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<120> Vaccine Compositions

<130> P39479WO

<150> EP12305911.5
<151> 2012-07-25

<150> EP12305908.1
<151> 2012-07-24

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<170> PatentIn version 3.5

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Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile
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Leu Lys Cys Arg Leu Arg Met Asp Lys Leu Gln Leu Lys Gly Met Ser
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Tyr Ser Met Cys Thr Gly Lys Phe Lys Val Val Lys Glu Ile Ala Glu
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Ser Pro Val Asn Ile Glu Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile
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Ile Ile Gly Val Glu Pro Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys
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Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys
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Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly
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Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala
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Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu
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Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser
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Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile
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Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys
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Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser
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Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile Glu Thr Trp Ile Leu
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Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile Leu Ala Tyr Thr Ile
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Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe Ile Leu Leu Thr Ala
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Phe Val Glu Gly Val Ser Gly Gly Ser Trp Val Asp Ile Val Leu Glu
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Pro Thr Gln Gly Glu Pro Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe
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Val Cys Lys His Ser Met Val Asp Arg Gly Trp Gly Asn Gly Cys Gly
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Leu Phe Gly Lys Gly Gly Ile Val Thr Cys Ala Met Phe Thr Cys Lys
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Lys Asn Met Glu Gly Lys Xaa Val Gln Pro Glu Asn Leu Glu Tyr Thr
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Ile Val Ile Thr Pro His Ser Gly Glu Glu His Ala Val Gly Asn Asp
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Thr Gly Lys His Gly Lys Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile
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Thr Glu Ala Glu Leu Thr Gly Tyr Gly Thr Val Thr Met Glu Cys Ser
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Pro Arg Thr Gly Leu Asp Phe Asn Glu Met Val Leu Leu Gln Met Glu
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Asp Lys Ala Trp Leu Val His Arg Gln Trp Phe Leu Asp Leu Pro Leu
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Pro Trp Leu Pro Gly Ala Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys
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Glu Thr Leu Val Thr Phe Lys Asn Pro His Ala Lys Lys Gln Asp Val
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Val Val Leu Gly Ser Gln Glu Gly Ala Met His Thr Ala Leu Thr Gly
            420                 425                 430

Ala Thr Glu Ile Gln Met Ser Ser Gly Asn Leu Leu Phe Thr Gly His
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Leu Lys Cys Arg Leu Arg Met Asp Lys Leu Gln Leu Lys Gly Met Ser
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Tyr Ser Met Cys Thr Gly Lys Phe Lys Xaa Val Lys Glu Ile Ala Glu
465                 470                 475                 480

Thr Gln His Gly Thr Ile Val Ile Arg Val Gln Tyr Glu Gly Asp Gly
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Ser Pro Cys Lys Ile Pro Phe Glu Ile Met Asp Leu Glu Lys Arg His
            500                 505                 510

Val Leu Gly Arg Leu Ile Thr Val Asn Pro Ile Val Thr Glu Lys Asp
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Ser Pro Val Asn Ile Glu Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile
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Ile Ile Gly Val Glu Pro Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys
545                 550                 555                 560

Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys
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Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly
            580                 585                 590

Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala
        595                 600                 605

Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu
    610                 615                 620

Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser
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acctgtgcta tgttcacatg caaaaagaac atggaaggaa aaatcgtgca accagaaaat 900

ttggaataca ccatcgtgat aacacctcac tcaggagaag agcacgctgt aggtaatgac 960

acaggaaaac atggtaagga aattaaaata acaccacaga gttccatcac agaagcagaa 1020

ctgacaggct atggcacagt cacgatggag tgctctccga gaacgggcct tgacttcaat 1080

gagatggtgc tgctgcagat ggaagataaa gcttggctgg tgcacaggca atggttccta 1140

gacctgccgt taccatggct acccggagcg gacacacaag gatcaaattg gatacagaaa 1200

gagacattgg tcactttcaa aaatccccac gcgaagaagc aggatgtcgt tgttttagga 1260

tctcaagaag gagccatgca cacggcactc acaggggcca cagaaatcca gatgtcatca 1320

ggaaacttac tattcacagg acatctcaaa tgcaggctga gaatggacaa actacagctc 1380

aaaggaatgt catactctat gtgtacagga aagtttaaaa ttgtgaagga aatagcagaa 1440

acacaacatg gaacaatagt tatcagagta caatatgaag gagacggctc tccatgtaag 1500

atccctttg aaataatgga tttggaaaaa agacatgtct taggtcgcct gattacagtt 1560

aatccgatcg taacagaaaa agatagccca gtcaacatag aagcagaacc tccattcgga 1620

gacagctaca tcattatagg agtagagccg ggacaattga aactcaactg gttcaagaaa 1680

ggaagttcca tcggccaaat gtttgagacg acaatgagag gagcaaagag aatggccatt 1740

ttaggtgaca cagcctggga ttttggatct ctgggaggag tgtttacatc tataggaaag 1800

gctctccacc aagttttcgg agcaatctat ggggctgcct ttagtggggt ttcatggact 1860

atgaaaatcc tcataggagt catcatcaca tggataggaa tgaattcacg tagcacctca 1920

ctgtctgtgt cactagtatt ggtgggaatc ataacactgt acttgggagc tatggtgcag 1980

gct 1983

<210> 8
<211> 661
<212> PRT
<213> Artificial Sequence

<220>
<223> prM+E LAV2

<400> 8

Phe His Leu Thr Thr Arg Asn Gly Glu Pro His Met Ile Val Ser Arg
1 5 10 15

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

Met Cys Thr Leu Met Ala Met Asp Leu Gly Glu Leu Cys Glu Asp Thr
35 40 45

Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile
50 55 60

Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys
65 70 75 80

Thr Thr Met Gly Glu His Arg Arg Glu Lys Arg Ser Val Ala Leu Val
85 90 95

Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser
100 105 110

Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile Glu Thr Trp Ile Leu
115 120 125

```
Arg His Pro Gly Phe Thr Met Met Ala Ala Ile Leu Ala Tyr Thr Ile
    130                 135                 140

Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe Ile Leu Leu Thr Ala
145                 150                 155                 160

Val Thr Pro Ser Met Thr Met Arg Cys Ile Gly Met Ser Asn Arg Asp
                165                 170                 175

Phe Val Glu Gly Val Ser Gly Gly Ser Trp Val Asp Ile Val Leu Glu
            180                 185                 190

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

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

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

Pro Thr Gln Gly Glu Pro Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe
                245                 250                 255

Val Cys Lys His Ser Met Val Asp Arg Gly Trp Gly Asn Gly Cys Gly
            260                 265                 270

Leu Phe Gly Lys Gly Gly Ile Val Thr Cys Ala Met Phe Arg Cys Lys
        275                 280                 285

Lys Asn Met Glu Gly Lys Val Val Gln Pro Glu Asn Leu Glu Tyr Thr
    290                 295                 300

Ile Val Ile Thr Pro His Ser Gly Glu Glu His Ala Val Gly Asn Asp
305                 310                 315                 320

Thr Gly Lys His Gly Lys Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile
                325                 330                 335

Thr Glu Ala Glu Leu Thr Gly Tyr Gly Thr Val Thr Met Glu Cys Ser
            340                 345                 350

Pro Arg Thr Gly Leu Asp Phe Asn Glu Met Val Leu Leu Gln Met Glu
        355                 360                 365

Asn Lys Ala Trp Leu Val His Arg Gln Trp Phe Leu Asp Leu Pro Leu
    370                 375                 380

Pro Trp Leu Pro Gly Ala Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys
385                 390                 395                 400
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```
Glu Thr Leu Val Thr Phe Lys Asn Pro His Ala Lys Lys Gln Asp Val
                405                 410                 415

Val Val Leu Gly Ser Gln Glu Gly Ala Met His Thr Ala Leu Thr Gly
            420                 425                 430

Ala Thr Glu Ile Gln Met Ser Ser Gly Asn Leu Leu Phe Thr Gly His
        435                 440                 445

Leu Lys Cys Arg Leu Arg Met Asp Lys Leu Gln Leu Lys Gly Met Ser
    450                 455                 460

Tyr Ser Met Cys Thr Gly Lys Phe Lys Val Val Lys Glu Ile Ala Glu
465                 470                 475                 480

Thr Gln His Gly Thr Ile Val Ile Arg Val Gln Tyr Glu Gly Asp Gly
                485                 490                 495

Ser Pro Cys Lys Ile Pro Phe Glu Ile Met Asp Leu Glu Lys Arg His
            500                 505                 510

Val Leu Gly Arg Leu Ile Thr Val Asn Pro Ile Val Thr Glu Lys Asp
        515                 520                 525

Ser Pro Val Asn Ile Glu Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile
    530                 535                 540

Ile Ile Gly Val Glu Pro Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys
545                 550                 555                 560

Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys
                565                 570                 575

Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly
            580                 585                 590

Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala
        595                 600                 605

Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu
    610                 615                 620

Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser
625                 630                 635                 640

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

Val Met Val Gln Ala
            660
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<210> 9
<211> 661
<212> PRT
<213> Artificial Sequence

<220>
<223> prM+E BID/V585

<400> 9

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Phe His Leu Thr Thr Arg Asn Gly Glu Pro His Met Ile Val Gly Arg
1               5                   10                  15

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

Met Cys Thr Leu Met Ala Ile Asp Leu Gly Glu Leu Cys Glu Asp Thr
        35                  40                  45

Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile
    50                  55                  60

Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys
65                  70                  75                  80

Thr Thr Thr Gly Glu His Arg Arg Glu Lys Arg Ser Val Ala Leu Val
                85                  90                  95

Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser
            100                 105                 110

Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile Glu Thr Trp Ile Leu
        115                 120                 125

Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile Leu Ala Tyr Thr Ile
    130                 135                 140

Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe Ile Leu Leu Thr Ala
145                 150                 155                 160

Val Ala Pro Ser Met Thr Met Arg Cys Ile Gly Ile Ser Asn Arg Asp
                165                 170                 175

Phe Val Glu Gly Val Ser Gly Gly Ser Trp Val Asp Ile Val Leu Glu
            180                 185                 190

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

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

Tyr Cys Ile Glu Ala Lys Leu Thr Asn Thr Thr Thr Glu Ser Arg Cys
```

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225                 230                 235                 240

Pro Thr Gln Gly Glu Pro Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe
                245                 250                 255

Ile Cys Lys His Ser Met Val Asp Arg Gly Trp Gly Asn Gly Cys Gly
            260                 265                 270

Leu Phe Gly Lys Gly Gly Ile Val Thr Cys Ala Met Phe Thr Cys Lys
        275                 280                 285

Lys Asn Met Glu Gly Lys Val Val Gln Pro Glu Asn Leu Glu Tyr Thr
    290                 295                 300

Ile Val Ile Thr Pro His Ser Gly Glu Glu His Ala Val Gly Asn Asp
305                 310                 315                 320

Thr Gly Lys His Gly Lys Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile
                325                 330                 335

Thr Glu Ala Glu Leu Thr Gly Tyr Gly Thr Val Thr Met Glu Cys Ser
            340                 345                 350

Pro Arg Thr Gly Leu Asp Phe Asn Glu Met Val Leu Leu Gln Met Glu
        355                 360                 365

Asp Lys Ala Trp Leu Val His Arg Gln Trp Phe Leu Asp Leu Pro Leu
    370                 375                 380

Pro Trp Leu Pro Gly Ala Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys
385                 390                 395                 400

Glu Thr Leu Val Thr Phe Lys Asn Pro His Ala Lys Lys Gln Asp Val
                405                 410                 415

Val Val Leu Gly Ser Gln Glu Gly Ala Met His Thr Ala Leu Thr Gly
            420                 425                 430

Ala Thr Glu Ile Gln Met Ser Ser Gly Asn Leu Leu Phe Thr Gly His
        435                 440                 445

Leu Lys Cys Arg Leu Arg Met Asp Lys Leu Gln Leu Lys Gly Met Ser
    450                 455                 460

Tyr Ser Met Cys Thr Gly Lys Phe Lys Ile Val Lys Glu Ile Ala Glu
465                 470                 475                 480

Thr Gln His Gly Thr Ile Val Ile Arg Val Gln Tyr Glu Gly Asp Gly
                485                 490                 495

Ser Pro Cys Lys Ile Pro Phe Glu Ile Met Asp Leu Glu Lys Arg His
```

500 505 510

Val Leu Gly Arg Leu Ile Thr Val Asn Pro Ile Val Thr Glu Lys Asp
515 520 525

Ser Pro Val Asn Ile Glu Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile
530 535 540

Ile Ile Gly Val Glu Pro Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys
545 550 555 560

Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys
565 570 575

Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly
580 585 590

Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala
595 600 605

Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu
610 615 620

Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser
625 630 635 640

Leu Ser Val Ser Leu Val Leu Val Gly Val Val Thr Leu Tyr Leu Gly
645 650 655

Val Met Val Gln Ala
660

<210> 10
<211> 661
<212> PRT
<213> Artificial Sequence

<220>
<223> prM+E PR/DB023

<400> 10

Phe His Leu Thr Thr Arg Asn Gly Glu Pro His Met Ile Val Gly Arg
1 5 10 15

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

Met Cys Thr Leu Met Ala Ile Asp Leu Gly Glu Leu Cys Glu Asp Thr
35 40 45

Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile
50 55 60

```
Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys
65                  70                  75                  80

Thr Thr Thr Gly Glu His Arg Arg Glu Lys Arg Ser Val Ala Leu Val
                85                  90                  95

Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser
            100                 105                 110

Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile Glu Thr Trp Ile Leu
        115                 120                 125

Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile Leu Ala Tyr Thr Ile
    130                 135                 140

Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe Ile Leu Leu Thr Ala
145                 150                 155                 160

Val Ala Pro Ser Met Thr Met Arg Cys Ile Gly Ile Ser Asn Arg Asp
                165                 170                 175

Phe Val Glu Gly Val Ser Gly Gly Ser Trp Val Asp Ile Val Leu Glu
            180                 185                 190

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

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

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

Pro Thr Gln Gly Glu Pro Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe
                245                 250                 255

Ile Cys Lys His Ser Met Val Asp Arg Gly Trp Gly Asn Gly Cys Gly
            260                 265                 270

Leu Phe Gly Lys Gly Gly Ile Val Thr Cys Ala Met Phe Thr Cys Lys
        275                 280                 285

Lys Asn Met Glu Gly Lys Val Val Leu Pro Glu Asn Leu Glu Tyr Thr
    290                 295                 300

Ile Val Ile Thr Pro His Ser Gly Glu Glu His Ala Val Gly Asn Asp
305                 310                 315                 320

Thr Gly Lys His Gly Lys Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile
                325                 330                 335
```

```
Thr Glu Ala Glu Leu Thr Gly Tyr Gly Thr Val Thr Met Glu Cys Ser
            340                 345                 350

Pro Arg Thr Gly Leu Asp Phe Asn Glu Met Val Leu Leu Gln Met Glu
        355                 360                 365

Asp Lys Ala Trp Leu Val His Arg Gln Trp Phe Leu Asp Leu Pro Leu
    370                 375                 380

Pro Trp Leu Pro Gly Ala Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys
385                 390                 395                 400

Glu Thr Leu Val Thr Phe Lys Asn Pro His Ala Lys Lys Gln Asp Val
                405                 410                 415

Val Val Leu Gly Ser Gln Glu Gly Ala Met His Thr Ala Leu Thr Gly
            420                 425                 430

Ala Thr Glu Ile Gln Met Ser Ser Gly Asn Leu Leu Phe Thr Gly His
        435                 440                 445

Leu Lys Cys Arg Leu Arg Met Asp Lys Leu Gln Leu Lys Gly Met Ser
    450                 455                 460

Tyr Ser Met Cys Thr Gly Lys Phe Lys Ile Val Lys Glu Ile Ala Glu
465                 470                 475                 480

Thr Gln His Gly Thr Ile Val Ile Arg Val Gln Tyr Glu Gly Asp Gly
                485                 490                 495

Ser Pro Cys Lys Ile Pro Phe Glu Ile Met Asp Leu Glu Lys Arg His
            500                 505                 510

Val Leu Gly Arg Leu Ile Thr Val Asn Pro Ile Val Thr Glu Lys Asp
        515                 520                 525

Ser Pro Val Asn Ile Glu Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile
    530                 535                 540

Ile Ile Gly Val Glu Pro Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys
545                 550                 555                 560

Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys
                565                 570                 575

Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly
            580                 585                 590

Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala
        595                 600                 605
```

```
Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu
    610                 615                 620

Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser
625                 630                 635                 640

Leu Ser Val Ser Leu Val Leu Val Gly Val Val Thr Leu Tyr Leu Gly
                645                 650                 655

Val Met Val Gln Ala
            660

<210>  11
<211>  661
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  prM+E MD1280

<400>  11

Phe His Leu Thr Thr Arg Asn Gly Glu Pro His Met Ile Val Gly Arg
1               5                   10                  15

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

Met Cys Thr Leu Met Ala Ile Asp Leu Gly Glu Leu Cys Glu Asp Thr
        35                  40                  45

Ile Thr Tyr Lys Cys Pro Leu Leu Arg Gln Asn Glu Pro Glu Asp Ile
    50                  55                  60

Asp Cys Trp Cys Asn Ser Thr Ser Thr Trp Val Thr Tyr Gly Thr Cys
65                  70                  75                  80

Thr Thr Thr Gly Glu His Arg Arg Glu Lys Arg Ser Val Ala Leu Val
                85                  90                  95

Pro His Val Gly Met Gly Leu Glu Thr Arg Thr Glu Thr Trp Met Ser
            100                 105                 110

Ser Glu Gly Ala Trp Lys His Ala Gln Arg Ile Glu Thr Trp Ile Leu
        115                 120                 125

Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile Leu Ala Tyr Thr Val
    130                 135                 140

Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe Ile Leu Leu Ala Ala
145                 150                 155                 160

Val Ala Pro Ser Met Thr Met Arg Cys Ile Gly Ile Ser Asn Arg Asp
```

```
                165                 170                 175

Phe Val Glu Gly Val Ser Gly Gly Ser Trp Val Asp Ile Val Leu Glu
            180                 185                 190

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

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

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

Pro Thr Gln Gly Glu Pro Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe
                245                 250                 255

Val Cys Lys His Ser Met Val Asp Arg Gly Trp Gly Asn Gly Cys Gly
            260                 265                 270

Leu Phe Gly Lys Gly Gly Ile Val Thr Cys Ala Met Phe Thr Cys Lys
        275                 280                 285

Lys Asn Met Glu Gly Lys Ile Val Gln Pro Glu Asn Leu Glu Tyr Thr
    290                 295                 300

Ile Val Ile Thr Pro His Ser Gly Glu Glu His Ala Val Gly Asn Asp
305                 310                 315                 320

Thr Gly Lys His Gly Lys Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile
                325                 330                 335

Thr Glu Ala Glu Leu Thr Gly Tyr Gly Thr Val Thr Met Glu Cys Ser
            340                 345                 350

Pro Arg Thr Gly Leu Asp Phe Asn Glu Met Val Leu Leu Gln Met Glu
        355                 360                 365

Asp Lys Ala Trp Leu Val His Arg Gln Trp Phe Leu Asp Leu Pro Leu
    370                 375                 380

Pro Trp Leu Pro Gly Ala Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys
385                 390                 395                 400

Glu Thr Leu Val Thr Phe Lys Asn Pro His Ala Lys Lys Gln Asp Val
                405                 410                 415

Val Val Leu Gly Ser Gln Glu Gly Ala Met His Thr Ala Leu Thr Gly
            420                 425                 430

Ala Thr Glu Ile Gln Met Ser Ser Gly Asn Leu Leu Phe Thr Gly His
```

435 440 445

Leu Lys Cys Arg Leu Arg Met Asp Lys Leu Gln Leu Lys Gly Met Ser
450 455 460

Tyr Ser Met Cys Thr Gly Lys Phe Lys Ile Val Lys Glu Ile Ala Glu
465 470 475 480

Thr Gln His Gly Thr Ile Val Ile Arg Val Gln Tyr Glu Gly Asp Gly
485 490 495

Ser Pro Cys Lys Ile Pro Phe Glu Ile Met Asp Leu Glu Lys Arg His
500 505 510

Val Leu Gly Arg Leu Ile Thr Val Asn Pro Ile Val Thr Glu Lys Asp
515 520 525

Ser Pro Val Asn Ile Glu Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile
530 535 540

Ile Ile Gly Val Glu Pro Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys
545 550 555 560

Gly Ser Ser Ile Gly Gln Met Phe Glu Thr Thr Met Arg Gly Ala Lys
565 570 575

Arg Met Ala Ile Leu Gly Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly
580 585 590

Gly Val Phe Thr Ser Ile Gly Lys Ala Leu His Gln Val Phe Gly Ala
595 600 605

Ile Tyr Gly Ala Ala Phe Ser Gly Val Ser Trp Thr Met Lys Ile Leu
610 615 620

Ile Gly Val Ile Ile Thr Trp Ile Gly Met Asn Ser Arg Ser Thr Ser
625 630 635 640

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

Ala Met Val Gln Ala
660

<210> 12
<211> 495
<212> PRT
<213> Artificial Sequence

<220>
<223> E universal

<220>
<221> Variant
<222> (129)..(129)
<223> Xaa can be Val or Ile

<220>
<221> Variant
<222> (308)..(308)
<223> Xaa can be Val or Ile

<400> 12

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Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1               5                   10                  15


Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30


Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
        35                  40                  45


Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
    50                  55                  60


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


Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Val Cys Lys His Ser Met
                85                  90                  95


Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
            100                 105                 110


Ile Val Thr Cys Ala Met Phe Thr Cys Lys Lys Asn Met Glu Gly Lys
        115                 120                 125


Xaa Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Ile Thr Pro His
    130                 135                 140


Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145                 150                 155                 160


Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
                165                 170                 175


Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190


Phe Asn Glu Met Val Leu Leu Gln Met Glu Asp Lys Ala Trp Leu Val
        195                 200                 205


His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220
```

```
Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240

Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Xaa Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
385                 390                 395                 400

Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
                405                 410                 415

Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
            420                 425                 430

Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
        435                 440                 445

Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
    450                 455                 460

Trp Ile Gly Met Asn Ser Arg Ser Thr Ser Leu Ser Val Ser Leu Val
465                 470                 475                 480

Leu Val Gly Val Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
                485                 490                 495
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<210> 13
<211> 495
<212> PRT
<213> Artificial Sequence

<220>
<223> E LAV2

<400> 13

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Met Arg Cys Ile Gly Met Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1               5                   10                  15

Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
        35                  40                  45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
    50                  55                  60

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

Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Val Cys Lys His Ser Met
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
            100                 105                 110

Ile Val Thr Cys Ala Met Phe Arg Cys Lys Lys Asn Met Glu Gly Lys
        115                 120                 125

Val Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Ile Thr Pro His
    130                 135                 140

Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145                 150                 155                 160

Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
                165                 170                 175

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asn Lys Ala Trp Leu Val
        195                 200                 205

His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220

Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240
```

```
Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Val Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
385                 390                 395                 400

Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
                405                 410                 415

Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
            420                 425                 430

Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
        435                 440                 445

Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
    450                 455                 460

Trp Ile Gly Met Asn Ser Arg Ser Thr Ser Leu Ser Val Thr Leu Val
465                 470                 475                 480

Leu Val Gly Ile Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
                485                 490                 495
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<210> 14
<211> 495

<212> PRT
<213> Artificial Sequence

<220>
<223> E BID/V585

<400> 14

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Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1               5                  10                  15

Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
        35                  40                  45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
    50                  55                  60

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

Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Ile Cys Lys His Ser Met
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
            100                 105                 110

Ile Val Thr Cys Ala Met Phe Thr Cys Lys Lys Asn Met Glu Gly Lys
        115                 120                 125

Val Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Ile Thr Pro His
    130                 135                 140

Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145                 150                 155                 160

Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
                165                 170                 175

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asp Lys Ala Trp Leu Val
        195                 200                 205

His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220

Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240
```

```
Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Ile Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
385                 390                 395                 400

Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
                405                 410                 415

Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
            420                 425                 430

Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
        435                 440                 445

Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
    450                 455                 460

Trp Ile Gly Met Asn Ser Arg Ser Thr Ser Leu Ser Val Ser Leu Val
465                 470                 475                 480

Leu Val Gly Val Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
                485                 490                 495
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<210> 15
<211> 495
<212> PRT
<213> Artificial Sequence

<220>
<223> E PR/DB023

<400> 15

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Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1               5                  10                  15

Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
        35                  40                  45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
    50                  55                  60

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

Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Ile Cys Lys His Ser Met
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
            100                 105                 110

Ile Val Thr Cys Ala Met Phe Thr Cys Lys Lys Asn Met Glu Gly Lys
        115                 120                 125

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

Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145                 150                 155                 160

Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
                165                 170                 175

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asp Lys Ala Trp Leu Val
        195                 200                 205

His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220

Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240

Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255
```

```
Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Ile Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
385                 390                 395                 400

Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
                405                 410                 415

Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
            420                 425                 430

Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
        435                 440                 445

Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
    450                 455                 460

Trp Ile Gly Met Asn Ser Arg Ser Thr Ser Leu Ser Val Ser Leu Val
465                 470                 475                 480

Leu Val Gly Val Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
                485                 490                 495
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<210> 16
<211> 495
<212> PRT
<213> Artificial Sequence

<220>

<223> E MD1280

<400> 16

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Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1               5                  10                  15

Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
            20                  25                  30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
        35                  40                  45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
    50                  55                  60

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

Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Val Cys Lys His Ser Met
                85                  90                  95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
            100                 105                 110

Ile Val Thr Cys Ala Met Phe Thr Cys Lys Lys Asn Met Glu Gly Lys
        115                 120                 125

Ile Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Ile Thr Pro His
    130                 135                 140

Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145                 150                 155                 160

Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
                165                 170                 175

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asp Lys Ala Trp Leu Val
        195                 200                 205

His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220

Asp Thr Gln Gly Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240

Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255
```

```
Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Ile Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
385                 390                 395                 400

Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
                405                 410                 415

Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
            420                 425                 430

Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
        435                 440                 445

Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
    450                 455                 460

Trp Ile Gly Met Asn Ser Arg Ser Thr Ser Leu Ser Val Ser Leu Val
465                 470                 475                 480

Leu Val Gly Ile Ile Thr Leu Tyr Leu Gly Ala Met Val Gln Ala
                485                 490                 495
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<210> 17
<211> 75
<212> PRT
<213> Artificial Sequence

<220>
<223> M consensus

<400> 17

Ser Val Ala Leu Val Pro His Val Gly Met Gly Leu Glu Thr Arg Thr
1 5 10 15

Glu Thr Trp Met Ser Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile
20 25 30

Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile
35 40 45

Leu Ala Tyr Thr Ile Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe
50 55 60

Ile Leu Leu Thr Ala Val Ala Pro Ser Met Thr
65 70 75

<210> 18
<211> 495
<212> PRT
<213> Artificial Sequence

<220>
<223> E circulating strain

<400> 18

Met Arg Cys Ile Gly Ile Ser Asn Arg Asp Phe Val Glu Gly Val Ser
1 5 10 15

Gly Gly Ser Trp Val Asp Ile Val Leu Glu His Gly Ser Cys Val Thr
20 25 30

Thr Met Ala Lys Asn Lys Pro Thr Leu Asp Phe Glu Leu Ile Lys Thr
35 40 45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
50 55 60

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

Ser Leu Lys Glu Glu Gln Asp Lys Arg Phe Val Cys Lys His Ser Met
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
100 105 110

Ile Val Thr Cys Ala Met Phe Thr Cys Lys Lys Asn Met Glu Gly Lys
115 120 125

Ile Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Val Thr Pro His
130 135 140

```
Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145                 150                 155                 160

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

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
            180                 185                 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asn Lys Ala Trp Leu Val
        195                 200                 205

His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala
    210                 215                 220

Asp Lys Gln Glu Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
225                 230                 235                 240

Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
                245                 250                 255

Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
            260                 265                 270

Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
        275                 280                 285

Met Asp Lys Leu Gln Leu Lys Gly Met Ser Tyr Ser Met Cys Thr Gly
    290                 295                 300

Lys Phe Lys Val Val Lys Glu Ile Ala Glu Thr Gln His Gly Thr Ile
305                 310                 315                 320

Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
                325                 330                 335

Phe Glu Ile Met Asp Leu Glu Lys Arg Tyr Val Leu Gly Arg Leu Ile
            340                 345                 350

Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
        355                 360                 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
    370                 375                 380

Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
385                 390                 395                 400

Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
                405                 410                 415
```

```
Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
            420                 425                 430


Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
        435                 440                 445


Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
    450                 455                 460


Trp Ile Gly Met Asn Ser Arg Ser Thr Ser Leu Ser Val Ser Leu Val
465                 470                 475                 480


Leu Val Gly Ile Val Thr Leu Tyr Leu Gly Val Met Val Gln Ala
                485                 490                 495


<210>  19
<211>  75
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  M LAV2

<400>  19

Ser Val Ala Leu Val Pro His Val Gly Met Gly Leu Glu Thr Arg Thr
1               5                   10                  15


Glu Thr Trp Met Ser Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile
            20                  25                  30


Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Met Met Ala Ala Ile
        35                  40                  45


Leu Ala Tyr Thr Ile Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe
    50                  55                  60


Ile Leu Leu Thr Ala Val Thr Pro Ser Met Thr
65                  70                  75


<210>  20
<211>  75
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  M BID/V585

<400>  20

Ser Val Ala Leu Val Pro His Val Gly Met Gly Leu Glu Thr Arg Thr
1               5                   10                  15


Glu Thr Trp Met Ser Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile
            20                  25                  30
```

```
Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile
        35                  40                  45


Leu Ala Tyr Thr Ile Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe
    50                  55                  60


Ile Leu Leu Thr Ala Val Ala Pro Ser Met Thr
65                  70                  75


<210>  21
<211>  75
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  M PR/DB023

<400>  21

Ser Val Ala Leu Val Pro His Val Gly Met Gly Leu Glu Thr Arg Thr
1               5                   10                  15


Glu Thr Trp Met Ser Ser Glu Gly Ala Trp Lys His Val Gln Arg Ile
            20                  25                  30


Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile
        35                  40                  45


Leu Ala Tyr Thr Ile Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe
    50                  55                  60


Ile Leu Leu Thr Ala Val Ala Pro Ser Met Thr
65                  70                  75


<210>  22
<211>  75
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  M MD1280

<400>  22

Ser Val Ala Leu Val Pro His Val Gly Met Gly Leu Glu Thr Arg Thr
1               5                   10                  15


Glu Thr Trp Met Ser Ser Glu Gly Ala Trp Lys His Ala Gln Arg Ile
            20                  25                  30


Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile
        35                  40                  45


Leu Ala Tyr Thr Val Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe
    50                  55                  60
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Ile Leu Leu Ala Ala Val Ala Pro Ser Met Thr
65 70 75

<210> 23
<211> 75
<212> PRT
<213> Artificial Sequence

<220>
<223> M clinical trial circulating strain

<400> 23

Ser Val Ala Leu Val Pro His Val Gly Met Gly Leu Glu Thr Arg Thr
1 5 10 15

Glu Thr Trp Met Ser Ser Glu Gly Ala Trp Lys His Ala Gln Arg Ile
20 25 30

Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Ile Met Ala Ala Ile
35 40 45

Leu Ala Tyr Thr Ile Gly Thr Thr His Phe Gln Arg Val Leu Ile Phe
50 55 60

Ile Leu Leu Thr Ala Val Ala Pro Ser Met Thr
65 70 75

<210> 24
<211> 10723
<212> RNA
<213> Artificial Sequence

<220>
<223> VDV2

<400> 24
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guucuaacag uuuuuuaauu agagagcaga ucucugauga auaaccaacg gaaaaaggcg 120

aaaaacacgc cuuucaauau gcugaaacgc gagagaaacc gcgugucgac ugugcaacag 180

cugacaaaga gauucucacu uggaaugcug cagggacgag gaccauuaaa acuguucaug 240

gcccuggugg cguuccuucg uuuccuaaca aucccaccaa cagcagggau auugaagaga 300

uggggaacaa uuaaaaaauc aaaagcuauu aauguuuuga gaggguucag gaaagagauu 360

ggaaggaugc ugaacaucuu gaauaggaga cgcagaucug caggcaugau cauuaugcug 420

auuccaacag ugauggcguu ccauuuaacc acacguaacg gagaaccaca caugaucguc 480

agcagacaag agaaagggaa aagucuucug uuuaaaacag agguuggcgu gaacaugugu 540

acccucaugg ccauggaccu uggugaauug ugugaagaca caaucacgua caaguguccc 600

cuucucaggc agaaugagcc agaagacaua gacuguuggu gcaacucuac guccacgugg 660

guaacuuaug ggacguguac caccauggga gaacauagaa gagaaaaaag aucaguggca 720

cucguuccac augugcgaau gggacuggag acacgaacug aaacauggau gucaucagaa 780

ggggccugga aacaugucca gagaauugaa acuuggaucu ugagacaucc aggcuucacc 840

augauggcag caauccuggc auacaccaua ggaacgacac auuuccaaag agcccugauu 900

uucaucuuac ugacagcugu cacuccuuca augacaaugc guugcauagg aaugucaaau 960

agagacuuug uggaaggggu uucaggagga agcuggguug acauagucuu agaacaugga 1020

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guugugcaac cagaaaacuu ggaauacacc auugugauaa caccucacuc aggggaagag 1380

caugcagucg gaaaugacac aggaaaacau ggcaaggaaa ucaaaauaac accacagagu 1440

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gauguuguug uuuuaggauc ccaagaaggg gccaugcaca cagcacuuac aggggccaca 1740

gaaauccaaa ugucaucagg aaacuuacuc uucacaggac aucucaagug caggcugaga 1800

auggacaagc uacagcucaa aggaauguca uacucuaugu gcacaggaaa guuuaaaguu 1860

gugaaggaaa uagcagaaac acaacaugga acaauaguua ucagagugca auaugaaggg 1920

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ggucgccuga uuacagucaa cccaauugug acagaaaaag auagcccagu caacauagaa 2040

gcagaaccuc cauuuggaga cagcuacauc aucauaggag uagagccggg acaacugaag 2100

cucaacuggu uuaagaaagg aaguucuauc ggccaaaugu uugagacaac aaugaggggg 2160

gcgaagagaa uggccauuuu aggugacaca gccugggauu uuggauccuu gggaggagug 2220

uuuacaucua uaggaaaggc ucuccaccaa gucuuuggag caaucuaugg agcugccuuc 2280

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aaacaggaug uauucugcga cucaaaacuc augucagcgg ccauaaaaga caacagagcc 3000

guccaugccg auauggguua uuggauagaa agugcacuca augacacaug gaagauagag 3060

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aauggagugc uagaaaguga gaugauaauu ccaaagaauc ucgcuggacc agugucucaa 3180

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cgaucuugca cauuaccacc gcuaagauac agaggugagg augggugcug guacgggaug 3420

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augcuuagga cccgaguagg aacgaaacau gcaauacuac uaguugcagu uucuuuugug 3600

acauugauca cagggaacau guccuuuaga gaccugggaa gagugauggu uaugguaggc 3660

gccacuauga cggaugacau agguaugggc gugacuuauc uugcccuacu agcagccuuc 3720

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gaguugacug augcguuagc cuuaggcaug augguccuca aaauggugag aaauauggaa 3900

aaguaucaau uggcagugac uaucauggcu aucuugugcg ucccaaacgc agugauauua 3960

caaaacgcau ggaaagugag uugcacaaua uuggcagugg uguccguuuc cccacuguuc 4020

uuaacauccu cacagcaaaa aacagauugg auaccauuag cauugacgau caaaggucuc 4080

aauccaacag cuauuuuucu aacaacccuc ucaagaacca gcaagaaaag gagcuggcca 4140

uuaaaugagg cuaucauggc agucgggaug gugagcauuu uagccaguuc ucuccuaaaa 4200

aaugauauuc ccaugacagg accauuagug gcuggagggc uccucacugu gugcuacgug 4260

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ucccagaucg gagccggagu uuacaaagaa ggaacauucc auacaaugug gcaugucaca 4680

cguggcgcug uucuaaugca uaaaggaaag aggauugaac caacaugggc ggacgucaag 4740

aaagaccuaa uaucauaugg aggaggcugg aaguuagaag gagaauggaa ggaaggagaa 4800

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35 40 45

Glu Ala Lys Gln Pro Ala Thr Leu Arg Lys Tyr Cys Ile Glu Ala Lys
50 55 60

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

Ser Leu Asn Glu Glu Gln Asp Lys Arg Phe Val Cys Lys His Ser Met
85 90 95

Val Asp Arg Gly Trp Gly Asn Gly Cys Gly Leu Phe Gly Lys Gly Gly
100 105 110

Ile Val Thr Cys Ala Met Phe Arg Cys Lys Lys Asn Met Glu Gly Lys
115 120 125

Val Val Gln Pro Glu Asn Leu Glu Tyr Thr Ile Val Ile Thr Pro His
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Ser Gly Glu Glu His Ala Val Gly Asn Asp Thr Gly Lys His Gly Lys
145 150 155 160

Glu Ile Lys Ile Thr Pro Gln Ser Ser Ile Thr Glu Ala Glu Leu Thr
165 170 175

Gly Tyr Gly Thr Val Thr Met Glu Cys Ser Pro Arg Thr Gly Leu Asp
180 185 190

Phe Asn Glu Met Val Leu Leu Gln Met Glu Asn Lys Ala Trp Leu Val
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His Arg Gln Trp Phe Leu Asp Leu Pro Leu Pro Trp Leu Pro Gly Ala

210 215 220

Asp Thr Gln Glu Ser Asn Trp Ile Gln Lys Glu Thr Leu Val Thr Phe
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Lys Asn Pro His Ala Lys Lys Gln Asp Val Val Val Leu Gly Ser Gln
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Glu Gly Ala Met His Thr Ala Leu Thr Gly Ala Thr Glu Ile Gln Met
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Ser Ser Gly Asn Leu Leu Phe Thr Gly His Leu Lys Cys Arg Leu Arg
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Val Ile Arg Val Gln Tyr Glu Gly Asp Gly Ser Pro Cys Lys Ile Pro
325 330 335

Phe Glu Ile Met Asp Leu Glu Lys Arg His Val Leu Gly Arg Leu Ile
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Thr Val Asn Pro Ile Val Thr Glu Lys Asp Ser Pro Val Asn Ile Glu
355 360 365

Ala Glu Pro Pro Phe Gly Asp Ser Tyr Ile Ile Ile Gly Val Glu Pro
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Gly Gln Leu Lys Leu Asn Trp Phe Lys Lys Gly Ser Ser Ile Gly Gln
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Met Phe Glu Thr Thr Met Arg Gly Ala Lys Arg Met Ala Ile Leu Gly
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Asp Thr Ala Trp Asp Phe Gly Ser Leu Gly Gly Val Phe Thr Ser Ile
420 425 430

Gly Lys Ala Leu His Gln Val Phe Gly Ala Ile Tyr Gly Ala Ala Phe
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Ser Gly Val Ser Trp Thr Met Lys Ile Leu Ile Gly Val Ile Ile Thr
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20 25 30

Glu Thr Trp Ile Leu Arg His Pro Gly Phe Thr Met Met Ala Ala Ile
35 40 45

Leu Ala Tyr Thr Ile Gly Thr Thr His Phe Gln Arg Ala Leu Ile Phe
50 55 60

Ile Leu Leu Thr Ala Val Thr Pro Ser Met Thr
65 70 75