg
705                 710                 715                 720

Ser Thr Gln Ala Ser Thr Leu Ala Ser Thr His Val Ala Val Gly Lys
                725                 730                 735

Asp Asp Ser Leu Pro Gly His Val Glu Glu Cys Gln Ala Phe Ala Ser
            740                 745                 750

Gly Asn His Ser Leu Thr Asp Gln Val Met Phe Glu Phe Ala Arg Arg
        755                 760                 765

His Pro Arg Ala Ser Val Ser Gln Val Glu Ser Leu Ala Arg Leu Tyr
    770                 775                 780

Ser Glu Leu Ala Arg Ala Cys Cys Ala Leu Thr Asp Ala Asp Gln Glu
785                 790                 795                 800

Ser Cys Leu His Thr Ala Arg Ser Gln Ala Arg Gln Glu Ala Leu Lys
                805                 810                 815

Ser Leu Gln Arg Ser Glu Arg Ile Cys Asn Thr Leu Ser Ala Ile Gly
            820                 825                 830

Lys Glu Lys Phe Glu Asp Arg Ile Val Ile Ala Leu Ser Gln Lys Ala
        835                 840                 845

Thr Asp Ala Ser Phe Glu Gln Ile Leu Glu Ile Ala Asn Arg Met Ser
    850                 855                 860

Arg Gly Leu Ala Arg Cys Cys Glu Gln Gly Asn Asn Val Gly Cys Leu
865                 870                 875                 880

Met Asp His Arg His Ala Leu His Glu Ala Ile Cys Ser Thr Pro Asp
                885                 890                 895

Gly Ser Leu Pro Gln Ser Val Ala Ala Cys Cys Asn Thr Ser Asn Thr
            900                 905                 910

Ser Thr Thr Thr Ser Thr Thr Thr Ser Thr Thr Thr Ser Thr Thr Thr
        915                 920                 925
```

```
Ser Thr Thr Thr Ser Thr Thr Ser Thr Thr Thr Ala Ala Glu Ile Arg
    930                 935                 940

Asp Ser Cys Phe Asp Asn Leu Gln Ala Asn Val Ser Arg Ala His Ala
945                 950                 955                 960

Pro Phe Tyr Ser Asn Ser Gln Leu Cys Leu Met Lys Leu Arg Thr Pro
                965                 970                 975

His Arg Phe Leu Glu Arg Phe Leu Trp Glu Phe Gly Arg Arg His Pro
            980                 985                 990

Gln Ala Ala Leu Ser Gln Val Glu  Glu Leu Ala Glu Met  Tyr Val Lys
        995                 1000                1005

Met Thr  Asp Ser Cys Cys Gly  Lys Leu His Ser Lys  Ser Cys Phe
    1010                1015                1020

Thr Glu  Gln Arg His Thr Ile  His Met Glu Ile Arg  His Ala Tyr
    1025                1030                1035

Ala Glu  Val Gln His Ile Cys  Gly Ser Leu His Ser  Arg Gly Glu
    1040                1045                1050

Glu Thr  Phe Ile Gln Arg Glu  Val Thr Leu Leu Ser  Gln Lys Ala
    1055                1060                1065

Pro Asn  Ala Ser Phe Glu Lys  Val Ser Gln Leu Ala  Arg His Phe
    1070                1075                1080

Leu Ser  Leu Ala Lys Lys Cys  Cys Ala Pro Asp His  Ala Ala Gly
    1085                1090                1095

Cys Phe  Leu Glu Glu Pro Tyr  Ala Ile His Asp Glu  Val Cys Arg
    1100                1105                1110

Asp Asp  Glu Val Val Asp Gln  Val Gly Gly Leu Ala  Thr Cys Cys
    1115                1120                1125

Arg Met  Ser Gly Thr Ser Arg  Ala Lys Cys Leu Ala  Gln Leu Pro
    1130                1135                1140

Arg Asp  Leu Gly Arg His Gly  Asn Arg Glu Thr Pro  Glu Phe Asp
    1145                1150                1155

Glu Leu  Lys Ile Cys Glu Leu  Arg Arg Asp Asn Pro  Ala Val Leu
    1160                1165                1170
```

```
Met Glu  Lys Ile Leu Tyr Glu  Phe Gly Arg Arg His  Ser Asp Ser
    1175                1180                1185

Ala Val  Ser Glu Val Lys Asn  Phe Ala Gln Lys Phe  Ser His Ser
    1190                1195                1200

Val Thr  Glu Cys Cys Thr Ser  Glu Lys Thr His Glu  Cys Phe Val
    1205                1210                1215

Glu Lys  Arg Ala Ala Ile Glu  Lys Val Ile Lys Asp  Glu Glu Ala
    1220                1225                1230

Lys Gly  Asn Leu Thr Cys Gln  Arg Leu Lys Ala Gln  Gly Val Glu
    1235                1240                1245

His Phe  Glu Gln Leu Val Ile  Leu Asn Phe Ala Arg  Ala Ala Lys
    1250                1255                1260

Ser Leu  Pro Met Glu Lys Val  Val Glu Phe Ala His  Arg Phe Thr
    1265                1270                1275

Arg Ile  Ala Gly Gln Cys Cys  Glu His Asp Thr His  Cys Leu Ile
    1280                1285                1290

Asp Glu  Ser Phe His Leu His  Ala Glu Met Cys Gly  Asp His Gly
    1295                1300                1305

Tyr Ile  Met Ala His Pro Gly  Val Ala Asn Cys Cys  Lys Ser Asp
    1310                1315                1320

Val Ser  Glu Gln Gly Thr Cys  Phe Lys Ile His Glu  Asp Val His
    1325                1330                1335

His Ala  Glu Glu Ile Leu Ser  Lys Asp Val Ser Pro  Ala His Pro
    1340                1345                1350

Thr Ala  Glu Arg Val Cys Leu  Arg Tyr Arg Gln Phe  Pro Glu Lys
    1355                1360                1365

Phe Ile  Asn Leu Ala Leu Phe  Glu Leu Val His Arg  Leu Pro Leu
    1370                1375                1380

Leu Glu  Ser Ser Val Leu Arg  Arg Lys Ala Leu Ala  Tyr Thr Gly
    1385                1390                1395
```

```
Phe Thr  Asp Asp Cys Cys Arg  Ala Val Asp Lys Thr  Ala Cys Phe
    1400                1405                1410


Thr Glu  Lys Leu Glu Ala Ile  Lys Ser Ser
    1415                1420


<210>  116
<211>  382
<212>  PRT
<213>  Rana catesbeiana

<400>  116

Lys Cys Arg Ile Ile Arg Glu Phe Pro Asp Ile Val Phe Lys Gly Leu
1               5                   10                  15


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


Val Lys Lys Val Thr Glu Glu Ile Val His Leu Asn Glu Asp Cys Cys
        35                  40                  45


Lys Gly Asp Ala Val Glu Cys Met Met Glu Arg Met Glu Ala Thr Asp
    50                  55                  60


His Ile Cys Glu Ala Lys Asp Lys Leu Ser Ser Lys Leu Ala Asp Cys
65                  70                  75                  80


Cys Ala Lys Ser Ile Leu Glu Arg Thr Pro Cys Leu Leu Ala Leu Pro
                85                  90                  95


Asn Asp Glu Ser Asp Leu Ser Lys Glu Leu Lys Asn Tyr Tyr Glu Asp
            100                 105                 110


Glu Arg Val Cys Glu Asn Tyr Lys Lys Asp Lys Leu Leu Phe Leu Ala
        115                 120                 125


His Phe Thr His Asp Tyr Ala Arg Ser His Gln Glu Ser Ser Pro Gln
    130                 135                 140


Ser Cys Leu Arg Val Ser Lys Gly Phe Glu Gly Leu Leu Glu Lys Cys
145                 150                 155                 160


Cys Ala Ser Glu Asn His Ala Glu Cys Leu Lys Gln Ala Pro Ile Leu
                165                 170                 175


Leu Glu Ala Ala Leu Lys Glu Ile Glu Glu Leu Arg Lys Gln Asn Cys
            180                 185                 190
```

```
Gly Ala Leu Gln Leu Leu Gly Phe Arg Asp Tyr Asn Ile Gln Leu Leu
        195                 200                 205

Phe Arg Tyr Phe Phe Lys Met Pro Gln Val Thr Ala Pro Thr Leu Val
    210                 215                 220

Glu Leu Ala Gly Arg Met Thr Lys Val Ala Val Tyr Cys Cys Gly Leu
225                 230                 235                 240

Ala Glu Asn Lys Gln Gln Thr Cys Ala Glu Glu Lys Leu Asp Ile Leu
                245                 250                 255

Leu Gly Glu Met Cys Glu Lys Glu Lys His Thr Phe Val Asn Asp Asn
            260                 265                 270

Val Arg His Cys Cys Val Asp Ser Tyr Ala Asn Arg Arg Lys Cys Phe
        275                 280                 285

Thr Asp Leu Gln Arg Tyr Pro Asn Tyr Val Ala Pro Lys Trp Asp Glu
    290                 295                 300

Ser Lys Leu His Phe Asn Glu Asp Leu Cys Lys Gly Ser Glu Asp Asp
305                 310                 315                 320

Gln Ile Lys Lys Lys Leu Glu Val Leu Val Glu Tyr Met Lys Met Lys
                325                 330                 335

Pro Asp Cys Gly Pro Glu Lys Leu Lys Glu Val Val Glu Ala Phe Arg
            340                 345                 350

Lys Ile Asp Ile Lys Cys Cys Ala Ala Glu Asp His Gln Lys Cys Phe
        355                 360                 365

Asp Asp Glu Lys Ala Gly Leu Leu Gln Ile Ile Glu Ala His
    370                 375                 380
```

<210> 117
<211> 603
<212> PRT
<213> Rana shqiperica

<400> 117

```
Lys Trp Ala Thr Leu Ile Cys Leu Phe Ile Leu Ser Ile Thr Thr Glu
1               5                   10                  15

Ser Arg His Leu Gln Lys Arg His His Glu Glu His Pro Arg Ile Ile
            20                  25                  30
```

```
Asn Asp Ile Val Lys Ala Val Gly Lys Pro Ala Val Glu Lys Leu Val
        35                  40                  45

Leu Val Met Val Ala Gln Asp Phe Glu Lys Cys Ser Leu Asp Glu His
    50                  55                  60

Leu Lys Val Gln Ala Lys Ile Ile Glu Ala Val Asp Asn Cys Glu Lys
65                  70                  75                  80

His Pro Glu Glu Ala Glu Cys Lys Lys Pro Ala Ile Glu Leu Tyr His
                85                  90                  95

Asp Ile Val Cys Lys Glu Glu Asp Ile Asp Gln Leu Tyr Pro Trp Thr
            100                 105                 110

Thr Glu Cys Cys Gly Lys Ala Glu Ala Glu Arg Thr Lys Cys Phe Tyr
        115                 120                 125

Glu His Arg Glu Val Arg Val Glu Glu Tyr Lys Ile Pro Asn Ile Glu
    130                 135                 140

Glu Ser Cys Lys Glu His Lys Glu His Pro Gln Arg Ala Phe Ser Tyr
145                 150                 155                 160

Tyr Leu Ser Asn Ile Ala Lys Arg His Ser Lys Leu Tyr Pro Pro Ala
                165                 170                 175

Val Leu Gly Phe Ala Ile Gln Tyr Asn Glu Ile Thr Thr Glu Cys Cys
            180                 185                 190

Ala Ala Glu Asp Lys Ala Lys Cys Phe Gly Glu Arg Met Pro Gln Val
        195                 200                 205

Lys Lys Leu Thr Asn Tyr Leu Glu Asp Lys His Lys Gln Lys Cys Arg
    210                 215                 220

Val Leu Lys Glu Phe Pro Glu Arg Val Ser Gln Ala Leu Thr Leu Val
225                 230                 235                 240

Gln Val Ser Gln Arg Phe Gly Asn Ala Lys Tyr Asp Asp Val Glu Lys
                245                 250                 255

Val Thr Ile Glu Ile Ala His Leu Asn Glu Asp Cys Cys Lys Gly Asp
            260                 265                 270
```

```
Ala Val Glu Cys Met Ile Glu Arg Met Glu Ala Thr Glu His Ile Cys
        275                 280                 285

Leu Ala Lys Glu Lys Leu Ser Ser Lys Leu Ser Asp Cys Cys Ala Lys
    290                 295                 300

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

Pro Asp Leu Pro Ile Glu Leu Lys Glu Tyr Tyr Glu Asp Glu His Val
                325                 330                 335

Cys Glu Asn Tyr Gln Lys Asp Lys Arg Lys Tyr Leu Ala His Phe Thr
            340                 345                 350

His Asp Tyr Ser Arg Ser His Gln Glu Ser Ser Pro Gln Ser Cys Leu
        355                 360                 365

Arg Val Ser Arg Gly Phe Glu Met Leu Leu Glu Lys Cys Cys Ala Ser
    370                 375                 380

Ala Asn Ser Ala Glu Cys Leu Lys Asp Ala Pro Lys Leu Leu Glu Ala
385                 390                 395                 400

Ala Leu Lys Glu Asn Glu Glu Ile Ser Lys Gln Asn Cys Gly Ala Leu
                405                 410                 415

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

Phe Gly Lys Met Pro Gln Val Thr Ala Gln Thr Leu Val Glu Leu Thr
        435                 440                 445

Gly Arg Met Ala Lys Ile Gly Val Tyr Cys Cys Gly Leu Pro Asp Asn
    450                 455                 460

Lys Lys Gln Pro Cys Ala Glu Glu Lys Leu Asp Ile Leu Leu Gly Glu
465                 470                 475                 480

Met Cys Glu Arg Glu Lys Lys Thr Phe Ile Asn Asp Asn Val His His
                485                 490                 495

Cys Cys Val Asp Ser Tyr Ala Asn Arg Arg Pro Cys Phe Thr Lys Leu
            500                 505                 510

Gly Pro Tyr Ala Asn Tyr Glu Ala Pro Val Trp Asp Glu Ser Lys Leu
        515                 520                 525
```

```
His Phe Thr Ala Asp Met Cys Lys Gly Ser Ala Asp Asp Gln Leu Lys
    530                 535                 540

Thr Lys Leu Val Leu Leu Val Glu Phe Leu Lys Met Lys Pro Thr Cys
545                 550                 555                 560

Gly Lys Glu Lys Leu Thr Glu Val Ile Glu Ser Phe Arg Lys Thr Val
                565                 570                 575

Val Glu Cys Cys Ala Ala Glu Asn Gln Gln Ala Cys Phe Asp Glu Lys
            580                 585                 590

Lys Gly Gly Leu His Glu Ile Ile Lys Asp His
        595                 600
```

<210> 118
<211> 608
<212> PRT
<213> Xenopus laevis

<400> 118

```
Met Lys Trp Ile Thr Leu Ile Cys Leu Leu Ile Ser Ser Thr Leu Ile
1               5                   10                  15

Glu Ser Arg Ile Ile Phe Lys Arg Asp Thr Asp Val Asp His His Lys
            20                  25                  30

His Ile Ala Asp Met Tyr Asn Leu Leu Thr Glu Arg Thr Phe Lys Gly
        35                  40                  45

Leu Thr Leu Ala Ile Val Ser Gln Asn Leu Gln Lys Cys Ser Leu Glu
    50                  55                  60

Glu Leu Ser Lys Leu Val Asn Glu Ile Asn Asp Phe Ala Lys Ser Cys
65                  70                  75                  80

Thr Gly Asn Asp Lys Thr Pro Glu Cys Glu Lys Pro Ile Gly Thr Leu
                85                  90                  95

Phe Tyr Asp Lys Leu Cys Ala Asp Pro Lys Val Gly Val Asn Tyr Glu
            100                 105                 110

Trp Ser Lys Glu Cys Cys Ser Lys Gln Asp Pro Glu Arg Ala Gln Cys
        115                 120                 125

Phe Arg Ala His Arg Val Phe Glu His Asn Pro Val Arg Pro Lys Pro
```

```
    130                 135                 140

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

Ala Phe Ile His Glu Glu Ala Arg Asn His Pro Asp Leu Tyr Pro Pro
                165                 170                 175

Ala Val Leu Leu Leu Thr Gln Gln Tyr Gly Lys Leu Val Glu His Cys
            180                 185                 190

Cys Glu Glu Glu Asp Lys Asp Lys Cys Phe Ala Glu Lys Met Lys Glu
        195                 200                 205

Leu Met Lys His Ser His Ser Ile Glu Asp Lys Gln Lys His Phe Cys
    210                 215                 220

Trp Ile Val Asn Asn Tyr Pro Glu Arg Val Ile Lys Ala Leu Asn Leu
225                 230                 235                 240

Ala Arg Val Ser His Arg Tyr Pro Lys Pro Asp Phe Lys Leu Ala His
                245                 250                 255

Lys Phe Thr Glu Glu Thr Thr His Phe Ile Lys Asp Cys Cys His Gly
            260                 265                 270

Asp Met Phe Glu Cys Met Thr Glu Arg Leu Glu Leu Ser Glu His Thr
        275                 280                 285

Cys Gln His Lys Asp Glu Leu Ser Thr Lys Leu Glu Lys Cys Cys Asn
    290                 295                 300

Leu Pro Leu Leu Glu Arg Thr Tyr Cys Ile Val Thr Leu Glu Asn Asp
305                 310                 315                 320

Asp Val Pro Ala Glu Leu Ser Lys Pro Ile Thr Glu Phe Thr Glu Asp
                325                 330                 335

Pro His Val Cys Glu Lys Tyr Ala Glu Asn Lys Glu Ser Phe Leu Glu
            340                 345                 350

Arg Ile Ser Pro Trp Gln Ser Gln Glu Thr Pro Glu Leu Ser Glu Gln
        355                 360                 365

Phe Leu Leu Gln Ser Ala Lys Glu Tyr Glu Ser Leu Leu Asn Lys Cys
    370                 375                 380
```

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

Phe Met Asn Glu Ala Lys Glu Arg Phe Ala Tyr Leu Lys Gln Asn Cys
                405                 410                 415

Asp Ile Leu His Glu His Gly Glu Tyr Leu Phe Glu Asn Glu Leu Leu
            420                 425                 430

Ile Arg Tyr Thr Lys Lys Met Pro Gln Val Ser Asp Glu Thr Leu Ile
        435                 440                 445

Gly Ile Ala His Gln Met Ala Asp Ile Gly Glu His Cys Cys Ala Val
    450                 455                 460

Pro Glu Asn Gln Arg Met Pro Cys Ala Glu Gly Asp Leu Thr Ile Leu
465                 470                 475                 480

Ile Gly Lys Met Cys Glu Arg Gln Lys Lys Thr Phe Ile Asn Asn His
                485                 490                 495

Val Ala His Cys Cys Thr Asp Ser Tyr Ser Gly Met Arg Ser Cys Phe
            500                 505                 510

Thr Ala Leu Gly Pro Asp Glu Asp Tyr Val Pro Pro Pro Val Thr Asp
        515                 520                 525

Asp Thr Phe His Phe Asp Asp Lys Ile Cys Thr Ala Asn Asp Lys Glu
    530                 535                 540

Lys Gln His Ile Lys Gln Lys Phe Leu Val Lys Leu Ile Lys Val Ser
545                 550                 555                 560

Pro Lys Leu Glu Lys Asn His Ile Asp Glu Trp Leu Leu Glu Phe Leu
                565                 570                 575

Lys Met Val Gln Lys Cys Cys Thr Ala Asp Glu His Gln Pro Cys Phe
            580                 585                 590

Asp Thr Glu Lys Pro Val Leu Ile Glu His Cys Gln Lys Leu His Pro
        595                 600                 605
```

<210> 119
<211> 572
<212> PRT
<213> Xenopus (Silwana) tropicalis

<400> 119

```
Met Asn Ala Leu Met Arg Arg Ala Cys Cys Gly Ala Leu Phe Pro Leu
1               5                  10                  15

Ser Phe Arg Leu Ala Ala Leu Ser Pro Met Lys Gly Ala Ser Asn Phe
            20                  25                  30

Ser Cys Gly Asn Val Cys Ala Ser Pro Ala Gly Cys Trp Ala Pro Pro
        35                  40                  45

Ser Gly His Asp Thr Gly Ile Lys Val Tyr Asn Ser Leu Thr Arg Arg
    50                  55                  60

Lys Asp Pro Leu Ile Leu Ala Asp Pro Thr Val Ala Thr Trp Tyr Ser
65                  70                  75                  80

Cys Gly Pro Thr Val Tyr Asp His Ala His Leu Gly His Ala Cys Ser
                85                  90                  95

Tyr Val Arg Phe Asp Ile Ile Arg Arg Ile Leu Leu Lys Val Phe Gly
            100                 105                 110

Ile Asp Thr Val Val Val Met Val Val Thr Asp Ile Asp Asp Lys Ile
        115                 120                 125

Ile Lys Arg Ala Lys Glu Leu Asn Ile Ser Pro Val Ala Leu Ala Arg
    130                 135                 140

Thr Tyr Glu Gln Asp Phe Lys Gln Asp Met Thr Ala Leu Lys Val Leu
145                 150                 155                 160

Pro Pro Thr Val Tyr Met Arg Val Thr Glu Asn Ile Pro Gln Ile Ile
                165                 170                 175

Ser Phe Ile Glu His Ile Ile Ala Asn Gly Tyr Ala Tyr Ala Thr Ser
            180                 185                 190

Gln Gly Asn Val Tyr Phe Asp Val Gln Ser Ile Gly Glu Arg Tyr Gly
        195                 200                 205

Lys Phe Asn Asp Ser Phe Ser Asp Thr Ala Ser Glu Ser Ala Ser Gln
    210                 215                 220

Asp Lys Arg His Ile Arg Asp Phe Ala Leu Trp Lys Thr Ser Lys Pro
225                 230                 235                 240
```

```
Glu Glu Pro Tyr Trp Ala Ser Pro Trp Gly Lys Gly Arg Pro Gly Trp
                245                 250                 255

His Ile Glu Cys Ser Thr Ile Ala Ser Ser Val Phe Gly Lys His Leu
            260                 265                 270

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

Glu Ile Ala Gln Cys Glu Ala Tyr His Gln Ser Thr Gln Trp Gly Asn
    290                 295                 300

Tyr Phe Leu His Thr Gly His Leu His Leu Lys Gly Asn Glu Glu Lys
305                 310                 315                 320

Met Ser Lys Ser Leu Arg Asn Tyr Leu Thr Val Lys Glu Phe Leu Lys
                325                 330                 335

Ser Phe Ser Pro Asp Gln Phe Arg Met Phe Cys Leu Arg Ser Lys Tyr
            340                 345                 350

Lys Ser Ala Val Glu Tyr Ser Asn Gly Ser Met His Asp Ala Val Asn
        355                 360                 365

Thr Leu His Thr Ile Ser Ser Phe Val Asp Asp Ala Lys Ala Tyr Met
    370                 375                 380

Lys Gly Gln Leu Ile Cys Gln Pro Val Gln Glu Ala Leu Leu Trp Gln
385                 390                 395                 400

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

Phe Asp Thr Pro Arg Ala Val Asp Ala Val Met Asp Leu Ile His His
            420                 425                 430

Gly Asn Arg Gln Leu Lys Ala Val Ser Lys Glu Ser Asn Ser Pro Arg
        435                 440                 445

Ser Ser Val Val Tyr Gly Ala Met Ile Ser Tyr Ile Glu Gln Phe Leu
    450                 455                 460

Glu Ile Leu Gly Ile Ser Leu Ser Gln Asn Gln Val Ala Ala Glu Asp
465                 470                 475                 480

Arg His Ser Ala Val Leu Phe Asn Val Val Glu Glu Met Ile Ser Phe
                485                 490                 495
```

```
Arg Ser Lys Val Arg Asn Tyr Ala Leu Ala Ala Asp Glu Ser Pro Asn
            500                 505                 510

Ala Ile Gly Gln Glu Glu Lys Gln Gln Tyr Lys Glu Arg Arg Arg Gln
        515                 520                 525

Leu Leu Leu Glu Arg Glu Pro Leu Leu Gln Ala Cys Asp Ile Met Arg
    530                 535                 540

Gln His Leu Ala Val Tyr Gly Ile Asn Val Lys Asp Arg Gly Asn Thr
545                 550                 555                 560

Ser Thr Trp Glu Leu Leu Asp Arg Lys Glu Glu Thr
                565                 570
```

<210> 120
<211> 626
<212> PRT
<213> Ambystoma maculatum

<400> 120

```
Met Lys Trp Ala Thr Leu Ile Ser Ile Val Ile Val Leu Ser Cys Thr
1               5                   10                  15

Glu Ser Arg Ile Leu Asn Lys Arg His His His Glu Gly His Val Asp
            20                  25                  30

Asn Pro Pro His Leu Ile Gly Asp Leu Ile Pro Met Ile Gly Val Asp
        35                  40                  45

Asn Ser Lys Gly Leu Val Leu Ala Ala Val Ser Gln Met Leu Pro Leu
    50                  55                  60

Cys Pro Tyr Glu Glu His Leu Gln Arg Val Glu Asp Val Met Gln Ile
65                  70                  75                  80

Ala Asp Leu Cys Ala Lys Gly Ala Arg His Ala Asn Cys Ala Lys Ser
                85                  90                  95

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

Glu Lys Tyr Pro Phe His Gln Glu Cys Cys Lys Lys Glu Asp Pro Glu
        115                 120                 125

Arg His Lys Cys Phe Val Glu His Lys Met Ala Asn His Glu Glu Leu
```

```
    130                 135                 140

Thr Lys Tyr Val Arg Pro Ala Pro Glu Gln Ile Cys Lys Asp His Ala
145                 150                 155                 160

Glu Asn Arg Gly Pro Leu Leu Ala Arg Tyr Ile Phe Met Leu Ala Ile
                165                 170                 175

Gly His Pro His Met Tyr Ile Pro Ala Ile Leu Gly Phe Ala Gln Arg
            180                 185                 190

Phe Asp Gly Ile Val Ser His Cys Cys Lys Asp Val Glu Thr Ala Gly
        195                 200                 205

Gln Cys Phe Asn Asp Lys Met Pro Glu His Lys Gln Glu Val Glu Tyr
    210                 215                 220

Val Cys Ala Leu Gln Lys His Asn Cys Tyr Ile Leu Gln Asp Phe Lys
225                 230                 235                 240

Glu Arg Ala Leu Thr Ala Tyr Lys Ala Val Gln Ala Ser Gln Lys Phe
                245                 250                 255

Pro Leu Ala Ser Phe Glu Asn Val Gln Ile Ile Val Pro Asp Thr Val
            260                 265                 270

His Leu His Gln Thr Cys Cys Gly Gly Asp Met Met Ala Cys Met Leu
        275                 280                 285

Glu Arg Met Lys Leu Thr Ala Lys Ile Cys Glu Lys Lys Asp Glu Leu
    290                 295                 300

Ala Thr His Leu Lys Glu Cys Cys Asp Lys Pro Leu Leu Glu Arg Ser
305                 310                 315                 320

Ala Cys Ile Ile Arg Leu Pro Asn Asp Gln Lys Pro Ala Asp Leu Ser
                325                 330                 335

Pro Lys Val Pro His Tyr Ile Asp Asp Pro Glu Val Cys Lys Leu Tyr
            340                 345                 350

Thr Glu Gly Gly Asp Thr Phe Met Gly Arg Phe Leu Tyr Glu Cys Ala
        355                 360                 365

Arg Arg His Gln Asp Tyr Ser Pro Glu Met Leu Leu Arg Met Gly Ser
    370                 375                 380
```

```
Gly Tyr Glu Glu Phe Leu Lys Lys Cys Cys Ala Ala Glu Gly His Asn
385                 390                 395                 400

Glu Cys Leu Ala Lys Thr Glu Glu Ser Leu Lys Lys Glu Ile Glu Ser
                405                 410                 415

Ser Val Thr Leu Leu Lys Thr Asn Cys Gly Ala Leu Asp Lys Leu Lys
            420                 425                 430

Ser Tyr Leu Phe Gln Asn Leu Leu Ile Phe Lys Tyr Val Ala Arg Met
        435                 440                 445

Pro Ala Leu Ser Glu Gln Ser Leu Leu Arg Ile Thr Lys Ser Met Thr
    450                 455                 460

Thr Ile Gly Glu Lys Cys Cys His Arg Pro Glu Asp Gln Gln Met Thr
465                 470                 475                 480

Cys Ser Glu Gly Gly Leu Gly Ile Val Phe Gly Gln Ile Cys Met Lys
                485                 490                 495

Gln Lys Thr Thr Pro Val Asn Glu Lys Val Ala Gln Cys Cys Ser His
            500                 505                 510

Ser Leu Ser Ser Gln Thr Pro Cys Phe Ser Ala Leu Pro Val Asp Glu
        515                 520                 525

Thr Tyr Val Pro Pro Pro Leu Ser Val Ala Ser Phe Asn Phe Asn Asp
    530                 535                 540

Glu Leu Cys Thr Thr Ser Glu Pro Glu Gln Gln Ser Lys Lys Gln Val
545                 550                 555                 560

Phe Leu Ile Arg Leu Met Lys Gln Tyr Pro His Met Thr Asp Glu Gln
                565                 570                 575

Leu Lys Thr Cys Val Val Asn Phe Val Pro Met Val Asp Gln Cys Cys
            580                 585                 590

Lys Ala Asp Asn His Asn Glu Cys Phe Ala Leu Glu Gly Ala Lys Leu
        595                 600                 605

Ile Asp Ala Cys Lys Ala Ile Leu Ala Val His Pro Ala Val Glu Val
    610                 615                 620

Ser Val
```

625

<210> 121
<211> 608
<212> PRT
<213> Salmo salar

<400> 121

Met Gln Trp Leu Ser Val Cys Ser Leu Leu Val Leu Leu Ser Val Leu
1 5 10 15

Ser Arg Ser Gln Ala Gln Asn Gln Ile Cys Thr Ile Phe Thr Glu Ala
20 25 30

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

Leu Pro Asp Ser Thr Leu Gly Asp Leu Val Pro Leu Ile Ala Glu Ala
50 55 60

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

Glu Arg Asp Val Ala Asp Leu Phe Gln Ser Ala Val Cys Ser Ser Glu
85 90 95

Thr Leu Val Glu Lys Asn Asp Leu Lys Met Cys Cys Glu Lys Thr Ala
100 105 110

Ala Glu Arg Thr His Cys Phe Val Asp His Lys Ala Lys Ile Pro Arg
115 120 125

Asp Leu Ser Leu Lys Ala Glu Leu Pro Ala Ala Asp Gln Cys Glu Asp
130 135 140

Phe Lys Lys Asp His Lys Ala Phe Val Gly Arg Phe Ile Phe Lys Phe
145 150 155 160

Ser Lys Ser Asn Pro Met Leu Pro Pro His Val Val Leu Ala Ile Ala
165 170 175

Lys Gly Tyr Gly Glu Val Leu Thr Thr Cys Cys Gly Glu Ala Glu Ala
180 185 190

Gln Thr Cys Phe Asp Thr Lys Lys Ala Thr Phe Gln His Ala Val Met
195 200 205

```
Lys Arg Val Ala Glu Leu Arg Ser Leu Cys Ile Val His Lys Lys Tyr
    210                 215                 220

Gly Asp Arg Val Val Lys Ala Lys Lys Leu Val Gln Tyr Ser Gln Lys
225                 230                 235                 240

Met Pro Gln Ala Ser Phe Gln Glu Met Gly Gly Met Val Asp Lys Ile
                245                 250                 255

Val Ala Thr Val Ala Pro Cys Cys Ser Gly Asp Met Val Thr Cys Met
            260                 265                 270

Lys Glu Arg Lys Thr Leu Val Asp Glu Val Cys Ala Asp Glu Ser Val
        275                 280                 285

Leu Ser Arg Ala Ala Gly Leu Ser Ala Cys Cys Lys Glu Asp Ala Val
    290                 295                 300

His Arg Gly Ser Cys Val Glu Ala Met Lys Pro Asp Pro Lys Pro Asp
305                 310                 315                 320

Gly Leu Ser Glu His Tyr Asp Ile His Ala Asp Ile Ala Ala Val Cys
                325                 330                 335

Gln Thr Phe Thr Lys Thr Pro Asp Val Ala Met Gly Lys Leu Val Tyr
            340                 345                 350

Glu Ile Ser Val Arg His Pro Glu Ser Ser Gln Gln Val Ile Leu Arg
        355                 360                 365

Phe Ala Lys Glu Ala Glu Gln Ala Leu Leu Gln Cys Cys Asp Met Glu
    370                 375                 380

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

Lys Lys Ile Thr Asp Glu Thr Asp Tyr Tyr Lys Lys Met Cys Ala Ala
                405                 410                 415

Glu Ala Ala Val Ser Asp Asp Ser Phe Glu Lys Ser Met Met Val Tyr
            420                 425                 430

Tyr Thr Arg Ile Met Pro Gln Ala Ser Phe Asp Gln Leu His Met Val
        435                 440                 445

Ser Glu Thr Val His Asp Val Leu His Ala Cys Cys Lys Asp Glu Gln
    450                 455                 460
```

```
Gly His Phe Val Leu Pro Cys Ala Glu Glu Lys Leu Thr Asp Ala Ile
465                 470                 475                 480


Asp Ala Thr Cys Asp Asp Tyr Asp Pro Ser Ser Ile Asn Pro His Ile
                485                 490                 495


Ala His Cys Cys Asn Gln Ser Tyr Ser Met Arg Arg His Cys Ile Leu
            500                 505                 510


Ala Ile Gln Pro Asp Thr Glu Phe Thr Pro Pro Glu Leu Asp Ala Ser
        515                 520                 525


Ser Phe His Met Gly Pro Glu Leu Cys Thr Lys Asp Ser Lys Asp Leu
    530                 535                 540


Leu Leu Ser Gly Lys Lys Leu Leu Tyr Gly Val Val Arg His Lys Thr
545                 550                 555                 560


Thr Ile Thr Glu Asp His Leu Lys Thr Ile Ser Thr Lys Tyr His Thr
                565                 570                 575


Met Lys Glu Lys Cys Cys Ala Ala Glu Asp Gln Ala Ala Cys Phe Thr
            580                 585                 590


Glu Glu Ala Pro Lys Leu Val Ser Glu Ser Ala Glu Leu Val Lys Val
        595                 600                 605


<210>  122
<211>  527
<212>  PRT
<213>  Sphenodon punctatus

<400>  122

Glu Asp Pro Thr Cys Leu Lys Ser Leu Asp Thr Ile Phe Leu Asp Glu
1               5                   10                  15


Ile Cys His Glu Glu Gly Phe Ala Ala Lys Tyr Asp Leu Ala Ala Cys
            20                  25                  30


Cys Ala Lys Ala Glu Val Glu Arg Lys Glu Cys Leu Leu Ala His Lys
        35                  40                  45


Asn Ala Thr Pro Gly Phe Ile Pro Ala Phe Gln Arg Pro Gly Ile Glu
    50                  55                  60


Val Ser Cys Lys Leu Tyr Gln Asp Asp Arg Leu Thr Leu Leu Gly Asn
```

```
65                  70                  75                  80

Tyr Ile Tyr Glu Val Ala Arg Arg His Pro Tyr Leu Gln Val Pro Pro
                85                  90                  95

Val Phe Ala Thr Ala Ser Leu Tyr Asp Glu Ala Leu Lys Thr Cys Cys
            100                 105                 110

Gln Thr Ala Asp Lys Ala Thr Cys Phe His Pro Arg Ile Pro Pro Leu
        115                 120                 125

Ile Glu Tyr Leu Lys Met Ser Asn Gly Ile Gln Glu Asn Thr Cys Gly
    130                 135                 140

Ile Leu Lys Lys Phe Gly Glu Arg Thr Leu Lys Ala Thr Lys Leu Val
145                 150                 155                 160

Gln Met Ser Gln Lys Phe Pro Lys Ala Asp Phe Ala Thr Ile Asn Lys
                165                 170                 175

Leu Val Glu Asp Ile Thr His Met His Thr Glu Cys Cys Arg Gly Asp
            180                 185                 190

Thr Leu Glu Cys Leu Arg Asp Arg Glu Ala Leu Thr Glu Tyr Thr Cys
        195                 200                 205

Ser His Lys Asp Ala Ile Ser Ser Lys Leu Pro Thr Cys Cys Glu Lys
    210                 215                 220

Ser Val Leu Glu Arg Gly Glu Cys Ile Val Arg Leu Glu Asn Asp Asp
225                 230                 235                 240

Lys Pro Ala Asp Leu Ser Glu Arg Ile Ala Glu Tyr Ile Glu Asp Pro
                245                 250                 255

His Val Cys Asp His Leu Ala Lys Glu Gln Asp Ala Phe Leu Ala Lys
            260                 265                 270

Phe Leu Tyr Glu Tyr Ser Arg Arg His Pro Glu Leu Ser Thr Gln Ile
        275                 280                 285

Leu Leu Gly Val Gly Lys Gly Tyr Gln Glu Leu Leu Glu Arg Cys Cys
    290                 295                 300

Lys Thr Asp Asn Pro Pro Glu Cys Tyr Gly Gln Ala Glu Ala Asp Leu
305                 310                 315                 320
```

```
Lys Lys His Ile Ala Gln Phe Gln Glu Leu Val Gln Gln Asn Cys Asp
                325                 330                 335

Leu Tyr Asn Thr Leu Gly Gly Tyr Leu Phe His Asn Ala Leu Leu Ile
            340                 345                 350

Arg Tyr Thr Lys Arg Met Pro Gln Leu Thr Ser Glu Glu Leu Ile Phe
        355                 360                 365

Tyr Thr Arg Ile Thr Lys Ala Ala Ser Arg Cys Cys Glu Val Ser Val
    370                 375                 380

Asp Lys Lys Leu Pro Cys Thr Glu Gly Tyr Val Asp Phe Val Leu Gly
385                 390                 395                 400

Gln Ile Cys Gln Arg His Gln Arg Ser Ser Ile Asn Val Asn Val Cys
                405                 410                 415

Gln Cys Cys Ser Asn Ser Tyr Ala Leu Arg Ser Leu Cys Ile Thr Ser
            420                 425                 430

Leu Gly Gly Asp Glu Lys Phe Val Pro Ile Glu Phe Ser Ala Asp Leu
        435                 440                 445

Phe Thr Phe His Glu Asp Leu Cys His Ala Ala Gln Asp Lys Leu Gln
    450                 455                 460

Glu Arg Lys Gln Gln Met Ile Val Asn Leu Val Lys His Lys Pro Asn
465                 470                 475                 480

Ile Thr Lys Glu Gln Leu Gln Thr Val Phe Gly Gly Phe Thr Lys Met
                485                 490                 495

Thr Glu Lys Cys Cys Lys Ala Glu Asp His Glu Ala Cys Phe Gly Glu
            500                 505                 510

Glu Gly Pro Lys Leu Val Ala Glu Ser Gln Thr Ala Leu Ala Ala
        515                 520                 525
```

<210> 123
<211> 101
<212> PRT
<213> Neoceratodus forsteri

<220>
<221> misc_feature
<222> (79)..(79)

<223> Xaa can be any naturally occurring amino acid

<400> 123

```
Asp Ala Glu His Lys Ser Asn Ile Cys Lys His Phe Gln Val Val Gly
1               5                   10                  15


Glu Glu Lys Phe Lys Asn Ile Ile Leu Val Thr Gln Asp Gly His Gly
            20                  25                  30


Pro Phe Ile Gln Val Ser Lys Glu Glu Gln Cys Lys His Tyr Ala Glu
        35                  40                  45


Asn Arg Val Pro Tyr Met Gly Asn Phe Ile Tyr Thr Ala Ala Lys Arg
    50                  55                  60


His Pro Asp Leu Pro Ala Thr Glu Val Leu Ile Tyr Ala Phe Xaa Tyr
65                  70                  75                  80


Glu Ser Gly Ala Val Leu Val Ser Tyr Pro Glu Met Val Gly Cys Cys
                85                  90                  95


Pro Pro Asp Val Leu
            100
```

<210> 124
<211> 614
<212> PRT
<213> Naja kaouthia

<400> 124

```
Met Lys Trp Val Ile Phe Ile Ser Leu Leu Cys Leu Val Ser Phe Ala
1               5                   10                  15


Glu Val Lys Asn Leu Pro Arg Arg Tyr Arg His Val Asp Asp Gln His
            20                  25                  30


Ser Thr Ile Arg Leu Ala Ser Gln Ile Ser Ala Thr Asp Phe Gly Ala
        35                  40                  45


Ile Thr Leu Thr Leu Val Thr Gln Thr Val Pro Asn Ala Thr Leu Glu
    50                  55                  60


Asp Leu Lys Lys Leu Ser Ala Glu Ile Ile Glu Leu His Lys Lys Cys
65                  70                  75                  80


Val Ala Ser Glu Phe Ser Asp Pro Pro Cys Thr Lys Pro Leu Gly Ile
                85                  90                  95
```

```
Val Phe Leu Asp Val Leu Cys His Asn Glu Glu Phe Ser Asn Lys Tyr
            100                 105                 110

Gly Ile Asn Asp Cys Cys Ala Lys Ala Asp Pro Asp Arg Asn Glu Cys
        115                 120                 125

Val Leu Ser His Lys Thr Ser Ser Thr Gly Thr Ile Ser Pro Phe Val
    130                 135                 140

His Pro Asn Ala Glu Glu Ala Cys Gln Ala Phe Gln Asn Asp Arg Asp
145                 150                 155                 160

Ser Val Leu Ala Gln Tyr Ile Phe Glu Leu Ser Arg Arg Tyr Pro Thr
                165                 170                 175

Ala Leu Ser Val Val Ile Leu Glu Ser Thr Lys Thr Tyr Lys Lys Ile
            180                 185                 190

Leu Glu Thr Cys Cys Ala Glu Ala Asp Lys Asp Ala Cys Ile His Glu
        195                 200                 205

Lys Ala Thr Glu Ala Lys Lys Lys Phe Arg Glu Ile Met Glu Glu Gln
    210                 215                 220

Glu Tyr Thr Cys Tyr Asn Leu Lys Lys Tyr Gly Lys Asp Lys Leu Tyr
225                 230                 235                 240

Ala Leu Lys Phe Ile Glu Thr His Glu Lys Phe Val Asn Ala Lys Leu
                245                 250                 255

Glu Thr Ile Thr Gly Ile Ala Glu Phe Val Val His Ile Tyr Glu Glu
            260                 265                 270

Ile Cys Met Gly Asp Ser Val Asp Val Leu Val Asp Arg Ala Ala Leu
        275                 280                 285

Ser Gln Tyr Val Cys Glu His Lys Asp Ala Ile Ser Ser Asn Val Gly
    290                 295                 300

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

Leu Ala Asn Asp Ala Arg Ser Pro Asp Leu Pro Pro Pro Ser Glu Glu
                325                 330                 335

Ile Leu Lys Glu Thr Glu Ala Cys Thr Thr Tyr Thr Glu Gln Arg Glu
```

```
            340                 345                 350

Asn Tyr Lys Glu Ser Phe Leu Phe Thr Leu Thr Arg Asn His Pro Glu
        355                 360                 365

Leu Ser Lys Leu Ile Asp Leu Glu Ile Leu Tyr Lys Tyr Glu Lys Leu
    370                 375                 380

Leu Glu Glu Cys Cys Gln Ser Glu His His Val Gln Cys Leu His Gly
385                 390                 395                 400

Gly Glu Gln Val Phe Lys Leu Tyr Ile Thr Lys Ile Asn Glu Val Val
                405                 410                 415

Lys Ser Asn Cys Asp Ser Tyr Lys Glu Leu Gly Asp Tyr Phe Phe Thr
            420                 425                 430

Asn Glu Phe Leu Val Lys Tyr Ser Arg Met Met Pro Gln Ala Pro Thr
        435                 440                 445

Ser Phe Leu Ile Glu Leu Thr Glu Lys Val Gly Lys Val Ala Glu Lys
    450                 455                 460

Cys Cys Asn Leu Asp Ser Asn His Gln Val Ser Cys Ala Leu Glu Asn
465                 470                 475                 480

Thr Asp Lys Val Met Gly Ser Ile Cys Lys Tyr His Asn Lys His Phe
                485                 490                 495

Ile Asn Asp Gln Ile Cys His Cys Cys Asn Ser Ser Phe Ile Ser Arg
            500                 505                 510

Trp Glu Cys Ile Ser Asn Leu Gly Pro Asp Leu Ser Phe Val Pro Pro
        515                 520                 525

Thr Phe Asn Pro Lys Thr Met Asp Asn Pro Glu Lys Leu Cys Ser Thr
    530                 535                 540

Ser Glu Asp Thr Val Gln Lys Ser Lys Lys Gly Leu Leu Ser Glu Leu
545                 550                 555                 560

Val Lys Ser Lys Pro Asn Ile Ser Glu Glu Glu Leu Ala Ala Thr Ile
                565                 570                 575

Leu Thr Phe Arg Glu Ile Gln Lys Leu Cys Cys Glu Ala Glu Asn Lys
            580                 585                 590
```

```
Lys Glu Cys Phe Asp Lys Lys Gly Gln Glu Met Val Glu His Leu Gln
        595                 600                 605

Asn Gly Pro Thr Thr Glu
    610
```

<210> 125
<211> 608
<212> PRT
<213> Schistosoma mansoni

<400> 125

```
Met Lys Trp Val Thr Phe Leu Leu Leu Leu Phe Val Ser Asp Ser Ala
1               5                   10                  15

Phe Ser Arg Gly Leu Phe Arg Arg Asp Ala His Lys Ser Glu Ile Ala
            20                  25                  30

His Arg Phe Lys Asp Leu Gly Glu Gln His Phe Lys Gly Leu Val Leu
        35                  40                  45

Ile Ala Phe Ser Gln Phe Leu Gln Lys Cys Pro Tyr Glu Glu His Val
    50                  55                  60

Lys Leu Val Asn Glu Val Thr Asp Phe Ala Lys Thr Cys Val Ala Asp
65                  70                  75                  80

Glu Ser Ala Glu Asn Cys Asp Lys Ser Leu His Thr Leu Phe Gly Asp
                85                  90                  95

Lys Leu Cys Ala Ile Pro Thr Leu Arg Asp Ser Tyr Gly Glu Leu Ala
            100                 105                 110

Asp Cys Cys Ala Lys Lys Glu Pro Glu Arg Asn Glu Cys Phe Leu Lys
        115                 120                 125

His Lys Asp Asp His Pro Asn Leu Pro Pro Phe Val Arg Pro Asp Ala
    130                 135                 140

Glu Ala Met Cys Thr Ser Phe Gln Glu Asn Ala Val Thr Phe Met Gly
145                 150                 155                 160

His Tyr Leu His Glu Val Ala Arg Arg His Pro Tyr Phe Tyr Ala Pro
                165                 170                 175

Glu Leu Leu Tyr Tyr Ala Glu Lys Tyr Ser Ala Ile Met Thr Glu Cys
            180                 185                 190
```

```
Cys Gly Glu Ala Asp Lys Ala Ala Cys Ile Thr Pro Lys Leu Asp Ala
        195                 200                 205

Leu Lys Glu Lys Ala Leu Ala Ser Ser Val Asn Gln Arg Leu Lys Cys
    210                 215                 220

Ser Ser Leu Gln Arg Phe Gly Gln Arg Ala Phe Lys Ala Trp Ala Val
225                 230                 235                 240

Ala Arg Met Ser Gln Lys Phe Pro Lys Ala Asp Phe Ala Glu Ile Thr
                245                 250                 255

Lys Leu Ala Thr Asp Leu Thr Lys Leu Thr Glu Glu Cys Cys His Gly
            260                 265                 270

Asp Leu Leu Glu Cys Ala Asp Asp Arg Ala Glu Leu Ala Lys Tyr Met
        275                 280                 285

Cys Glu Asn Gln Ala Ser Ile Ser Ser Lys Leu Gln Ala Cys Cys Asp
    290                 295                 300

Lys Pro Val Leu Lys Lys Ser His Cys Leu Ser Glu Val Glu Asn Asp
305                 310                 315                 320

Asp Leu Pro Ala Asp Leu Pro Ser Leu Ala Ala Asp Phe Val Glu Asp
                325                 330                 335

Lys Glu Val Cys Lys Asn Tyr Ala Glu Ala Lys Asp Val Phe Leu Gly
            340                 345                 350

Thr Phe Leu Tyr Glu Tyr Ala Arg Arg His Pro Asp Tyr Ser Val Ala
        355                 360                 365

Leu Leu Leu Arg Leu Ala Lys Lys Tyr Glu Ala Thr Leu Glu Lys Cys
    370                 375                 380

Cys Ala Glu Ala Asp Pro Ser Ala Cys Tyr Gly Lys Val Leu Asp Glu
385                 390                 395                 400

Phe Gln Pro Leu Val Glu Glu Pro Lys Asn Leu Val Lys Ala Asn Cys
                405                 410                 415

Glu Leu Phe Glu Lys Leu Gly Glu Tyr Gly Phe Gln Asn Ala Leu Ile
            420                 425                 430
```

```
Val Arg Tyr Thr Gln Lys Ala Pro Gln Val Ser Thr Pro Thr Leu Val
        435                 440                 445

Glu Ala Ala Arg Asn Leu Gly Lys Val Gly Ser Lys Cys Cys Val Leu
    450                 455                 460

Pro Glu Ala Gln Arg Leu Pro Cys Val Glu Asp Tyr Ile Ser Ala Ile
465                 470                 475                 480

Leu Asn Arg Val Cys Val Leu His Glu Lys Thr Pro Val Ser Glu Gln
                485                 490                 495

Val Thr Lys Cys Cys Thr Gly Ser Val Val Glu Arg Arg Pro Cys Phe
            500                 505                 510

Ser Ala Leu Pro Val Asp Glu Thr Tyr Val Pro Lys Glu Phe Lys Ala
        515                 520                 525

Glu Thr Phe Thr Phe His Ala Asp Ile Cys Ser Leu Pro Glu Lys Glu
    530                 535                 540

Lys Gln Met Lys Lys Gln Ala Ala Leu Val Glu Leu Val Lys His Lys
545                 550                 555                 560

Pro Lys Ala Thr Gly Pro Gln Leu Arg Thr Val Leu Gly Glu Phe Thr
                565                 570                 575

Ala Phe Leu Asp Lys Cys Cys Lys Ala Glu Asp Lys Glu Ala Cys Phe
            580                 585                 590

Ser Glu Asp Gly Pro Lys Leu Val Ala Ser Ser Gln Ala Ala Leu Ala
        595                 600                 605
```

<210> 126
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce restriction site into SEQ ID NO: 2

<400> 126
gagtcagctg aaaa 14

<210> 127
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 127
gagtccgcgg aaaa 14

<210> 128
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 128
aaggcttcgt ctgc 14

<210> 129
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 129
aaggctagct ctgc 14

<210> 130
<211> 15
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 130
tctgcttgaa tgtgc 15

<210> 131
<211> 15
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 131
tctgctcgag tgtgc 15

<210> 132
<211> 13

<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 132
gtgggcagca aat 13

<210> 133
<211> 13
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 133
gtgggatcca aat 13

<210> 134
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 134
ggaagtcgat gaaa 14

<210> 135
<211> 14
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 135
ggaagtcgac gaaa 14

<210> 136
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce
restriction site into SEQ ID NO: 2

<400> 136
cgctagcctc gaggtttaaa cgctagcgag ctcggatcc 39

<210> 137
<211> 47
<212> DNA
<213> Artificial Sequence

<220>
<223> Fragment of nucleic acid encoding albumin to introduce restriction site into SEQ ID NO: 2

<400> 137
catggcgatc ggagctccaa atttgcgatc gctcgagcct aggccgg 47

<210> 138
<211> 608
<212> PRT
<213> Salmo salar

<400> 138

Met Gln Trp Leu Ser Val Cys Ser Leu Leu Val Leu Leu Ser Val Leu
1 5 10 15

Ser Arg Ser Gln Ala Gln Asn Gln Ile Cys Thr Ile Phe Thr Glu Ala
20 25 30

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

Leu Pro Asp Ser Thr Leu Gly Asp Leu Val Pro Leu Ile Ala Glu Ala
50 55 60

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

Glu Arg Asp Val Ala Asp Leu Phe Gln Ser Ala Val Cys Ser Ser Glu
85 90 95

Thr Leu Val Glu Lys Asn Asp Leu Lys Met Cys Cys Glu Lys Thr Ala
100 105 110

Ala Glu Arg Thr His Cys Phe Val Asp His Lys Ala Lys Ile Pro Arg
115 120 125

Asp Leu Ser Leu Lys Ala Glu Leu Pro Ala Ala Asp Gln Cys Glu Asp
130 135 140

Phe Lys Lys Asp His Lys Ala Phe Val Gly Arg Phe Ile Phe Lys Phe
145 150 155 160

Ser Lys Ser Asn Pro Met Leu Pro Pro His Val Val Leu Ala Ile Ala

```
                165                 170                 175

Lys Gly Tyr Gly Glu Val Leu Thr Thr Cys Cys Gly Glu Ala Glu Ala
            180                 185                 190

Gln Thr Cys Phe Asp Thr Lys Lys Ala Thr Phe Gln His Ala Ile Ala
        195                 200                 205

Lys Arg Val Ala Glu Leu Lys Ser Leu Cys Ile Val His Lys Lys Tyr
    210                 215                 220

Gly Asp Arg Val Val Lys Ala Lys Lys Leu Val Gln Tyr Ser Gln Lys
225                 230                 235                 240

Met Pro Gln Ala Ser Phe Gln Glu Met Ala Gly Met Val Asp Lys Ile
                245                 250                 255

Val Ala Thr Val Ala Pro Cys Cys Ser Gly Asp Met Val Thr Cys Met
            260                 265                 270

Lys Glu Arg Lys Thr Leu Val Asp Glu Val Cys Ala Asp Glu Ser Val
        275                 280                 285

Leu Ser Arg Ala Ala Gly Leu Ser Ala Cys Cys Lys Glu Asp Ala Val
    290                 295                 300

His Arg Gly Ser Cys Val Glu Ala Met Lys Pro Asp Pro Lys Pro Asp
305                 310                 315                 320

Gly Leu Ser Glu His Tyr Asp Val His Ala Asp Ile Ala Ala Val Cys
                325                 330                 335

Gln Thr Phe Thr Lys Thr Pro Asp Val Ala Met Gly Lys Leu Val Tyr
            340                 345                 350

Glu Ile Ser Val Arg His Pro Glu Ser Ser Gln Gln Val Ile Leu Arg
        355                 360                 365

Phe Ala Lys Glu Ala Glu Gln Ala Leu Leu Gln Cys Cys Asp Met Glu
    370                 375                 380

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

Lys Lys Ile Thr Asp Glu Thr Asp Tyr Tyr Lys Lys Met Cys Ala Ala
                405                 410                 415
```

```
Glu Ala Ala Val Ser Asp Asp Asn Phe Glu Lys Ser Met Met Val Tyr
            420                 425                 430

Tyr Thr Arg Ile Met Pro Gln Ala Ser Phe Asp Gln Leu His Met Val
        435                 440                 445

Ser Glu Thr Val His Asp Val Leu His Ala Cys Cys Lys Asp Glu Pro
    450                 455                 460

Gly His Phe Val Leu Pro Cys Ala Glu Glu Lys Leu Thr Asp Ala Ile
465                 470                 475                 480

Asp Ala Thr Cys Asp Asp Tyr Asp Pro Ser Ser Ile Asn Pro His Ile
                485                 490                 495

Ala His Cys Cys Asn Gln Ser Tyr Ser Met Arg Arg His Cys Ile Leu
            500                 505                 510

Ala Ile Gln Pro Asp Thr Glu Phe Thr Pro Pro Glu Leu Asp Ala Ser
        515                 520                 525

Ser Phe His Met Gly Pro Glu Leu Cys Thr Lys Asp Ser Lys Asp Leu
    530                 535                 540

Leu Leu Ser Gly Lys Lys Leu Leu Tyr Gly Val Val Arg His Lys Thr
545                 550                 555                 560

Thr Ile Thr Glu Asp His Leu Lys Thr Ile Ser Thr Lys Tyr His Thr
                565                 570                 575

Met Lys Asp Lys Cys Cys Ala Ala Glu Asp Gln Ala Ala Cys Phe Thr
            580                 585                 590

Glu Glu Ala Pro Lys Leu Val Ser Glu Ser Ala Glu Leu Val Lys Val
        595                 600                 605
```