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SEQUENCE LISTING

<110> Agency for Science, Technology and Research

<120> PROTEASE-RESPONSIVE PEPTIDE BIOSENSORS AND METHODS FOR ANALYTE DETECTION

<130> P108399

<150> SG201304395-5
<151> 2013-06-06

<160> 23

<170> PatentIn version 3.5

<210> 1
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<212> PRT
<213> Artificial

<220>
<223> Enterokinase protease recognition site

<400> 1

Asp Asp Asp Asp Arg
1 5

<210> 2
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<212> PRT
<213> Artificial

<220>
<223> Influenza virus hemagglutinin epitope

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Tyr Pro Tyr Asp Val Pro Asp Tyr Ala
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<212> PRT
<213> Artificial

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<223> p53-derived binding site for mdm2

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Thr Ser Phe Ala Glu Tyr Trp Asn Leu Leu Ser Pro
1 5 10

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<211> 286
<212> PRT
<213> Salmonella typhimurium

<400> 4

Met Ser Ile Gln His Phe Arg Val Ala Leu Ile Pro Phe Phe Ala Ala
1 5 10 15

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Phe Cys Leu Pro Val Phe Ala His Pro Glu Thr Leu Val Lys Val Lys
            20                  25                  30

Asp Ala Glu Asp Gln Leu Gly Ala Arg Val Gly Tyr Ile Glu Leu Asp
        35                  40                  45

Leu Asn Ser Gly Lys Ile Leu Glu Ser Phe Arg Pro Glu Glu Arg Phe
    50                  55                  60

Pro Met Met Ser Thr Phe Lys Val Leu Leu Cys Gly Ala Val Leu Ser
65                  70                  75                  80

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

Gln Asn Asp Leu Val Glu Tyr Ser Pro Val Thr Glu Lys His Leu Thr
            100                 105                 110

Asp Gly Met Thr Val Arg Glu Leu Cys Ser Ala Ala Ile Thr Met Ser
        115                 120                 125

Asp Asn Thr Ala Ala Asn Leu Leu Leu Thr Thr Ile Gly Gly Pro Lys
    130                 135                 140

Glu Leu Thr Ala Phe Leu His Asn Met Gly Asp His Val Thr Arg Leu
145                 150                 155                 160

Asp Arg Trp Glu Pro Glu Leu Asn Glu Ala Ile Pro Asn Asp Glu Arg
                165                 170                 175

Asp Thr Thr Met Pro Ala Ala Met Ala Thr Thr Leu Arg Lys Leu Leu
            180                 185                 190

Thr Gly Glu Leu Leu Thr Leu Ala Ser Arg Gln Gln Leu Ile Asp Trp
        195                 200                 205

Met Glu Ala Asp Lys Val Ala Gly Pro Leu Leu Arg Ser Ala Leu Pro
    210                 215                 220

Ala Gly Trp Phe Ile Ala Asp Lys Ser Gly Ala Gly Glu Arg Gly Ser
225                 230                 235                 240

Arg Gly Ile Ile Ala Ala Leu Gly Pro Asp Gly Lys Pro Ser Arg Ile
                245                 250                 255

Val Val Ile Tyr Thr Thr Gly Ser Gln Ala Thr Met Asp Glu Arg Asn
            260                 265                 270

Arg Gln Ile Ala Glu Ile Gly Ala Ser Leu Ile Lys His Trp
        275                 280                 285
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<210> 5
<211> 1743
<212> PRT
<213> Clostridium difficile

<400> 5

Met Lys Gln Asn Lys Leu Leu Gln Arg Gly Ala Tyr Phe Asn Asp Lys
1 5 10 15

Asn Ile Leu Ile Asp Asp Phe Asp Lys Arg Tyr Asn Asp Tyr Asp Phe
20 25 30

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

Asp Gly Asn Leu Tyr Ala Cys Gly Asp Asn Thr Gly Phe Gln Leu Gly
50 55 60

Leu Gly Lys Asp Ser Ser Glu Arg Arg Met Phe Ser Lys Val Lys Ile
65 70 75 80

Asp Asn Val Lys Tyr Val Ser Cys Gly Ser Lys His Ser Val Ala Val
85 90 95

Thr Lys Asp Gly Phe Ala Tyr Gly Ala Gly Thr Ser Asn Val Gly Gln
100 105 110

Leu Gly Val Ile Glu Ser Thr Val Tyr Tyr Glu Phe Thr Lys Leu Pro
115 120 125

Ile Asp Asp Val Lys Thr Val Ala Cys Gly Tyr Asp Phe Thr Phe Val
130 135 140

Leu Lys Asn Asp Gly Thr Leu Tyr Ser Ala Gly Leu Asn Ser Ser Gly
145 150 155 160

Gln Leu Gly Leu Gly Asp Thr Asn Asn Arg Val Thr Phe Thr Lys Val
165 170 175

Asn Ile Asp Ser Val Lys Asp Val Val Thr Tyr Asn Gln Ser Val Phe
180 185 190

Ile Ile Lys Met Asp Gly Thr Ala His Ala Cys Gly Leu Asn Ser Asn
195 200 205

Gly Gln Leu Gly Ile Asn Ser Thr Leu Asn Lys Ser Val Phe Asn Lys
210 215 220

Ile Glu Gly Met Asp Asn Val Lys Gln Ile Ala Cys Gly Ser Ser His
225 230 235 240

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Thr Ile Leu Ile Lys Asn Asp Gly Thr Met Tyr Thr Thr Gly Ser Asn
                245                 250                 255

Gly Tyr Gly Gln Leu Gly Thr Gly Asn Asn Asn Ser Ile Val Phe
            260                 265                 270

Thr Leu Ser Ser Ile Asn Asn Val Lys Tyr Ala Ser Cys Gly Asn Asn
        275                 280                 285

His Thr Met Ile Leu Lys Tyr Asp Asn Thr Leu Phe Ser Thr Gly Gln
    290                 295                 300

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

Asn Thr Phe Val Lys Val Asn Val Glu Asn Ile Lys Asp Ile Lys Cys
                325                 330                 335

Gly Ser Gln Phe Asn Phe Leu Ile Asn Gly Ser Lys Glu Ile Phe Val
            340                 345                 350

Ser Gly Cys Asn Leu Ala Gly Gln Leu Gly Ser Phe Phe His Thr Thr
        355                 360                 365

Phe Leu Tyr Glu Phe Ser Lys Val Gln Ser Ser Asn Leu Asp Asn Tyr
    370                 375                 380

Ser Gly Leu Leu Val Asn Asp Asp Tyr Leu Tyr Val Thr Lys Asp Asn
385                 390                 395                 400

Ser Glu Phe Leu Asn Val Lys Leu Ser Asp Asn Phe Gln Asp Tyr Lys
                405                 410                 415

Lys Ile Glu Leu Thr Asp Asn Asn Met Phe Ile Val Met Asn Asp Gly
            420                 425                 430

Thr Leu Tyr Ala Cys Gly Leu Asn Asn Tyr Gly Gln Leu Gly Leu Gly
        435                 440                 445

Asp Thr Val Asn Arg Ser Val Met Thr Lys Val Asp Ile Asp Asn Val
    450                 455                 460

Leu Asp Ile Lys Gly Asn Gly Asn Ser Thr Phe Val Leu Lys Asn Asn
465                 470                 475                 480

Gly Thr Leu Tyr Ser Cys Gly Tyr Asn Ser Ser Gly Ile Leu Gly Leu
                485                 490                 495

Lys Asp Asn Thr Asn Arg Asn Ile Phe Thr Lys Ile Glu Ile Glu Asn
            500                 505                 510
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```
Ile Lys Glu Phe Cys Val Glu Ser Asn Tyr Ile Val Ala Leu Asn His
        515                 520                 525

Ser Lys Glu Leu Tyr Gly Trp Gly Asn Gln Ser Tyr Ile Val Tyr Gly
    530                 535                 540

Asp Asn Arg Asn Tyr Pro Tyr Lys Asp Thr Arg Val Ser Asn Val Glu
545                 550                 555                 560

Lys Ile Ala Thr Trp Ser Asp Thr Leu Tyr Ile Leu Asp Ser Thr Gly
                565                 570                 575

Ala Thr Lys Thr Ile Gly Tyr Ser Tyr Asn Gly Ser Gly Gly Tyr Pro
            580                 585                 590

Ala Pro Ser Ser Ser Ser Thr Tyr Arg Glu Gly Gly Tyr Ile Asn Lys
        595                 600                 605

Asn Thr Ser Tyr Arg Thr Leu Glu Phe Tyr Asn Thr Ser Lys Thr Lys
    610                 615                 620

Leu Val Asn Leu Phe Ala Phe Tyr Asn Gly Cys Val Phe Val Asp Glu
625                 630                 635                 640

Asn Gly Leu Ala Tyr Cys Ile Gly Glu Asn Asn Ile Asn Phe Arg Gly
                645                 650                 655

Gly Ser Thr Thr Asn Glu Asn Asn Ser Leu Arg Phe Ile Asn Asn Ser
            660                 665                 670

Gly Val Tyr Tyr Thr Asn Thr Asp Gly Thr Asp Tyr Thr Cys Tyr Gln
        675                 680                 685

Trp Thr Tyr Lys Leu Ile Arg Cys Ser Ile Phe Asp Ser Pro Gln Asn
    690                 695                 700

Ile Ile Gly Asn Ser Lys Asn Ile Leu Tyr Leu Ser Lys Asn Asn Ser
705                 710                 715                 720

Thr Phe Lys Cys Thr Gly Asn Cys Ile Thr Tyr Gly Ile Asn Ser Gln
                725                 730                 735

Asn Trp Tyr Ser Tyr Phe Ser Asp Ser Ser Asn Gly Ala Ile Ala Leu
            740                 745                 750

Gly Asn Glu Phe Ile Leu Lys Asn Tyr Ser Gly Glu Cys Leu Leu Lys
        755                 760                 765

Gly Tyr Gly Lys Ala Thr Asn Gly Glu Phe Gly Asn Ser Thr Asn Ile
    770                 775                 780
```

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Ser Ser Ile Ser Asn Tyr Asp Thr Gly Leu Lys Asp Ile Lys Asp Ile
785                 790                 795                 800

Ile Val Lys Asn Asn Thr Val Val Val Val Asp Lys Asn Asn Asn Ile
                805                 810                 815

Tyr Val Thr Gly Ala Asn Gln Phe Asn Lys Leu Gly Ile Gly Glu Tyr
            820                 825                 830

Asn Asn Gln Pro Ile Arg Lys Phe Thr Asn Ile Thr Glu Gln Ser Asn
        835                 840                 845

Ser Phe Ile Phe Met Asp Asp Ile Lys Glu Ile Thr Thr Ser Arg Asn
    850                 855                 860

Thr Met Phe Ile Val Lys Asn Asp Gly Thr Ala Tyr Ala Thr Gly Asn
865                 870                 875                 880

Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr Ile Asn Arg Asn Lys
                885                 890                 895

Phe Thr Gln Ile Asn Leu Asp Asn Ile Lys Lys Ile Ser Thr Ser Ile
            900                 905                 910

Asp Gly Asn Thr Thr Phe Ala Ile Arg Asn Asp Gly Thr Leu Tyr Ser
        915                 920                 925

Thr Gly Leu Asn Thr Lys Gly Gln Leu Gly Leu Gly Asp Ile Val Asn
    930                 935                 940

Arg Asn Thr Phe Thr Lys Val Asn Ile Gln Asn Val Arg Asp Val Val
945                 950                 955                 960

Leu Gly Thr Thr His Ser His Ala Ile Lys Asp Asp Asn Thr Leu Tyr
                965                 970                 975

Ser Cys Gly Glu Asn Thr His Gly Gln Leu Gly Leu Gly Ser Glu Ser
            980                 985                 990

Asn His Pro Asp Val Leu Thr Phe  Thr Val Asn Asn Ile  Thr Asn Val
        995                 1000                1005

Arg Asp  Val Tyr Cys Ser Asp  Thr Thr Thr Phe Ile  Val Lys Asp
    1010                1015                1020

Thr Asn  Ile Ala Tyr Cys Cys  Gly Tyr Asn Asn Asn  Ser Gln Leu
    1025                1030                1035

Gly Met  Gly Asn Thr Thr Asp  Gln Tyr Ser Phe Ile  Lys Cys Met
    1040                1045                1050
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Glu Asn Val Lys Glu Val Ile Pro Asn Glu Ile Asn Thr Tyr Ile
1055 1060 1065

Ile Thr Ile Tyr Asn Thr Ala Tyr Ser Thr Gly Leu Asn Thr Asp
1070 1075 1080

Tyr Cys Leu Gly Leu Asn Ser Asn Ser Asn Gln Ser Ser Phe Ser
1085 1090 1095

Glu Ile Pro Ile Ser Asn Val Val Lys Val Ala Pro Asn Arg Asn
1100 1105 1110

Asn Ala Val Leu Leu Leu Thr Ser Glu Gly Asp Val Tyr Thr Ala
1115 1120 1125

Gly Lys Cys Ser Asn Gly Ser Gly Thr Gly Ser Glu Thr Pro Glu
1130 1135 1140

Lys Ile Lys Lys Ile Ala Ser Lys Ala Lys Asp Ile Gly Met Asn
1145 1150 1155

Tyr Arg Cys Gly His Tyr Val Ser Asp Asn Gly Asp Leu Tyr Gly
1160 1165 1170

Thr Gly Phe Asn Asp Cys Gly Gln Leu Gly Val Gly Asn Val Thr
1175 1180 1185

Lys Arg Asp Thr Phe Ile Lys Thr Asn Thr Arg Val Lys Lys Ile
1190 1195 1200

Leu Pro Leu Glu Tyr Ala Asn Ile Ala Ile Lys Asp Thr Asn Asp
1205 1210 1215

Ile Tyr Ile Cys Gly Leu Asn Asn Tyr Gly Gln Leu Gly Val Gly
1220 1225 1230

Asn Arg Tyr Asp Ser Arg Asn Asn Asp Asn Arg Ile Phe Asn Tyr
1235 1240 1245

Lys His Met Asn Phe Val Met Gly Asp Leu Thr Ser Ile Lys Asn
1250 1255 1260

Arg His Asn Phe Ile Leu Leu Asn Asn Lys Ile Val Ile Pro Thr
1265 1270 1275

Thr Lys Asp Ile Asp Tyr Gly Leu Val Leu Gly Asn Leu Tyr Lys
1280 1285 1290

Gly Asp Leu Tyr Thr Glu Leu Pro Tyr Glu Asp Ile Lys Glu Val
1295 1300 1305

Ser Ile Ser Lys Thr His Ile Ile Ile Leu Leu Asn Asp Gly Thr
1310 1315 1320

Met Tyr Gly Cys Gly Thr Asn Tyr His Gly Glu Leu Leu Gln Asp
1325 1330 1335

Leu Ser Ile Asn Gln Val Asp Glu Phe Val Gln Ile Asn Val Ser
1340 1345 1350

Asp Val Lys His Val Ser Cys Gly Asp Asn Phe Thr Tyr Phe Ile
1355 1360 1365

Lys Ser Asp Asp Ser Leu Trp Ser Ile Gly Lys Asn Ser Glu Tyr
1370 1375 1380

Gln Leu Gly Ile Gly His Asn Asn Pro Val Thr Glu Leu Gln Arg
1385 1390 1395

Ile Thr Thr Ile Ser Ser Cys Lys Glu Val His Cys Gly Lys Asn
1400 1405 1410

Tyr Thr Leu Val Val Thr Thr Ser Asn Glu Leu Phe Val Gln Gly
1415 1420 1425

Tyr Asn Asp Lys Gly Ala Leu Gly Leu Gly Ser Asp Ser Glu Asn
1430 1435 1440

Thr Ile Ile Lys Phe Phe Thr Lys Ala Leu Thr Asp Ile Arg Glu
1445 1450 1455

Ile Lys Ser Tyr Gly Ser Asp His Ile Leu Val Leu Lys Asn Asp
1460 1465 1470

Asn Ser Val Trp Val Thr Gly Lys Asn Arg Asp Val Tyr Lys Ile
1475 1480 1485

Glu Gln Pro Val Glu Phe Leu Lys Glu Phe Thr Ile Val Pro Ile
1490 1495 1500

Ser Glu Asp Val Asn Thr Val Lys Asp Val Leu Ala Thr Asp Asn
1505 1510 1515

Thr Leu Tyr Ile Ile Ser Glu Val Gly Thr Thr Asn Ala Ala Ile
1520 1525 1530

Glu Ile Thr Glu Lys Ser Ile Ser Ser Ile Lys Ile Lys Ile Gln
1535 1540 1545

Asp Pro Asn Lys Asp Ile Ser Arg Ile Glu Met Leu Ile Asn Gly
1550 1555 1560

Glu Ser Val Lys Ser Val Ser Asp Leu Ile Thr Glu Lys Ile Ser
1565 1570 1575

Phe Glu Val Pro Pro Asp Lys Ile Lys Ile Gly Glu Asn Lys Ile
1580 1585 1590

Leu Phe Arg Ala Tyr Cys Lys Gly Asp Asp Leu Tyr Ala Ser Leu
1595 1600 1605

Phe Ile Phe Lys Glu Ser Thr Gly Asn Ser Ile Ile Lys Asp Ser
1610 1615 1620

Tyr Val Met Ile Gly Asn Arg Met Tyr Lys Val Val Asn Thr Thr
1625 1630 1635

Ser Asn Glu Gln Asp Ile Thr Ile Thr Leu Asp Arg Gly Leu Glu
1640 1645 1650

Glu Asp Leu Asn Leu Gly Asp Pro Ile Tyr Gln Leu Ile Asn Lys
1655 1660 1665

Thr Lys Val Gln Val Lys Ile Asn Lys Ser Asp Leu Phe Lys Asp
1670 1675 1680

Met Lys Leu Val Glu Ile Lys Lys Ser Asp Ser Ser Tyr Gln Glu
1685 1690 1695

Ile Tyr Glu Leu Glu Glu Ala Asn Ile Lys Ser Ala Gln Pro Lys
1700 1705 1710

Ile Ile Val Glu Lys Gly Asp Lys Trp Thr Ala Ile Lys Arg Pro
1715 1720 1725

Ser Met Ile Phe Arg Tyr Asp Ala Glu Asn Asn Glu Pro Gln Ala
1730 1735 1740

<210> 6
<211> 24
<212> PRT
<213> Artificial

<220>
<223> Artificial peptide, E at position 1 side chain modified with EDANS, K at position 10 side chain modified with Dabcyl

<400> 6

Glu Ser Gly Asp Asp Asp Asp Arg Gly Lys Thr Ser Phe Ala Glu Tyr
1 5 10 15

Trp Asn Leu Leu Ser Pro Gly Ser
20

<210> 7

<211> 11
<212> PRT
<213> Artificial

<220>
<223> p53 wt peptide

<400> 7

Glu Thr Phe Ser Asp Leu Trp Lys Leu Leu Ser
1 5 10

<210> 8
<211> 11
<212> PRT
<213> Artificial

<220>
<223> mutated p53 peptide

<400> 8

Glu Thr Ala Ser Asp Leu Ala Lys Leu Ala Pro
1 5 10

<210> 9
<211> 45
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 9
aacatcgtac ggatagccac ggtcatcgtc atcgctaccg cccca 45

<210> 10
<211> 36
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 10
tatccgtacg atgttccgga ctacgccgga ggtgtt 36

<210> 11
<211> 36
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 11
ctgaaaatac aggttttcgc taccgcccca atgttt 36

<210> 12
<211> 33
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 12
aacctgtatt ttcagtctgg ctatccgtac gat 33

<210> 13
<211> 33
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 13
acgatcgtca tcgtcaccac taccgcccca atg 33

<210> 14
<211> 42
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 14
gacgatgacg atcgtggtgg tactagcttt gcagaatatt gg 42

<210> 15
<211> 42
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

<400> 15
gcagaatatt ggaacctgtt gtctccggga tccgaagaga tt 42

<210> 16
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<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

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<210> 17
<211> 42
<212> DNA
<213> Artificial

<220>
<223> Oligonucleotide primer

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tatagccgtg atcaactgtt agcgctggga tccgaagaga tt 42

<210> 18

<211> 2057
<212> PRT
<213> Artificial

<220>
<223> Peptide biosensor HA-enterokinase

<400> 18

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Phe Cys Leu Pro Val Phe Ala His Pro Glu Thr Leu Val Lys Val Lys
            20                  25                  30

Asp Ala Glu Asp Gln Leu Gly Ala Arg Val Gly Tyr Ile Glu Leu Asp
        35                  40                  45

Leu Asn Ser Gly Lys Ile Leu Glu Ser Phe Arg Pro Glu Glu Arg Phe
    50                  55                  60

Pro Met Met Ser Thr Phe Lys Val Leu Leu Cys Gly Ala Val Leu Ser
65                  70                  75                  80

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

Gln Asn Asp Leu Val Glu Tyr Ser Pro Val Thr Glu Lys His Leu Thr
            100                 105                 110

Asp Gly Met Thr Val Arg Glu Leu Cys Ser Ala Ala Ile Thr Met Ser
        115                 120                 125

Asp Asn Thr Ala Ala Asn Leu Leu Leu Thr Thr Ile Gly Gly Pro Lys
    130                 135                 140

Glu Leu Thr Ala Phe Leu His Asn Met Gly Asp His Val Thr Arg Leu
145                 150                 155                 160

Asp Arg Trp Glu Pro Glu Leu Asn Glu Ala Ile Pro Asn Asp Glu Arg
                165                 170                 175

Asp Thr Thr Met Pro Ala Ala Met Ala Thr Thr Leu Arg Lys Leu Leu
            180                 185                 190

Thr Gly Glu Leu Leu Thr Leu Ala Ser Arg Gln Gln Leu Ile Asp Trp
        195                 200                 205

Met Glu Ala Asp Lys Val Ala Gly Pro Leu Leu Arg Ser Ala Leu Pro
    210                 215                 220

Ala Gly Trp Phe Ile Ala Asp Lys Ser Gly Ala Gly Glu Arg Gly Ser
225                 230                 235                 240
```

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Arg Gly Ile Ile Ala Ala Leu Gly Pro Asp Gly Lys Pro Ser Arg Ile
                245                 250                 255

Val Val Ile Tyr Thr Thr Gly Ser Gln Ala Thr Met Asp Glu Arg Asn
            260                 265                 270

Arg Gln Ile Ala Glu Ile Gly Ala Ser Leu Ile Lys His Trp Lys His
        275                 280                 285

Trp Gly Gly Ser Asp Asp Asp Asp Arg Gly Tyr Pro Tyr Asp Val Pro
    290                 295                 300

Asp Tyr Ala Gly Gly Val Met Thr Met Lys Gln Asn Lys Leu Leu Gln
305                 310                 315                 320

Arg Gly Ala Tyr Phe Asn Asp Lys Asn Ile Leu Ile Asp Asp Phe Asp
                325                 330                 335

Lys Arg Tyr Asn Asp Tyr Asp Phe Val Glu Phe Phe Thr Gly Ile Ser
            340                 345                 350

Asn Ser Thr Phe Gly Leu Lys Ser Asp Gly Asn Leu Tyr Ala Cys Gly
        355                 360                 365

Asp Asn Thr Gly Phe Gln Leu Gly Leu Gly Lys Asp Ser Ser Glu Arg
    370                 375                 380

Arg Met Phe Ser Lys Val Lys Ile Asp Asn Val Lys Tyr Val Ser Cys
385                 390                 395                 400

Gly Ser Lys His Ser Val Ala Val Thr Lys Asp Gly Phe Ala Tyr Gly
                405                 410                 415

Ala Gly Thr Ser Asn Val Gly Gln Leu Gly Val Ile Glu Ser Thr Val
            420                 425                 430

Tyr Tyr Glu Phe Thr Lys Leu Pro Ile Asp Asp Val Lys Thr Val Ala
        435                 440                 445

Cys Gly Tyr Asp Phe Thr Phe Val Leu Lys Asn Asp Gly Thr Leu Tyr
    450                 455                 460

Ser Ala Gly Leu Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr Asn
465                 470                 475                 480

Asn Arg Val Thr Phe Thr Lys Val Asn Ile Asp Ser Val Lys Asp Val
                485                 490                 495

Val Thr Tyr Asn Gln Ser Val Phe Ile Ile Lys Met Asp Gly Thr Ala
            500                 505                 510
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His Ala Cys Gly Leu Asn Ser Asn Gly Gln Leu Gly Ile Asn Ser Thr
        515                 520                 525

Leu Asn Lys Ser Val Phe Asn Lys Ile Glu Gly Met Asp Asn Val Lys
    530                 535                 540

Gln Ile Ala Cys Gly Ser Ser His Thr Ile Leu Ile Lys Asn Asp Gly
545                 550                 555                 560

Thr Met Tyr Thr Thr Gly Ser Asn Gly Tyr Gly Gln Leu Gly Thr Gly
                565                 570                 575

Asn Asn Asn Asn Ser Ile Val Phe Thr Leu Ser Ser Ile Asn Asn Val
            580                 585                 590

Lys Tyr Ala Ser Cys Gly Asn Asn His Thr Met Ile Leu Lys Tyr Asp
        595                 600                 605

Asn Thr Leu Phe Ser Thr Gly Gln Asn Asn Tyr Gly Gln Leu Ala Asn
    610                 615                 620

Ala Asn Lys Asp Val Ala Ser Arg Asn Thr Phe Val Lys Val Asn Val
625                 630                 635                 640

Glu Asn Ile Lys Asp Ile Lys Cys Gly Ser Gln Phe Asn Phe Leu Ile
                645                 650                 655

Asn Gly Ser Lys Glu Ile Phe Val Ser Gly Cys Asn Leu Ala Gly Gln
            660                 665                 670

Leu Gly Ser Phe Phe His Thr Thr Phe Leu Tyr Glu Phe Ser Lys Val
        675                 680                 685

Gln Ser Ser Asn Leu Asp Asn Tyr Ser Gly Leu Leu Val Asn Asp Asp
    690                 695                 700

Tyr Leu Tyr Val Thr Lys Asp Asn Ser Glu Phe Leu Asn Val Lys Leu
705                 710                 715                 720

Ser Asp Asn Phe Gln Asp Tyr Lys Lys Ile Glu Leu Thr Asp Asn Asn
                725                 730                 735

Met Phe Ile Val Met Asn Asp Gly Thr Leu Tyr Ala Cys Gly Leu Asn
            740                 745                 750

Asn Tyr Gly Gln Leu Gly Leu Gly Asp Thr Val Asn Arg Ser Val Met
        755                 760                 765

Thr Lys Val Asp Ile Asp Asn Val Leu Asp Ile Lys Gly Asn Gly Asn
    770                 775                 780
```

```
Ser Thr Phe Val Leu Lys Asn Asn Gly Thr Leu Tyr Ser Cys Gly Tyr
785                 790                 795                 800

Asn Ser Ser Gly Ile Leu Gly Leu Lys Asp Asn Thr Asn Arg Asn Ile
                805                 810                 815

Phe Thr Lys Ile Glu Ile Glu Asn Ile Lys Glu Phe Cys Val Glu Ser
            820                 825                 830

Asn Tyr Ile Val Ala Leu Asn His Ser Lys Glu Leu Tyr Gly Trp Gly
        835                 840                 845

Asn Gln Ser Tyr Ile Val Tyr Gly Asp Asn Arg Asn Tyr Pro Tyr Lys
    850                 855                 860

Asp Thr Arg Val Ser Asn Val Glu Lys Ile Ala Thr Trp Ser Asp Thr
865                 870                 875                 880

Leu Tyr Ile Leu Asp Ser Thr Gly Ala Thr Lys Thr Ile Gly Tyr Ser
                885                 890                 895

Tyr Asn Gly Ser Gly Gly Tyr Pro Ala Pro Ser Ser Ser Ser Thr Tyr
            900                 905                 910

Arg Glu Gly Gly Tyr Ile Asn Lys Asn Thr Ser Tyr Arg Thr Leu Glu
        915                 920                 925

Phe Tyr Asn Thr Ser Lys Thr Lys Leu Val Asn Leu Phe Ala Phe Tyr
    930                 935                 940

Asn Gly Cys Val Phe Val Asp Glu Asn Gly Leu Ala Tyr Cys Ile Gly
945                 950                 955                 960

Glu Asn Asn Ile Asn Phe Arg Gly Gly Ser Thr Thr Asn Glu Asn Asn
                965                 970                 975

Ser Leu Arg Phe Ile Asn Asn Ser Gly Val Tyr Tyr Thr Asn Thr Asp
            980                 985                 990

Gly Thr Asp Tyr Thr Cys Tyr Gln  Trp Thr Tyr Lys Leu  Ile Arg Cys
        995                 1000                1005

Ser Ile  Phe Asp Ser Pro Gln  Asn Ile Ile Gly Asn  Ser Lys Asn
    1010                1015                1020

Ile Leu  Tyr Leu Ser Lys Asn  Asn Ser Thr Phe Lys  Cys Thr Gly
    1025                1030                1035

Asn Cys  Ile Thr Tyr Gly Ile  Asn Ser Gln Asn Trp  Tyr Ser Tyr
    1040                1045                1050
```

```
Phe Ser Asp Ser Ser Asn Gly Ala Ile Ala Leu Gly Asn Glu Phe
1055                1060                1065

Ile Leu Lys Asn Tyr Ser Gly Glu Cys Leu Leu Lys Gly Tyr Gly
1070                1075                1080

Lys Ala Thr Asn Gly Glu Phe Gly Asn Ser Thr Asn Ile Ser Ser
1085                1090                1095

Ile Ser Asn Tyr Asp Thr Gly Leu Lys Asp Ile Lys Asp Ile Ile
1100                1105                1110

Val Lys Asn Asn Thr Val Val Val Val Asp Lys Asn Asn Asn Ile
1115                1120                1125

Tyr Val Thr Gly Ala Asn Gln Phe Asn Lys Leu Gly Ile Gly Glu
1130                1135                1140

Tyr Asn Asn Gln Pro Ile Arg Lys Phe Thr Asn Ile Thr Glu Gln
1145                1150                1155

Ser Asn Ser Phe Ile Phe Met Asp Asp Ile Lys Glu Ile Thr Thr
1160                1165                1170

Ser Arg Asn Thr Met Phe Ile Val Lys Asn Asp Gly Thr Ala Tyr
1175                1180                1185

Ala Thr Gly Asn Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr
1190                1195                1200

Ile Asn Arg Asn Lys Phe Thr Gln Ile Asn Leu Asp Asn Ile Lys
1205                1210                1215

Lys Ile Ser Thr Ser Ile Asp Gly Asn Thr Thr Phe Ala Ile Arg
1220                1225                1230

Asn Asp Gly Thr Leu Tyr Ser Thr Gly Leu Asn Thr Lys Gly Gln
1235                1240                1245

Leu Gly Leu Gly Asp Ile Val Asn Arg Asn Thr Phe Thr Lys Val
1250                1255                1260

Asn Ile Gln Asn Val Arg Asp Val Val Leu Gly Thr Thr His Ser
1265                1270                1275

His Ala Ile Lys Asp Asp Asn Thr Leu Tyr Ser Cys Gly Glu Asn
1280                1285                1290

Thr His Gly Gln Leu Gly Leu Gly Ser Glu Ser Asn His Pro Asp
1295                1300                1305
```

```
Val Leu Thr Phe Thr Val Asn Asn Ile Thr Asn Val Arg Asp Val
    1310                1315                1320

Tyr Cys Ser Asp Thr Thr Thr Phe Ile Val Lys Asp Thr Asn Ile
    1325                1330                1335

Ala Tyr Cys Cys Gly Tyr Asn Asn Asn Ser Gln Leu Gly Met Gly
    1340                1345                1350

Asn Thr Thr Asp Gln Tyr Ser Phe Ile Lys Cys Met Glu Asn Val
    1355                1360                1365

Lys Glu Val Ile Pro Asn Glu Ile Asn Thr Tyr Ile Ile Thr Ile
    1370                1375                1380

Tyr Asn Thr Ala Tyr Ser Thr Gly Leu Asn Thr Asp Tyr Cys Leu
    1385                1390                1395

Gly Leu Asn Ser Asn Ser Asn Gln Ser Ser Phe Ser Glu Ile Pro
    1400                1405                1410

Ile Ser Asn Val Val Lys Val Ala Pro Asn Arg Asn Asn Ala Val
    1415                1420                1425

Leu Leu Leu Thr Ser Glu Gly Asp Val Tyr Thr Ala Gly Lys Cys
    1430                1435                1440

Ser Asn Gly Ser Gly Thr Gly Ser Glu Thr Pro Glu Lys Ile Lys
    1445                1450                1455

Lys Ile Ala Ser Lys Ala Lys Asp Ile Gly Met Asn Tyr Arg Cys
    1460                1465                1470

Gly His Tyr Val Ser Asp Asn Gly Asp Leu Tyr Gly Thr Gly Phe
    1475                1480                1485

Asn Asp Cys Gly Gln Leu Gly Val Gly Asn Val Thr Lys Arg Asp
    1490                1495                1500

Thr Phe Ile Lys Thr Asn Thr Arg Val Lys Lys Ile Leu Pro Leu
    1505                1510                1515

Glu Tyr Ala Asn Ile Ala Ile Lys Asp Thr Asn Asp Ile Tyr Ile
    1520                1525                1530

Cys Gly Leu Asn Asn Tyr Gly Gln Leu Gly Val Gly Asn Arg Tyr
    1535                1540                1545

Asp Ser Arg Asn Asn Asp Asn Arg Ile Phe Asn Tyr Lys His Met
    1550                1555                1560
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Asn Phe Val Met Gly Asp Leu Thr Ser Ile Lys Asn Arg His Asn
    1565                1570                1575

Phe Ile Leu Leu Asn Asn Lys Ile Val Ile Pro Thr Thr Lys Asp
    1580                1585                1590

Ile Asp Tyr Gly Leu Val Leu Gly Asn Leu Tyr Lys Gly Asp Leu
    1595                1600                1605

Tyr Thr Glu Leu Pro Tyr Glu Asp Ile Lys Glu Val Ser Ile Ser
    1610                1615                1620

Lys Thr His Ile Ile Ile Leu Leu Asn Asp Gly Thr Met Tyr Gly
    1625                1630                1635

Cys Gly Thr Asn Tyr His Gly Glu Leu Leu Gln Asp Leu Ser Ile
    1640                1645                1650

Asn Gln Val Asp Glu Phe Val Gln Ile Asn Val Ser Asp Val Lys
    1655                1660                1665

His Val Ser Cys Gly Asp Asn Phe Thr Tyr Phe Ile Lys Ser Asp
    1670                1675                1680

Asp Ser Leu Trp Ser Ile Gly Lys Asn Ser Glu Tyr Gln Leu Gly
    1685                1690                1695

Ile Gly His Asn Asn Pro Val Thr Glu Leu Gln Arg Ile Thr Thr
    1700                1705                1710

Ile Ser Ser Cys Lys Glu Val His Cys Gly Lys Asn Tyr Thr Leu
    1715                1720                1725

Val Val Thr Thr Ser Asn Glu Leu Phe Val Gln Gly Tyr Asn Asp
    1730                1735                1740

Lys Gly Ala Leu Gly Leu Gly Ser Asp Ser Glu Asn Thr Ile Ile
    1745                1750                1755

Lys Phe Phe Thr Lys Ala Leu Thr Asp Ile Arg Glu Ile Lys Ser
    1760                1765                1770

Tyr Gly Ser Asp His Ile Leu Val Leu Lys Asn Asp Asn Ser Val
    1775                1780                1785

Trp Val Thr Gly Lys Asn Arg Asp Val Tyr Lys Ile Glu Gln Pro
    1790                1795                1800

Val Glu Phe Leu Lys Glu Phe Thr Ile Val Pro Ile Ser Glu Asp
    1805                1810                1815
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Val Asn Thr Val Lys Asp Val Leu Ala Thr Asp Asn Thr Leu Tyr
1820 1825 1830

Ile Ile Ser Glu Val Gly Thr Thr Asn Ala Ala Ile Glu Ile Thr
1835 1840 1845

Glu Lys Ser Ile Ser Ser Ile Lys Ile Lys Ile Gln Asp Pro Asn
1850 1855 1860

Lys Asp Ile Ser Arg Ile Glu Met Leu Ile Asn Gly Glu Ser Val
1865 1870 1875

Lys Ser Val Ser Asp Leu Ile Thr Glu Lys Ile Ser Phe Glu Val
1880 1885 1890

Pro Pro Asp Lys Ile Lys Ile Gly Glu Asn Lys Ile Leu Phe Arg
1895 1900 1905

Ala Tyr Cys Lys Gly Asp Asp Leu Tyr Ala Ser Leu Phe Ile Phe
1910 1915 1920

Lys Glu Ser Thr Gly Asn Ser Ile Ile Lys Asp Ser Tyr Val Met
1925 1930 1935

Ile Gly Asn Arg Met Tyr Lys Val Val Asn Thr Thr Ser Asn Glu
1940 1945 1950

Gln Asp Ile Thr Ile Thr Leu Asp Arg Gly Leu Glu Glu Asp Leu
1955 1960 1965

Asn Leu Gly Asp Pro Ile Tyr Gln Leu Ile Asn Lys Thr Lys Val
1970 1975 1980

Gln Val Lys Ile Asn Lys Ser Asp Leu Phe Lys Asp Met Lys Leu
1985 1990 1995

Val Glu Ile Lys Lys Ser Asp Ser Ser Tyr Gln Glu Ile Tyr Glu
2000 2005 2010

Leu Glu Glu Ala Asn Ile Lys Ser Ala Gln Pro Lys Ile Ile Val
2015 2020 2025

Glu Lys Gly Asp Lys Trp Thr Ala Ile Lys Arg Pro Ser Met Ile
2030 2035 2040

Phe Arg Tyr Asp Ala Glu Asn Asn Glu Pro Gln Ala His Ala
2045 2050 2055

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<212> PRT

<213> Artificial

<220>
<223> Peptide biosensor mdm2-enterokinase

<400> 19

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1 5 10 15

Phe Cys Leu Pro Val Phe Ala His Pro Glu Thr Leu Val Lys Val Lys
20 25 30

Asp Ala Glu Asp Gln Leu Gly Ala Arg Val Gly Tyr Ile Glu Leu Asp
35 40 45

Leu Asn Ser Gly Lys Ile Leu Glu Ser Phe Arg Pro Glu Glu Arg Phe
50 55 60

Pro Met Met Ser Thr Phe Lys Val Leu Leu Cys Gly Ala Val Leu Ser
65 70 75 80

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

Gln Asn Asp Leu Val Glu Tyr Ser Pro Val Thr Glu Lys His Leu Thr
100 105 110

Asp Gly Met Thr Val Arg Glu Leu Cys Ser Ala Ala Ile Thr Met Ser
115 120 125

Asp Asn Thr Ala Ala Asn Leu Leu Leu Thr Thr Ile Gly Gly Pro Lys
130 135 140

Glu Leu Thr Ala Phe Leu His Asn Met Gly Asp His Val Thr Arg Leu
145 150 155 160

Asp Arg Trp Glu Pro Glu Leu Asn Glu Ala Ile Pro Asn Asp Glu Arg
165 170 175

Asp Thr Thr Met Pro Ala Ala Met Ala Thr Thr Leu Arg Lys Leu Leu
180 185 190

Thr Gly Glu Leu Leu Thr Leu Ala Ser Arg Gln Gln Leu Ile Asp Trp
195 200 205

Met Glu Ala Asp Lys Val Ala Gly Pro Leu Leu Arg Ser Ala Leu Pro
210 215 220

Ala Gly Trp Phe Ile Ala Asp Lys Ser Gly Ala Gly Glu Arg Gly Ser
225 230 235 240

Arg Gly Ile Ile Ala Ala Leu Gly Pro Asp Gly Lys Pro Ser Arg Ile

245 250 255

Val Val Ile Tyr Thr Thr Gly Ser Gln Ala Thr Met Asp Glu Arg Asn
260 265 270

Arg Gln Ile Ala Glu Ile Gly Ala Ser Leu Ile Lys His Trp Lys His
275 280 285

Trp Gly Gly Ser Gly Asp Asp Asp Asp Arg Gly Gly Thr Ser Phe Ala
290 295 300

Glu Tyr Trp Asn Leu Leu Ser Pro Gly Ser Glu Glu Ile Gly Leu Gly
305 310 315 320

Ala Gly Val Met Thr Met Lys Gln Asn Lys Leu Leu Gln Arg Gly Ala
325 330 335

Tyr Phe Asn Asp Lys Asn Ile Leu Ile Asp Asp Phe Asp Lys Arg Tyr
340 345 350

Asn Asp Tyr Asp Phe Val Glu Phe Phe Thr Gly Ile Ser Asn Ser Thr
355 360 365

Phe Gly Leu Lys Ser Asp Gly Asn Leu Tyr Ala Cys Gly Asp Asn Thr
370 375 380

Gly Phe Gln Leu Gly Leu Gly Lys Asp Ser Ser Glu Arg Arg Met Phe
385 390 395 400

Ser Lys Val Lys Ile Asp Asn Val Lys Tyr Val Ser Cys Gly Ser Lys
405 410 415

His Ser Val Ala Val Thr Lys Asp Gly Phe Ala Tyr Gly Ala Gly Thr
420 425 430

Ser Asn Val Gly Gln Leu Gly Val Ile Glu Ser Thr Val Tyr Tyr Glu
435 440 445

Phe Thr Lys Leu Pro Ile Asp Asp Val Lys Thr Val Ala Cys Gly Tyr
450 455 460

Asp Phe Thr Phe Val Leu Lys Asn Asp Gly Thr Leu Tyr Ser Ala Gly
465 470 475 480

Leu Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr Asn Asn Arg Val
485 490 495

Thr Phe Thr Lys Val Asn Ile Asp Ser Val Lys Asp Val Val Thr Tyr
500 505 510

Asn Gln Ser Val Phe Ile Ile Lys Met Asp Gly Thr Ala His Ala Cys

515 520 525

Gly Leu Asn Ser Asn Gly Gln Leu Gly Ile Asn Ser Thr Leu Asn Lys
530 535 540

Ser Val Phe Asn Lys Ile Glu Gly Met Asp Asn Val Lys Gln Ile Ala
545 550 555 560

Cys Gly Ser Ser His Thr Ile Leu Ile Lys Asn Asp Gly Thr Met Tyr
565 570 575

Thr Thr Gly Ser Asn Gly Tyr Gly Gln Leu Gly Thr Gly Asn Asn Asn
580 585 590

Asn Ser Ile Val Phe Thr Leu Ser Ser Ile Asn Asn Val Lys Tyr Ala
595 600 605

Ser Cys Gly Asn Asn His Thr Met Ile Leu Lys Tyr Asp Asn Thr Leu
610 615 620

Phe Ser Thr Gly Gln Asn Asn Tyr Gly Gln Leu Ala Asn Ala Asn Lys
625 630 635 640

Asp Val Ala Ser Arg Asn Thr Phe Val Lys Val Asn Val Glu Asn Ile
645 650 655

Lys Asp Ile Lys Cys Gly Ser Gln Phe Asn Phe Leu Ile Asn Gly Ser
660 665 670

Lys Glu Ile Phe Val Ser Gly Cys Asn Leu Ala Gly Gln Leu Gly Ser
675 680 685

Phe Phe His Thr Thr Phe Leu Tyr Glu Phe Ser Lys Val Gln Ser Ser
690 695 700

Asn Leu Asp Asn Tyr Ser Gly Leu Leu Val Asn Asp Asp Tyr Leu Tyr
705 710 715 720

Val Thr Lys Asp Asn Ser Glu Phe Leu Asn Val Lys Leu Ser Asp Asn
725 730 735

Phe Gln Asp Tyr Lys Lys Ile Glu Leu Thr Asp Asn Asn Met Phe Ile
740 745 750

Val Met Asn Asp Gly Thr Leu Tyr Ala Cys Gly Leu Asn Asn Tyr Gly
755 760 765

Gln Leu Gly Leu Gly Asp Thr Val Asn Arg Ser Val Met Thr Lys Val
770 775 780

Asp Ile Asp Asn Val Leu Asp Ile Lys Gly Asn Gly Asn Ser Thr Phe

785 790 795 800

Val Leu Lys Asn Asn Gly Thr Leu Tyr Ser Cys Gly Tyr Asn Ser Ser
805 810 815

Gly Ile Leu Gly Leu Lys Asp Asn Thr Asn Arg Asn Ile Phe Thr Lys
820 825 830

Ile Glu Ile Glu Asn Ile Lys Glu Phe Cys Val Glu Ser Asn Tyr Ile
835 840 845

Val Ala Leu Asn His Ser Lys Glu Leu Tyr Gly Trp Gly Asn Gln Ser
850 855 860

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

Val Ser Asn Val Glu Lys Ile Ala Thr Trp Ser Asp Thr Leu Tyr Ile
885 890 895

Leu Asp Ser Thr Gly Ala Thr Lys Thr Ile Gly Tyr Ser Tyr Asn Gly
900 905 910

Ser Gly Gly Tyr Pro Ala Pro Ser Ser Ser Ser Thr Tyr Arg Glu Gly
915 920 925

Gly Tyr Ile Asn Lys Asn Thr Ser Tyr Arg Thr Leu Glu Phe Tyr Asn
930 935 940

Thr Ser Lys Thr Lys Leu Val Asn Leu Phe Ala Phe Tyr Asn Gly Cys
945 950 955 960

Val Phe Val Asp Glu Asn Gly Leu Ala Tyr Cys Ile Gly Glu Asn Asn
965 970 975

Ile Asn Phe Arg Gly Gly Ser Thr Thr Asn Glu Asn Asn Ser Leu Arg
980 985 990

Phe Ile Asn Asn Ser Gly Val Tyr Tyr Thr Asn Thr Asp Gly Thr Asp
995 1000 1005

Tyr Thr Cys Tyr Gln Trp Thr Tyr Lys Leu Ile Arg Cys Ser Ile
1010 1015 1020

Phe Asp Ser Pro Gln Asn Ile Ile Gly Asn Ser Lys Asn Ile Leu
1025 1030 1035

Tyr Leu Ser Lys Asn Asn Ser Thr Phe Lys Cys Thr Gly Asn Cys
1040 1045 1050

Ile Thr Tyr Gly Ile Asn Ser Gln Asn Trp Tyr Ser Tyr Phe Ser

1055 1060 1065

Asp Ser Ser Asn Gly Ala Ile Ala Leu Gly Asn Glu Phe Ile Leu
1070 1075 1080

Lys Asn Tyr Ser Gly Glu Cys Leu Leu Lys Gly Tyr Gly Lys Ala
1085 1090 1095

Thr Asn Gly Glu Phe Gly Asn Ser Thr Asn Ile Ser Ser Ile Ser
1100 1105 1110

Asn Tyr Asp Thr Gly Leu Lys Asp Ile Lys Asp Ile Ile Val Lys
1115 1120 1125

Asn Asn Thr Val Val Val Val Asp Lys Asn Asn Asn Ile Tyr Val
1130 1135 1140

Thr Gly Ala Asn Gln Phe Asn Lys Leu Gly Ile Gly Glu Tyr Asn
1145 1150 1155

Asn Gln Pro Ile Arg Lys Phe Thr Asn Ile Thr Glu Gln Ser Asn
1160 1165 1170

Ser Phe Ile Phe Met Asp Asp Ile Lys Glu Ile Thr Thr Ser Arg
1175 1180 1185

Asn Thr Met Phe Ile Val Lys Asn Asp Gly Thr Ala Tyr Ala Thr
1190 1195 1200

Gly Asn Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr Ile Asn
1205 1210 1215

Arg Asn Lys Phe Thr Gln Ile Asn Leu Asp Asn Ile Lys Lys Ile
1220 1225 1230

Ser Thr Ser Ile Asp Gly Asn Thr Thr Phe Ala Ile Arg Asn Asp
1235 1240 1245

Gly Thr Leu Tyr Ser Thr Gly Leu Asn Thr Lys Gly Gln Leu Gly
1250 1255 1260

Leu Gly Asp Ile Val Asn Arg Asn Thr Phe Thr Lys Val Asn Ile
1265 1270 1275

Gln Asn Val Arg Asp Val Val Leu Gly Thr Thr His Ser His Ala
1280 1285 1290

Ile Lys Asp Asp Asn Thr Leu Tyr Ser Cys Gly Glu Asn Thr His
1295 1300 1305

Gly Gln Leu Gly Leu Gly Ser Glu Ser Asn His Pro Asp Val Leu

1310 1315 1320

Thr Phe Thr Val Asn Asn Ile Thr Asn Val Arg Asp Val Tyr Cys
1325 1330 1335

Ser Asp Thr Thr Thr Phe Ile Val Lys Asp Thr Asn Ile Ala Tyr
1340 1345 1350

Cys Cys Gly Tyr Asn Asn Asn Ser Gln Leu Gly Met Gly Asn Thr
1355 1360 1365

Thr Asp Gln Tyr Ser Phe Ile Lys Cys Met Glu Asn Val Lys Glu
1370 1375 1380

Val Ile Pro Asn Glu Ile Asn Thr Tyr Ile Ile Thr Ile Tyr Asn
1385 1390 1395

Thr Ala Tyr Ser Thr Gly Leu Asn Thr Asp Tyr Cys Leu Gly Leu
1400 1405 1410

Asn Ser Asn Ser Asn Gln Ser Ser Phe Ser Glu Ile Pro Ile Ser
1415 1420 1425

Asn Val Val Lys Val Ala Pro Asn Arg Asn Asn Ala Val Leu Leu
1430 1435 1440

Leu Thr Ser Glu Gly Asp Val Tyr Thr Ala Gly Lys Cys Ser Asn
1445 1450 1455

Gly Ser Gly Thr Gly Ser Glu Thr Pro Glu Lys Ile Lys Lys Ile
1460 1465 1470

Ala Ser Lys Ala Lys Asp Ile Gly Met Asn Tyr Arg Cys Gly His
1475 1480 1485

Tyr Val Ser Asp Asn Gly Asp Leu Tyr Gly Thr Gly Phe Asn Asp
1490 1495 1500

Cys Gly Gln Leu Gly Val Gly Asn Val Thr Lys Arg Asp Thr Phe
1505 1510 1515

Ile Lys Thr Asn Thr Arg Val Lys Lys Ile Leu Pro Leu Glu Tyr
1520 1525 1530

Ala Asn Ile Ala Ile Lys Asp Thr Asn Asp Ile Tyr Ile Cys Gly
1535 1540 1545

Leu Asn Asn Tyr Gly Gln Leu Gly Val Gly Asn Arg Tyr Asp Ser
1550 1555 1560

Arg Asn Asn Asp Asn Arg Ile Phe Asn Tyr Lys His Met Asn Phe

1565 1570 1575

Val Met Gly Asp Leu Thr Ser Ile Lys Asn Arg His Asn Phe Ile
1580 1585 1590

Leu Leu Asn Asn Lys Ile Val Ile Pro Thr Thr Lys Asp Ile Asp
1595 1600 1605

Tyr Gly Leu Val Leu Gly Asn Leu Tyr Lys Gly Asp Leu Tyr Thr
1610 1615 1620

Glu Leu Pro Tyr Glu Asp Ile Lys Glu Val Ser Ile Ser Lys Thr
1625 1630 1635

His Ile Ile Ile Leu Leu Asn Asp Gly Thr Met Tyr Gly Cys Gly
1640 1645 1650

Thr Asn Tyr His Gly Glu Leu Leu Gln Asp Leu Ser Ile Asn Gln
1655 1660 1665

Val Asp Glu Phe Val Gln Ile Asn Val Ser Asp Val Lys His Val
1670 1675 1680

Ser Cys Gly Asp Asn Phe Thr Tyr Phe Ile Lys Ser Asp Asp Ser
1685 1690 1695

Leu Trp Ser Ile Gly Lys Asn Ser Glu Tyr Gln Leu Gly Ile Gly
1700 1705 1710

His Asn Asn Pro Val Thr Glu Leu Gln Arg Ile Thr Thr Ile Ser
1715 1720 1725

Ser Cys Lys Glu Val His Cys Gly Lys Asn Tyr Thr Leu Val Val
1730 1735 1740

Thr Thr Ser Asn Glu Leu Phe Val Gln Gly Tyr Asn Asp Lys Gly
1745 1750 1755

Ala Leu Gly Leu Gly Ser Asp Ser Glu Asn Thr Ile Ile Lys Phe
1760 1765 1770

Phe Thr Lys Ala Leu Thr Asp Ile Arg Glu Ile Lys Ser Tyr Gly
1775 1780 1785

Ser Asp His Ile Leu Val Leu Lys Asn Asp Asn Ser Val Trp Val
1790 1795 1800

Thr Gly Lys Asn Arg Asp Val Tyr Lys Ile Glu Gln Pro Val Glu
1805 1810 1815

Phe Leu Lys Glu Phe Thr Ile Val Pro Ile Ser Glu Asp Val Asn

1820 1825 1830

Thr Val Lys Asp Val Leu Ala Thr Asp Asn Thr Leu Tyr Ile Ile
1835 1840 1845

Ser Glu Val Gly Thr Thr Asn Ala Ala Ile Glu Ile Thr Glu Lys
1850 1855 1860

Ser Ile Ser Ser Ile Lys Ile Lys Ile Gln Asp Pro Asn Lys Asp
1865 1870 1875

Ile Ser Arg Ile Glu Met Leu Ile Asn Gly Glu Ser Val Lys Ser
1880 1885 1890

Val Ser Asp Leu Ile Thr Glu Lys Ile Ser Phe Glu Val Pro Pro
1895 1900 1905

Asp Lys Ile Lys Ile Gly Glu Asn Lys Ile Leu Phe Arg Ala Tyr
1910 1915 1920

Cys Lys Gly Asp Asp Leu Tyr Ala Ser Leu Phe Ile Phe Lys Glu
1925 1930 1935

Ser Thr Gly Asn Ser Ile Ile Lys Asp Ser Tyr Val Met Ile Gly
1940 1945 1950

Asn Arg Met Tyr Lys Val Val Asn Thr Thr Ser Asn Glu Gln Asp
1955 1960 1965

Ile Thr Ile Thr Leu Asp Arg Gly Leu Glu Glu Asp Leu Asn Leu
1970 1975 1980

Gly Asp Pro Ile Tyr Gln Leu Ile Asn Lys Thr Lys Val Gln Val
1985 1990 1995

Lys Ile Asn Lys Ser Asp Leu Phe Lys Asp Met Lys Leu Val Glu
2000 2005 2010

Ile Lys Lys Ser Asp Ser Ser Tyr Gln Glu Ile Tyr Glu Leu Glu
2015 2020 2025

Glu Ala Asn Ile Lys Ser Ala Gln Pro Lys Ile Ile Val Glu Lys
2030 2035 2040

Gly Asp Lys Trp Thr Ala Ile Lys Arg Pro Ser Met Ile Phe Arg
2045 2050 2055

Tyr Asp Ala Glu Asn Asn Glu Pro Gln Ala His Ala
2060 2065 2070

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<211> 2059
<212> PRT
<213> Artificial

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Phe Cys Leu Pro Val Phe Ala His Pro Glu Thr Leu Val Lys Val Lys
            20                  25                  30

Asp Ala Glu Asp Gln Leu Gly Ala Arg Val Gly Tyr Ile Glu Leu Asp
        35                  40                  45

Leu Asn Ser Gly Lys Ile Leu Glu Ser Phe Arg Pro Glu Glu Arg Phe
    50                  55                  60

Pro Met Met Ser Thr Phe Lys Val Leu Leu Cys Gly Ala Val Leu Ser
65                  70                  75                  80

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

Gln Asn Asp Leu Val Glu Tyr Ser Pro Val Thr Glu Lys His Leu Thr
            100                 105                 110

Asp Gly Met Thr Val Arg Glu Leu Cys Ser Ala Ala Ile Thr Met Ser
        115                 120                 125

Asp Asn Thr Ala Ala Asn Leu Leu Leu Thr Thr Ile Gly Gly Pro Lys
    130                 135                 140

Glu Leu Thr Ala Phe Leu His Asn Met Gly Asp His Val Thr Arg Leu
145                 150                 155                 160

Asp Arg Trp Glu Pro Glu Leu Asn Glu Ala Ile Pro Asn Asp Glu Arg
                165                 170                 175

Asp Thr Thr Met Pro Ala Ala Met Ala Thr Thr Leu Arg Lys Leu Leu
            180                 185                 190

Thr Gly Glu Leu Leu Thr Leu Ala Ser Arg Gln Gln Leu Ile Asp Trp
        195                 200                 205

Met Glu Ala Asp Lys Val Ala Gly Pro Leu Leu Arg Ser Ala Leu Pro
    210                 215                 220

Ala Gly Trp Phe Ile Ala Asp Lys Ser Gly Ala Gly Glu Arg Gly Ser
225                 230                 235                 240
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Arg Gly Ile Ile Ala Ala Leu Gly Pro Asp Gly Lys Pro Ser Arg Ile
                245                 250                 255

Val Val Ile Tyr Thr Thr Gly Ser Gln Ala Thr Met Asp Glu Arg Asn
            260                 265                 270

Arg Gln Ile Ala Glu Ile Gly Ala Ser Leu Ile Lys His Trp Lys His
        275                 280                 285

Trp Gly Gly Ser Glu Asn Leu Tyr Phe Gln Ser Gly Tyr Pro Tyr Asp
    290                 295                 300

Val Pro Asp Tyr Ala Ala Gly Val Met Thr Met Lys Gln Asn Lys Leu
305                 310                 315                 320

Leu Gln Arg Gly Ala Tyr Phe Asn Asp Lys Asn Ile Leu Ile Asp Asp
                325                 330                 335

Phe Asp Lys Arg Tyr Asn Asp Tyr Asp Phe Val Glu Phe Phe Thr Gly
            340                 345                 350

Ile Ser Asn Ser Thr Phe Gly Leu Lys Ser Asp Gly Asn Leu Tyr Ala
        355                 360                 365

Cys Gly Asp Asn Thr Gly Phe Gln Leu Gly Leu Gly Lys Asp Ser Ser
    370                 375                 380

Glu Arg Arg Met Phe Ser Lys Val Lys Ile Asp Asn Val Lys Tyr Val
385                 390                 395                 400

Ser Cys Gly Ser Lys His Ser Val Ala Val Thr Lys Asp Gly Phe Ala
                405                 410                 415

Tyr Gly Ala Gly Thr Ser Asn Val Gly Gln Leu Gly Val Ile Glu Ser
            420                 425                 430

Thr Val Tyr Tyr Glu Phe Thr Lys Leu Pro Ile Asp Asp Val Lys Thr
        435                 440                 445

Val Ala Cys Gly Tyr Asp Phe Thr Phe Val Leu Lys Asn Asp Gly Thr
    450                 455                 460

Leu Tyr Ser Ala Gly Leu Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp
465                 470                 475                 480

Thr Asn Asn Arg Val Thr Phe Thr Lys Val Asn Ile Asp Ser Val Lys
                485                 490                 495

Asp Val Val Thr Tyr Asn Gln Ser Val Phe Ile Ile Lys Met Asp Gly
            500                 505                 510
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Thr Ala His Ala Cys Gly Leu Asn Ser Asn Gly Gln Leu Gly Ile Asn
        515                 520                 525

Ser Thr Leu Asn Lys Ser Val Phe Asn Lys Ile Glu Gly Met Asp Asn
    530                 535                 540

Val Lys Gln Ile Ala Cys Gly Ser Ser His Thr Ile Leu Ile Lys Asn
545                 550                 555                 560

Asp Gly Thr Met Tyr Thr Thr Gly Ser Asn Gly Tyr Gly Gln Leu Gly
                565                 570                 575

Thr Gly Asn Asn Asn Asn Ser Ile Val Phe Thr Leu Ser Ser Ile Asn
            580                 585                 590

Asn Val Lys Tyr Ala Ser Cys Gly Asn Asn His Thr Met Ile Leu Lys
        595                 600                 605

Tyr Asp Asn Thr Leu Phe Ser Thr Gly Gln Asn Asn Tyr Gly Gln Leu
    610                 615                 620

Ala Asn Ala Asn Lys Asp Val Ala Ser Arg Asn Thr Phe Val Lys Val
625                 630                 635                 640

Asn Val Glu Asn Ile Lys Asp Ile Lys Cys Gly Ser Gln Phe Asn Phe
                645                 650                 655

Leu Ile Asn Gly Ser Lys Glu Ile Phe Val Ser Gly Cys Asn Leu Ala
            660                 665                 670

Gly Gln Leu Gly Ser Phe Phe His Thr Thr Phe Leu Tyr Glu Phe Ser
        675                 680                 685

Lys Val Gln Ser Ser Asn Leu Asp Asn Tyr Ser Gly Leu Leu Val Asn
    690                 695                 700

Asp Asp Tyr Leu Tyr Val Thr Lys Asp Asn Ser Glu Phe Leu Asn Val
705                 710                 715                 720

Lys Leu Ser Asp Asn Phe Gln Asp Tyr Lys Lys Ile Glu Leu Thr Asp
                725                 730                 735

Asn Asn Met Phe Ile Val Met Asn Asp Gly Thr Leu Tyr Ala Cys Gly
            740                 745                 750

Leu Asn Asn Tyr Gly Gln Leu Gly Leu Gly Asp Thr Val Asn Arg Ser
        755                 760                 765

Val Met Thr Lys Val Asp Ile Asp Asn Val Leu Asp Ile Lys Gly Asn
    770                 775                 780
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Gly Asn Ser Thr Phe Val Leu Lys Asn Asn Gly Thr Leu Tyr Ser Cys
785                 790                 795                 800

Gly Tyr Asn Ser Ser Gly Ile Leu Gly Leu Lys Asp Asn Thr Asn Arg
                805                 810                 815

Asn Ile Phe Thr Lys Ile Glu Ile Glu Asn Ile Lys Glu Phe Cys Val
            820                 825                 830

Glu Ser Asn Tyr Ile Val Ala Leu Asn His Ser Lys Glu Leu Tyr Gly
        835                 840                 845

Trp Gly Asn Gln Ser Tyr Ile Val Tyr Gly Asp Asn Arg Asn Tyr Pro
    850                 855                 860

Tyr Lys Asp Thr Arg Val Ser Asn Val Glu Lys Ile Ala Thr Trp Ser
865                 870                 875                 880

Asp Thr Leu Tyr Ile Leu Asp Ser Thr Gly Ala Thr Lys Thr Ile Gly
                885                 890                 895

Tyr Ser Tyr Asn Gly Ser Gly Gly Tyr Pro Ala Pro Ser Ser Ser Ser
            900                 905                 910

Thr Tyr Arg Glu Gly Gly Tyr Ile Asn Lys Asn Thr Ser Tyr Arg Thr
        915                 920                 925

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

Phe Tyr Asn Gly Cys Val Phe Val Asp Glu Asn Gly Leu Ala Tyr Cys
945                 950                 955                 960

Ile Gly Glu Asn Asn Ile Asn Phe Arg Gly Gly Ser Thr Thr Asn Glu
                965                 970                 975

Asn Asn Ser Leu Arg Phe Ile Asn Asn Ser Gly Val Tyr Tyr Thr Asn
            980                 985                 990

Thr Asp Gly Thr Asp Tyr Thr Cys  Tyr Gln Trp Thr Tyr  Lys Leu Ile
        995                 1000                1005

Arg Cys  Ser Ile Phe Asp Ser  Pro Gln Asn Ile Ile  Gly Asn Ser
    1010                1015                1020

Lys Asn  Ile Leu Tyr Leu Ser  Lys Asn Asn Ser Thr  Phe Lys Cys
    1025                1030                1035

Thr Gly  Asn Cys Ile Thr Tyr  Gly Ile Asn Ser Gln  Asn Trp Tyr
    1040                1045                1050
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Ser Tyr Phe Ser Asp Ser Ser Asn Gly Ala Ile Ala Leu Gly Asn
1055 1060 1065

Glu Phe Ile Leu Lys Asn Tyr Ser Gly Glu Cys Leu Leu Lys Gly
1070 1075 1080

Tyr Gly Lys Ala Thr Asn Gly Glu Phe Gly Asn Ser Thr Asn Ile
1085 1090 1095

Ser Ser Ile Ser Asn Tyr Asp Thr Gly Leu Lys Asp Ile Lys Asp
1100 1105 1110

Ile Ile Val Lys Asn Asn Thr Val Val Val Val Asp Lys Asn Asn
1115 1120 1125

Asn Ile Tyr Val Thr Gly Ala Asn Gln Phe Asn Lys Leu Gly Ile
1130 1135 1140

Gly Glu Tyr Asn Asn Gln Pro Ile Arg Lys Phe Thr Asn Ile Thr
1145 1150 1155

Glu Gln Ser Asn Ser Phe Ile Phe Met Asp Asp Ile Lys Glu Ile
1160 1165 1170

Thr Thr Ser Arg Asn Thr Met Phe Ile Val Lys Asn Asp Gly Thr
1175 1180 1185

Ala Tyr Ala Thr Gly Asn Asn Ser Ser Gly Gln Leu Gly Leu Gly
1190 1195 1200

Asp Thr Ile Asn Arg Asn Lys Phe Thr Gln Ile Asn Leu Asp Asn
1205 1210 1215

Ile Lys Lys Ile Ser Thr Ser Ile Asp Gly Asn Thr Thr Phe Ala
1220 1225 1230

Ile Arg Asn Asp Gly Thr Leu Tyr Ser Thr Gly Leu Asn Thr Lys
1235 1240 1245

Gly Gln Leu Gly Leu Gly Asp Ile Val Asn Arg Asn Thr Phe Thr
1250 1255 1260

Lys Val Asn Ile Gln Asn Val Arg Asp Val Val Leu Gly Thr Thr
1265 1270 1275

His Ser His Ala Ile Lys Asp Asp Asn Thr Leu Tyr Ser Cys Gly
1280 1285 1290

Glu Asn Thr His Gly Gln Leu Gly Leu Gly Ser Glu Ser Asn His
1295 1300 1305

Pro Asp Val Leu Thr Phe Thr Val Asn Asn Ile Thr Asn Val Arg
1310 1315 1320

Asp Val Tyr Cys Ser Asp Thr Thr Thr Phe Ile Val Lys Asp Thr
1325 1330 1335

Asn Ile Ala Tyr Cys Cys Gly Tyr Asn Asn Asn Ser Gln Leu Gly
1340 1345 1350

Met Gly Asn Thr Thr Asp Gln Tyr Ser Phe Ile Lys Cys Met Glu
1355 1360 1365

Asn Val Lys Glu Val Ile Pro Asn Glu Ile Asn Thr Tyr Ile Ile
1370 1375 1380

Thr Ile Tyr Asn Thr Ala Tyr Ser Thr Gly Leu Asn Thr Asp Tyr
1385 1390 1395

Cys Leu Gly Leu Asn Ser Asn Ser Asn Gln Ser Ser Phe Ser Glu
1400 1405 1410

Ile Pro Ile Ser Asn Val Val Lys Val Ala Pro Asn Arg Asn Asn
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Ala Val Leu Leu Leu Thr Ser Glu Gly Asp Val Tyr Thr Ala Gly
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Lys Cys Ser Asn Gly Ser Gly Thr Gly Ser Glu Thr Pro Glu Lys
1445 1450 1455

Ile Lys Lys Ile Ala Ser Lys Ala Lys Asp Ile Gly Met Asn Tyr
1460 1465 1470

Arg Cys Gly His Tyr Val Ser Asp Asn Gly Asp Leu Tyr Gly Thr
1475 1480 1485

Gly Phe Asn Asp Cys Gly Gln Leu Gly Val Gly Asn Val Thr Lys
1490 1495 1500

Arg Asp Thr Phe Ile Lys Thr Asn Thr Arg Val Lys Lys Ile Leu
1505 1510 1515

Pro Leu Glu Tyr Ala Asn Ile Ala Ile Lys Asp Thr Asn Asp Ile
1520 1525 1530

Tyr Ile Cys Gly Leu Asn Asn Tyr Gly Gln Leu Gly Val Gly Asn
1535 1540 1545

Arg Tyr Asp Ser Arg Asn Asn Asp Asn Arg Ile Phe Asn Tyr Lys
1550 1555 1560

His Met Asn Phe Val Met Gly Asp Leu Thr Ser Ile Lys Asn Arg
1565 1570 1575

His Asn Phe Ile Leu Leu Asn Asn Lys Ile Val Ile Pro Thr Thr
1580 1585 1590

Lys Asp Ile Asp Tyr Gly Leu Val Leu Gly Asn Leu Tyr Lys Gly
1595 1600 1605

Asp Leu Tyr Thr Glu Leu Pro Tyr Glu Asp Ile Lys Glu Val Ser
1610 1615 1620

Ile Ser Lys Thr His Ile Ile Ile Leu Leu Asn Asp Gly Thr Met
1625 1630 1635

Tyr Gly Cys Gly Thr Asn Tyr His Gly Glu Leu Leu Gln Asp Leu
1640 1645 1650

Ser Ile Asn Gln Val Asp Glu Phe Val Gln Ile Asn Val Ser Asp
1655 1660 1665

Val Lys His Val Ser Cys Gly Asp Asn Phe Thr Tyr Phe Ile Lys
1670 1675 1680

Ser Asp Asp Ser Leu Trp Ser Ile Gly Lys Asn Ser Glu Tyr Gln
1685 1690 1695

Leu Gly Ile Gly His Asn Asn Pro Val Thr Glu Leu Gln Arg Ile
1700 1705 1710

Thr Thr Ile Ser Ser Cys Lys Glu Val His Cys Gly Lys Asn Tyr
1715 1720 1725

Thr Leu Val Val Thr Thr Ser Asn Glu Leu Phe Val Gln Gly Tyr
1730 1735 1740

Asn Asp Lys Gly Ala Leu Gly Leu Gly Ser Asp Ser Glu Asn Thr
1745 1750 1755

Ile Ile Lys Phe Phe Thr Lys Ala Leu Thr Asp Ile Arg Glu Ile
1760 1765 1770

Lys Ser Tyr Gly Ser Asp His Ile Leu Val Leu Lys Asn Asp Asn
1775 1780 1785

Ser Val Trp Val Thr Gly Lys Asn Arg Asp Val Tyr Lys Ile Glu
1790 1795 1800

Gln Pro Val Glu Phe Leu Lys Glu Phe Thr Ile Val Pro Ile Ser
1805 1810 1815

Glu Asp Val Asn Thr Val Lys Asp Val Leu Ala Thr Asp Asn Thr
1820 1825 1830

Leu Tyr Ile Ile Ser Glu Val Gly Thr Thr Asn Ala Ala Ile Glu
1835 1840 1845

Ile Thr Glu Lys Ser Ile Ser Ser Ile Lys Ile Lys Ile Gln Asp
1850 1855 1860

Pro Asn Lys Asp Ile Ser Arg Ile Glu Met Leu Ile Asn Gly Glu
1865 1870 1875

Ser Val Lys Ser Val Ser Asp Leu Ile Thr Glu Lys Ile Ser Phe
1880 1885 1890

Glu Val Pro Pro Asp Lys Ile Lys Ile Gly Glu Asn Lys Ile Leu
1895 1900 1905

Phe Arg Ala Tyr Cys Lys Gly Asp Asp Leu Tyr Ala Ser Leu Phe
1910 1915 1920

Ile Phe Lys Glu Ser Thr Gly Asn Ser Ile Ile Lys Asp Ser Tyr
1925 1930 1935

Val Met Ile Gly Asn Arg Met Tyr Lys Val Val Asn Thr Thr Ser
1940 1945 1950

Asn Glu Gln Asp Ile Thr Ile Thr Leu Asp Arg Gly Leu Glu Glu
1955 1960 1965

Asp Leu Asn Leu Gly Asp Pro Ile Tyr Gln Leu Ile Asn Lys Thr
1970 1975 1980

Lys Val Gln Val Lys Ile Asn Lys Ser Asp Leu Phe Lys Asp Met
1985 1990 1995

Lys Leu Val Glu Ile Lys Lys Ser Asp Ser Ser Tyr Gln Glu Ile
2000 2005 2010

Tyr Glu Leu Glu Glu Ala Asn Ile Lys Ser Ala Gln Pro Lys Ile
2015 2020 2025

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

Leu Asn Ser Gly Lys Ile Leu Glu Ser Phe Arg Pro Glu Glu Arg Phe
    50                  55                  60

Pro Met Met Ser Thr Phe Lys Val Leu Leu Cys Gly Ala Val Leu Ser
65                  70                  75                  80

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

Gln Asn Asp Leu Val Glu Tyr Ser Pro Val Thr Glu Lys His Leu Thr
            100                 105                 110

Asp Gly Met Thr Val Arg Glu Leu Cys Ser Ala Ala Ile Thr Met Ser
        115                 120                 125

Asp Asn Thr Ala Ala Asn Leu Leu Leu Thr Thr Ile Gly Gly Pro Lys
    130                 135                 140

Glu Leu Thr Ala Phe Leu His Asn Met Gly Asp His Val Thr Arg Leu
145                 150                 155                 160

Asp Arg Trp Glu Pro Glu Leu Asn Glu Ala Ile Pro Asn Asp Glu Arg
                165                 170                 175

Asp Thr Thr Met Pro Ala Ala Met Ala Thr Thr Leu Arg Lys Leu Leu
            180                 185                 190

Thr Gly Glu Leu Leu Thr Leu Ala Ser Arg Gln Gln Leu Ile Asp Trp
        195                 200                 205

Met Glu Ala Asp Lys Val Ala Gly Pro Leu Leu Arg Ser Ala Leu Pro
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Ala Gly Trp Phe Ile Ala Asp Lys Ser Gly Ala Gly Glu Arg Gly Ser
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225 230 235 240

Arg Gly Ile Ile Ala Ala Leu Gly Pro Asp Gly Lys Pro Ser Arg Ile
245 250 255

Val Val Ile Tyr Thr Thr Gly Ser Gln Ala Thr Met Asp Glu Arg Asn
260 265 270

Arg Gln Ile Ala Glu Ile Gly Ala Ser Leu Ile Lys His Trp Lys His
275 280 285

Trp Gly Gly Ser Gly Asp Asp Asp Asp Arg Gly Lys Lys Arg Tyr Ser
290 295 300

Arg Asp Gln Leu Leu Ala Leu Gly Ser Glu Glu Ile Gly Leu Gly Ala
305 310 315 320

Gly Val Met Thr Met Lys Gln Asn Lys Leu Leu Gln Arg Gly Ala Tyr
325 330 335

Phe Asn Asp Lys Asn Ile Leu Ile Asp Asp Phe Asp Lys Arg Tyr Asn
340 345 350

Asp Tyr Asp Phe Val Glu Phe Phe Thr Gly Ile Ser Asn Ser Thr Phe
355 360 365

Gly Leu Lys Ser Asp Gly Asn Leu Tyr Ala Cys Gly Asp Asn Thr Gly
370 375 380

Phe Gln Leu Gly Leu Gly Lys Asp Ser Ser Glu Arg Arg Met Phe Ser
385 390 395 400

Lys Val Lys Ile Asp Asn Val Lys Tyr Val Ser Cys Gly Ser Lys His
405 410 415

Ser Val Ala Val Thr Lys Asp Gly Phe Ala Tyr Gly Ala Gly Thr Ser
420 425 430

Asn Val Gly Gln Leu Gly Val Ile Glu Ser Thr Val Tyr Tyr Glu Phe
435 440 445

Thr Lys Leu Pro Ile Asp Asp Val Lys Thr Val Ala Cys Gly Tyr Asp
450 455 460

Phe Thr Phe Val Leu Lys Asn Asp Gly Thr Leu Tyr Ser Ala Gly Leu
465 470 475 480

Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr Asn Asn Arg Val Thr
485 490 495

Phe Thr Lys Val Asn Ile Asp Ser Val Lys Asp Val Val Thr Tyr Asn

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            500                 505                 510

Gln Ser Val Phe Ile Ile Lys Met Asp Gly Thr Ala His Ala Cys Gly
        515                 520                 525

Leu Asn Ser Asn Gly Gln Leu Gly Ile Asn Ser Thr Leu Asn Lys Ser
    530                 535                 540

Val Phe Asn Lys Ile Glu Gly Met Asp Asn Val Lys Gln Ile Ala Cys
545                 550                 555                 560

Gly Ser Ser His Thr Ile Leu Ile Lys Asn Asp Gly Thr Met Tyr Thr
                565                 570                 575

Thr Gly Ser Asn Gly Tyr Gly Gln Leu Gly Thr Gly Asn Asn Asn Asn
            580                 585                 590

Ser Ile Val Phe Thr Leu Ser Ser Ile Asn Asn Val Lys Tyr Ala Ser
        595                 600                 605

Cys Gly Asn Asn His Thr Met Ile Leu Lys Tyr Asp Asn Thr Leu Phe
    610                 615                 620

Ser Thr Gly Gln Asn Asn Tyr Gly Gln Leu Ala Asn Ala Asn Lys Asp
625                 630                 635                 640

Val Ala Ser Arg Asn Thr Phe Val Lys Val Asn Val Glu Asn Ile Lys
                645                 650                 655

Asp Ile Lys Cys Gly Ser Gln Phe Asn Phe Leu Ile Asn Gly Ser Lys
            660                 665                 670

Glu Ile Phe Val Ser Gly Cys Asn Leu Ala Gly Gln Leu Gly Ser Phe
        675                 680                 685

Phe His Thr Thr Phe Leu Tyr Glu Phe Ser Lys Val Gln Ser Ser Asn
    690                 695                 700

Leu Asp Asn Tyr Ser Gly Leu Leu Val Asn Asp Asp Tyr Leu Tyr Val
705                 710                 715                 720

Thr Lys Asp Asn Ser Glu Phe Leu Asn Val Lys Leu Ser Asp Asn Phe
                725                 730                 735

Gln Asp Tyr Lys Lys Ile Glu Leu Thr Asp Asn Asn Met Phe Ile Val
            740                 745                 750

Met Asn Asp Gly Thr Leu Tyr Ala Cys Gly Leu Asn Asn Tyr Gly Gln
        755                 760                 765

Leu Gly Leu Gly Asp Thr Val Asn Arg Ser Val Met Thr Lys Val Asp
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770 775 780

Ile Asp Asn Val Leu Asp Ile Lys Gly Asn Gly Asn Ser Thr Phe Val
785 790 795 800

Leu Lys Asn Asn Gly Thr Leu Tyr Ser Cys Gly Tyr Asn Ser Ser Gly
805 810 815

Ile Leu Gly Leu Lys Asp Asn Thr Asn Arg Asn Ile Phe Thr Lys Ile
820 825 830

Glu Ile Glu Asn Ile Lys Glu Phe Cys Val Glu Ser Asn Tyr Ile Val
835 840 845

Ala Leu Asn His Ser Lys Glu Leu Tyr Gly Trp Gly Asn Gln Ser Tyr
850 855 860

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

Ser Asn Val Glu Lys Ile Ala Thr Trp Ser Asp Thr Leu Tyr Ile Leu
885 890 895

Asp Ser Thr Gly Ala Thr Lys Thr Ile Gly Tyr Ser Tyr Asn Gly Ser
900 905 910

Gly Gly Tyr Pro Ala Pro Ser Ser Ser Ser Thr Tyr Arg Glu Gly Gly
915 920 925

Tyr Ile Asn Lys Asn Thr Ser Tyr Arg Thr Leu Glu Phe Tyr Asn Thr
930 935 940

Ser Lys Thr Lys Leu Val Asn Leu Phe Ala Phe Tyr Asn Gly Cys Val
945 950 955 960

Phe Val Asp Glu Asn Gly Leu Ala Tyr Cys Ile Gly Glu Asn Asn Ile
965 970 975

Asn Phe Arg Gly Gly Ser Thr Thr Asn Glu Asn Asn Ser Leu Arg Phe
980 985 990

Ile Asn Asn Ser Gly Val Tyr Tyr Thr Asn Thr Asp Gly Thr Asp Tyr
995 1000 1005

Thr Cys Tyr Gln Trp Thr Tyr Lys Leu Ile Arg Cys Ser Ile Phe
1010 1015 1020

Asp Ser Pro Gln Asn Ile Ile Gly Asn Ser Lys Asn Ile Leu Tyr
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Leu Ser Lys Asn Asn Ser Thr Phe Lys Cys Thr Gly Asn Cys Ile

1040 1045 1050

Thr Tyr Gly Ile Asn Ser Gln Asn Trp Tyr Ser Tyr Phe Ser Asp
1055 1060 1065

Ser Ser Asn Gly Ala Ile Ala Leu Gly Asn Glu Phe Ile Leu Lys
1070 1075 1080

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

Asn Gly Glu Phe Gly Asn Ser Thr Asn Ile Ser Ser Ile Ser Asn
1100 1105 1110

Tyr Asp Thr Gly Leu Lys Asp Ile Lys Asp Ile Ile Val Lys Asn
1115 1120 1125

Asn Thr Val Val Val Val Asp Lys Asn Asn Asn Ile Tyr Val Thr
1130 1135 1140

Gly Ala Asn Gln Phe Asn Lys Leu Gly Ile Gly Glu Tyr Asn Asn
1145 1150 1155

Gln Pro Ile Arg Lys Phe Thr Asn Ile Thr Glu Gln Ser Asn Ser
1160 1165 1170

Phe Ile Phe Met Asp Asp Ile Lys Glu Ile Thr Thr Ser Arg Asn
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Thr Met Phe Ile Val Lys Asn Asp Gly Thr Ala Tyr Ala Thr Gly
1190 1195 1200

Asn Asn Ser Ser Gly Gln Leu Gly Leu Gly Asp Thr Ile Asn Arg
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Asn Lys Phe Thr Gln Ile Asn Leu Asp Asn Ile Lys Lys Ile Ser
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Thr Ser Ile Asp Gly Asn Thr Thr Phe Ala Ile Arg Asn Asp Gly
1235 1240 1245

Thr Leu Tyr Ser Thr Gly Leu Asn Thr Lys Gly Gln Leu Gly Leu
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Gly Asp Ile Val Asn Arg Asn Thr Phe Thr Lys Val Asn Ile Gln
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Asn Val Arg Asp Val Val Leu Gly Thr Thr His Ser His Ala Ile
1280 1285 1290

Lys Asp Asp Asn Thr Leu Tyr Ser Cys Gly Glu Asn Thr His Gly

1295 1300 1305

Gln Leu Gly Leu Gly Ser Glu Ser Asn His Pro Asp Val Leu Thr
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Phe Thr Val Asn Asn Ile Thr Asn Val Arg Asp Val Tyr Cys Ser
1325 1330 1335

Asp Thr Thr Thr Phe Ile Val Lys Asp Thr Asn Ile Ala Tyr Cys
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Cys Gly Tyr Asn Asn Asn Ser Gln Leu Gly Met Gly Asn Thr Thr
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Asp Gln Tyr Ser Phe Ile Lys Cys Met Glu Asn Val Lys Glu Val
1370 1375 1380

Ile Pro Asn Glu Ile Asn Thr Tyr Ile Ile Thr Ile Tyr Asn Thr
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Ala Tyr Ser Thr Gly Leu Asn Thr Asp Tyr Cys Leu Gly Leu Asn
1400 1405 1410

Ser Asn Ser Asn Gln Ser Ser Phe Ser Glu Ile Pro Ile Ser Asn
1415 1420 1425

Val Val Lys Val Ala Pro Asn Arg Asn Asn Ala Val Leu Leu Leu
1430 1435 1440

Thr Ser Glu Gly Asp Val Tyr Thr Ala Gly Lys Cys Ser Asn Gly
1445 1450 1455

Ser Gly Thr Gly Ser Glu Thr Pro Glu Lys Ile Lys Lys Ile Ala
1460 1465 1470

Ser Lys Ala Lys Asp Ile Gly Met Asn Tyr Arg Cys Gly His Tyr
1475 1480 1485

Val Ser Asp Asn Gly Asp Leu Tyr Gly Thr Gly Phe Asn Asp Cys
1490 1495 1500

Gly Gln Leu Gly Val Gly Asn Val Thr Lys Arg Asp Thr Phe Ile
1505 1510 1515

Lys Thr Asn Thr Arg Val Lys Lys Ile Leu Pro Leu Glu Tyr Ala
1520 1525 1530

Asn Ile Ala Ile Lys Asp Thr Asn Asp Ile Tyr Ile Cys Gly Leu
1535 1540 1545

Asn Asn Tyr Gly Gln Leu Gly Val Gly Asn Arg Tyr Asp Ser Arg

1550 1555 1560

Asn Asn Asp Asn Arg Ile Phe Asn Tyr Lys His Met Asn Phe Val
1565 1570 1575

Met Gly Asp Leu Thr Ser Ile Lys Asn Arg His Asn Phe Ile Leu
1580 1585 1590

Leu Asn Asn Lys Ile Val Ile Pro Thr Thr Lys Asp Ile Asp Tyr
1595 1600 1605

Gly Leu Val Leu Gly Asn Leu Tyr Lys Gly Asp Leu Tyr Thr Glu
1610 1615 1620

Leu Pro Tyr Glu Asp Ile Lys Glu Val Ser Ile Ser Lys Thr His
1625 1630 1635

Ile Ile Ile Leu Leu Asn Asp Gly Thr Met Tyr Gly Cys Gly Thr
1640 1645 1650

Asn Tyr His Gly Glu Leu Leu Gln Asp Leu Ser Ile Asn Gln Val
1655 1660 1665

Asp Glu Phe Val Gln Ile Asn Val Ser Asp Val Lys His Val Ser
1670 1675 1680

Cys Gly Asp Asn Phe Thr Tyr Phe Ile Lys Ser Asp Asp Ser Leu
1685 1690 1695

Trp Ser Ile Gly Lys Asn Ser Glu Tyr Gln Leu Gly Ile Gly His
1700 1705 1710

Asn Asn Pro Val Thr Glu Leu Gln Arg Ile Thr Thr Ile Ser Ser
1715 1720 1725

Cys Lys Glu Val His Cys Gly Lys Asn Tyr Thr Leu Val Val Thr
1730 1735 1740

Thr Ser Asn Glu Leu Phe Val Gln Gly Tyr Asn Asp Lys Gly Ala
1745 1750 1755

Leu Gly Leu Gly Ser Asp Ser Glu Asn Thr Ile Ile Lys Phe Phe
1760 1765 1770

Thr Lys Ala Leu Thr Asp Ile Arg Glu Ile Lys Ser Tyr Gly Ser
1775 1780 1785

Asp His Ile Leu Val Leu Lys Asn Asp Asn Ser Val Trp Val Thr
1790 1795 1800

Gly Lys Asn Arg Asp Val Tyr Lys Ile Glu Gln Pro Val Glu Phe

1805 1810 1815

Leu Lys Glu Phe Thr Ile Val Pro Ile Ser Glu Asp Val Asn Thr
1820 1825 1830

Val Lys Asp Val Leu Ala Thr Asp Asn Thr Leu Tyr Ile Ile Ser
1835 1840 1845

Glu Val Gly Thr Thr Asn Ala Ala Ile Glu Ile Thr Glu Lys Ser
1850 1855 1860

Ile Ser Ser Ile Lys Ile Lys Ile Gln Asp Pro Asn Lys Asp Ile
1865 1870 1875

Ser Arg Ile Glu Met Leu Ile Asn Gly Glu Ser Val Lys Ser Val
1880 1885 1890

Ser Asp Leu Ile Thr Glu Lys Ile Ser Phe Glu Val Pro Pro Asp
1895 1900 1905

Lys Ile Lys Ile Gly Glu Asn Lys Ile Leu Phe Arg Ala Tyr Cys
1910 1915 1920

Lys Gly Asp Asp Leu Tyr Ala Ser Leu Phe Ile Phe Lys Glu Ser
1925 1930 1935

Thr Gly Asn Ser Ile Ile Lys Asp Ser Tyr Val Met Ile Gly Asn
1940 1945 1950

Arg Met Tyr Lys Val Val Asn Thr Thr Ser Asn Glu Gln Asp Ile
1955 1960 1965

Thr Ile Thr Leu Asp Arg Gly Leu Glu Glu Asp Leu Asn Leu Gly
1970 1975 1980

Asp Pro Ile Tyr Gln Leu Ile Asn Lys Thr Lys Val Gln Val Lys
1985 1990 1995

Ile Asn Lys Ser Asp Leu Phe Lys Asp Met Lys Leu Val Glu Ile
2000 2005 2010

Lys Lys Ser Asp Ser Ser Tyr Gln Glu Ile Tyr Glu Leu Glu Glu
2015 2020 2025

Ala Asn Ile Lys Ser Ala Gln Pro Lys Ile Ile Val Glu Lys Gly
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Asp Lys Trp Thr Ala Ile Lys Arg Pro Ser Met Ile Phe Arg Tyr
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Asp Ala Glu Asn Asn Glu Pro Gln Ala His Ala

2060 2065

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