SEQUENCE LISTING

<110> Advaxis, Inc.

<120> LISTERIA-BASED COMPOSITIONS COMPRISING A PEPTIDE MINIGENE EXPRESSION SYSTEM AND METHODS OF USE THEREOF

<130> P-78709-PC

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<151> 2015-03-03

<160> 72

<170> PatentIn version 3.5

<210> 1
<211> 529
<212> PRT
<213> Artificial Sequence

<220>
<223> LLO protein

<400> 1

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


Pro Ile Ala Gln Gln Thr Glu Ala Lys Asp Ala Ser Ala Phe Asn Lys
            20                  25                  30


Glu Asn Ser Ile Ser Ser Met Ala Pro Pro Ala Ser Pro Pro Ala Ser
        35                  40                  45


Pro Lys Thr Pro Ile Glu Lys Lys His Ala Asp Glu Ile Asp Lys Tyr
    50                  55                  60


Ile Gln Gly Leu Asp Tyr Asn Lys Asn Asn Val Leu Val Tyr His Gly
65                  70                  75                  80


Asp Ala Val Thr Asn Val Pro Pro Arg Lys Gly Tyr Lys Asp Gly Asn
                85                  90                  95


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


Ala Asp Ile Gln Val Val Asn Ala Ile Ser Ser Leu Thr Tyr Pro Gly
        115                 120                 125


Ala Leu Val Lys Ala Asn Ser Glu Leu Val Glu Asn Gln Pro Asp Val
    130                 135                 140
```

```
Leu Pro Val Lys Arg Asp Ser Leu Thr Leu Ser Ile Asp Leu Pro Gly
145                 150                 155                 160

Met Thr Asn Gln Asp Asn Lys Ile Val Val Lys Asn Ala Thr Lys Ser
                165                 170                 175

Asn Val Asn Asn Ala Val Asn Thr Leu Val Glu Arg Trp Asn Glu Lys
            180                 185                 190

Tyr Ala Gln Ala Tyr Pro Asn Val Ser Ala Lys Ile Asp Tyr Asp Asp
        195                 200                 205

Glu Met Ala Tyr Ser Glu Ser Gln Leu Ile Ala Lys Phe Gly Thr Ala
    210                 215                 220

Phe Lys Ala Val Asn Asn Ser Leu Asn Val Asn Phe Gly Ala Ile Ser
225                 230                 235                 240

Glu Gly Lys Met Gln Glu Glu Val Ile Ser Phe Lys Gln Ile Tyr Tyr
                245                 250                 255

Asn Val Asn Val Asn Glu Pro Thr Arg Pro Ser Arg Phe Phe Gly Lys
            260                 265                 270

Ala Val Thr Lys Glu Gln Leu Gln Ala Leu Gly Val Asn Ala Glu Asn
        275                 280                 285

Pro Pro Ala Tyr Ile Ser Ser Val Ala Tyr Gly Arg Gln Val Tyr Leu
    290                 295                 300

Lys Leu Ser Thr Asn Ser His Ser Thr Lys Val Lys Ala Ala Phe Asp
305                 310                 315                 320

Ala Ala Val Ser Gly Lys Ser Val Ser Gly Asp Val Glu Leu Thr Asn
                325                 330                 335

Ile Ile Lys Asn Ser Ser Phe Lys Ala Val Ile Tyr Gly Gly Ser Ala
            340                 345                 350

Lys Asp Glu Val Gln Ile Ile Asp Gly Asn Leu Gly Asp Leu Arg Asp
        355                 360                 365

Ile Leu Lys Lys Gly Ala Thr Phe Asn Arg Glu Thr Pro Gly Val Pro
    370                 375                 380

Ile Ala Tyr Thr Thr Asn Phe Leu Lys Asp Asn Glu Leu Ala Val Ile
385                 390                 395                 400
```

```
Lys Asn Asn Ser Glu Tyr Ile Glu Thr Thr Ser Lys Ala Tyr Thr Asp
                405                 410                 415

Gly Lys Ile Asn Ile Asp His Ser Gly Gly Tyr Val Ala Gln Phe Asn
            420                 425                 430

Ile Ser Trp Asp Glu Val Asn Tyr Asp Pro Glu Gly Asn Glu Ile Val
        435                 440                 445

Gln His Lys Asn Trp Ser Glu Asn Asn Lys Ser Lys Leu Ala His Phe
    450                 455                 460

Thr Ser Ser Ile Tyr Leu Pro Gly Asn Ala Arg Asn Ile Asn Val Tyr
465                 470                 475                 480

Ala Lys Glu Cys Thr Gly Leu Ala Trp Glu Trp Trp Arg Thr Val Ile
                485                 490                 495

Asp Asp Arg Asn Leu Pro Leu Val Lys Asn Arg Asn Ile Ser Ile Trp
            500                 505                 510

Gly Thr Thr Leu Tyr Pro Lys Tyr Ser Asn Lys Val Asp Asn Pro Ile
        515                 520                 525

Glu
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<210> 2
<211> 441
<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal fragment of an LLO protein

<400> 2

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

Pro Ile Ala Gln Gln Thr Glu Ala Lys Asp Ala Ser Ala Phe Asn Lys
            20                  25                  30

Glu Asn Ser Ile Ser Ser Val Ala Pro Pro Ala Ser Pro Pro Ala Ser
        35                  40                  45

Pro Lys Thr Pro Ile Glu Lys Lys His Ala Asp Glu Ile Asp Lys Tyr
    50                  55                  60
```

```
Ile Gln Gly Leu Asp Tyr Asn Lys Asn Asn Val Leu Val Tyr His Gly
65                  70                  75                  80

Asp Ala Val Thr Asn Val Pro Pro Arg Lys Gly Tyr Lys Asp Gly Asn
                85                  90                  95

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

Ala Asp Ile Gln Val Val Asn Ala Ile Ser Ser Leu Thr Tyr Pro Gly
        115                 120                 125

Ala Leu Val Lys Ala Asn Ser Glu Leu Val Glu Asn Gln Pro Asp Val
    130                 135                 140

Leu Pro Val Lys Arg Asp Ser Leu Thr Leu Ser Ile Asp Leu Pro Gly
145                 150                 155                 160

Met Thr Asn Gln Asp Asn Lys Ile Val Val Lys Asn Ala Thr Lys Ser
                165                 170                 175

Asn Val Asn Asn Ala Val Asn Thr Leu Val Glu Arg Trp Asn Glu Lys
            180                 185                 190

Tyr Ala Gln Ala Tyr Ser Asn Val Ser Ala Lys Ile Asp Tyr Asp Asp
        195                 200                 205

Glu Met Ala Tyr Ser Glu Ser Gln Leu Ile Ala Lys Phe Gly Thr Ala
    210                 215                 220

Phe Lys Ala Val Asn Asn Ser Leu Asn Val Asn Phe Gly Ala Ile Ser
225                 230                 235                 240

Glu Gly Lys Met Gln Glu Glu Val Ile Ser Phe Lys Gln Ile Tyr Tyr
                245                 250                 255

Asn Val Asn Val Asn Glu Pro Thr Arg Pro Ser Arg Phe Phe Gly Lys
            260                 265                 270

Ala Val Thr Lys Glu Gln Leu Gln Ala Leu Gly Val Asn Ala Glu Asn
        275                 280                 285

Pro Pro Ala Tyr Ile Ser Ser Val Ala Tyr Gly Arg Gln Val Tyr Leu
    290                 295                 300

Lys Leu Ser Thr Asn Ser His Ser Thr Lys Val Lys Ala Ala Phe Asp
305                 310                 315                 320
```

```
Ala Ala Val Ser Gly Lys Ser Val Ser Gly Asp Val Glu Leu Thr Asn
                325                 330                 335

Ile Ile Lys Asn Ser Ser Phe Lys Ala Val Ile Tyr Gly Gly Ser Ala
            340                 345                 350

Lys Asp Glu Val Gln Ile Ile Asp Gly Asn Leu Gly Asp Leu Arg Asp
        355                 360                 365

Ile Leu Lys Lys Gly Ala Thr Phe Asn Arg Glu Thr Pro Gly Val Pro
    370                 375                 380

Ile Ala Tyr Thr Thr Asn Phe Leu Lys Asp Asn Glu Leu Ala Val Ile
385                 390                 395                 400

Lys Asn Asn Ser Glu Tyr Ile Glu Thr Thr Ser Lys Ala Tyr Thr Asp
                405                 410                 415

Gly Lys Ile Asn Ile Asp His Ser Gly Gly Tyr Val Ala Gln Phe Asn
            420                 425                 430

Ile Ser Trp Asp Glu Val Asn Tyr Asp
        435                 440
```

<210> 3
<211> 416
<212> PRT
<213> Artificial Sequence

<220>
<223> LLO fragment

<400> 3

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

Pro Ile Ala Gln Gln Thr Glu Ala Lys Asp Ala Ser Ala Phe Asn Lys
            20                  25                  30

Glu Asn Ser Ile Ser Ser Val Ala Pro Pro Ala Ser Pro Pro Ala Ser
        35                  40                  45

Pro Lys Thr Pro Ile Glu Lys Lys His Ala Asp Glu Ile Asp Lys Tyr
    50                  55                  60

Ile Gln Gly Leu Asp Tyr Asn Lys Asn Asn Val Leu Val Tyr His Gly
65                  70                  75                  80
```

```
Asp Ala Val Thr Asn Val Pro Pro Arg Lys Gly Tyr Lys Asp Gly Asn
                85                  90                  95

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

Ala Asp Ile Gln Val Val Asn Ala Ile Ser Ser Leu Thr Tyr Pro Gly
        115                 120                 125

Ala Leu Val Lys Ala Asn Ser Glu Leu Val Glu Asn Gln Pro Asp Val
    130                 135                 140

Leu Pro Val Lys Arg Asp Ser Leu Thr Leu Ser Ile Asp Leu Pro Gly
145                 150                 155                 160

Met Thr Asn Gln Asp Asn Lys Ile Val Val Lys Asn Ala Thr Lys Ser
                165                 170                 175

Asn Val Asn Asn Ala Val Asn Thr Leu Val Glu Arg Trp Asn Glu Lys
            180                 185                 190

Tyr Ala Gln Ala Tyr Ser Asn Val Ser Ala Lys Ile Asp Tyr Asp Asp
        195                 200                 205

Glu Met Ala Tyr Ser Glu Ser Gln Leu Ile Ala Lys Phe Gly Thr Ala
    210                 215                 220

Phe Lys Ala Val Asn Asn Ser Leu Asn Val Asn Phe Gly Ala Ile Ser
225                 230                 235                 240

Glu Gly Lys Met Gln Glu Glu Val Ile Ser Phe Lys Gln Ile Tyr Tyr
                245                 250                 255

Asn Val Asn Val Asn Glu Pro Thr Arg Pro Ser Arg Phe Phe Gly Lys
            260                 265                 270

Ala Val Thr Lys Glu Gln Leu Gln Ala Leu Gly Val Asn Ala Glu Asn
        275                 280                 285

Pro Pro Ala Tyr Ile Ser Ser Val Ala Tyr Gly Arg Gln Val Tyr Leu
    290                 295                 300

Lys Leu Ser Thr Asn Ser His Ser Thr Lys Val Lys Ala Ala Phe Asp
305                 310                 315                 320

Ala Ala Val Ser Gly Lys Ser Val Ser Gly Asp Val Glu Leu Thr Asn
                325                 330                 335
```

```
Ile Ile Lys Asn Ser Ser Phe Lys Ala Val Ile Tyr Gly Gly Ser Ala
            340                 345                 350

Lys Asp Glu Val Gln Ile Ile Asp Gly Asn Leu Gly Asp Leu Arg Asp
        355                 360                 365

Ile Leu Lys Lys Gly Ala Thr Phe Asn Arg Glu Thr Pro Gly Val Pro
    370                 375                 380

Ile Ala Tyr Thr Thr Asn Phe Leu Lys Asp Asn Glu Leu Ala Val Ile
385                 390                 395                 400

Lys Asn Asn Ser Glu Tyr Ile Glu Thr Thr Ser Lys Ala Tyr Thr Asp
                405                 410                 415
```

<210> 4
<211> 25
<212> PRT
<213> Artificial Sequence

<220>
<223> LLO signal peptide

<400> 4

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

Pro Ile Ala Gln Gln Thr Glu Ala Lys
            20                  25
```

<210> 5
<211> 639
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence ecoding an ActA protein

<400> 5

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Met Gly Leu Asn Arg Phe Met Arg Ala Met Met Val Val Phe Ile Thr
1               5                   10                  15

Ala Asn Cys Ile Thr Ile Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp
            20                  25                  30

Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr
        35                  40                  45

Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala
    50                  55                  60
```

```
Arg Glu Val Ser Ser Arg Asp Ile Lys Glu Leu Glu Lys Ser Asn Lys
65                  70                  75                  80

Val Arg Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu Lys Glu Lys
                85                  90                  95

Ala Glu Lys Gly Pro Asn Ile Asn Asn Asn Asn Ser Glu Gln Thr Glu
            100                 105                 110

Asn Ala Ala Ile Asn Glu Glu Ala Ser Gly Ala Asp Arg Pro Ala Ile
        115                 120                 125

Gln Val Glu Arg Arg His Pro Gly Leu Pro Ser Asp Ser Ala Ala Glu
    130                 135                 140

Ile Lys Lys Arg Arg Lys Ala Ile Ala Ser Ser Asp Ser Glu Leu Glu
145                 150                 155                 160

Ser Leu Thr Tyr Pro Asp Lys Pro Thr Lys Val Asn Lys Lys Lys Val
                165                 170                 175

Ala Lys Glu Ser Val Ala Asp Ala Ser Glu Ser Asp Leu Asp Ser Ser
            180                 185                 190

Met Gln Ser Ala Asp Glu Ser Ser Pro Gln Pro Leu Lys Ala Asn Gln
        195                 200                 205

Gln Pro Phe Phe Pro Lys Val Phe Lys Lys Ile Lys Asp Ala Gly Lys
    210                 215                 220

Trp Val Arg Asp Lys Ile Asp Glu Asn Pro Glu Val Lys Lys Ala Ile
225                 230                 235                 240

Val Asp Lys Ser Ala Gly Leu Ile Asp Gln Leu Leu Thr Lys Lys Lys
                245                 250                 255

Ser Glu Glu Val Asn Ala Ser Asp Phe Pro Pro Pro Pro Thr Asp Glu
            260                 265                 270

Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro Met Leu Leu Gly Phe Asn
        275                 280                 285

Ala Pro Ala Thr Ser Glu Pro Ser Ser Phe Glu Phe Pro Pro Pro Pro
    290                 295                 300

Thr Asp Glu Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro Met Leu Leu
```

```
305                 310                 315                 320

Gly Phe Asn Ala Pro Ala Thr Ser Glu Pro Ser Ser Phe Glu Phe Pro
                325                 330                 335

Pro Pro Pro Thr Glu Asp Glu Leu Glu Ile Ile Arg Glu Thr Ala Ser
            340                 345                 350

Ser Leu Asp Ser Ser Phe Thr Arg Gly Asp Leu Ala Ser Leu Arg Asn
        355                 360                 365

Ala Ile Asn Arg His Ser Gln Asn Phe Ser Asp Phe Pro Pro Ile Pro
    370                 375                 380

Thr Glu Glu Glu Leu Asn Gly Arg Gly Gly Arg Pro Thr Ser Glu Glu
385                 390                 395                 400

Phe Ser Ser Leu Asn Ser Gly Asp Phe Thr Asp Asp Glu Asn Ser Glu
                405                 410                 415

Thr Thr Glu Glu Glu Ile Asp Arg Leu Ala Asp Leu Arg Asp Arg Gly
            420                 425                 430

Thr Gly Lys His Ser Arg Asn Ala Gly Phe Leu Pro Leu Asn Pro Phe
        435                 440                 445

Ala Ser Ser Pro Val Pro Ser Leu Ser Pro Lys Val Ser Lys Ile Ser
    450                 455                 460

Asp Arg Ala Leu Ile Ser Asp Ile Thr Lys Lys Thr Pro Phe Lys Asn
465                 470                 475                 480

Pro Ser Gln Pro Leu Asn Val Phe Asn Lys Lys Thr Thr Thr Lys Thr
                485                 490                 495

Val Thr Lys Lys Pro Thr Pro Val Lys Thr Ala Pro Lys Leu Ala Glu
            500                 505                 510

Leu Pro Ala Thr Lys Pro Gln Glu Thr Val Leu Arg Glu Asn Lys Thr
        515                 520                 525

Pro Phe Ile Glu Lys Gln Ala Glu Thr Asn Lys Gln Ser Ile Asn Met
    530                 535                 540

Pro Ser Leu Pro Val Ile Gln Lys Glu Ala Thr Glu Ser Asp Lys Glu
545                 550                 555                 560
```

```
Glu Met Lys Pro Gln Thr Glu Glu Lys Met Val Glu Glu Ser Glu Ser
                565                 570                 575

Ala Asn Asn Ala Asn Gly Lys Asn Arg Ser Ala Gly Ile Glu Glu Gly
            580                 585                 590

Lys Leu Ile Ala Lys Ser Ala Glu Asp Glu Lys Ala Lys Glu Glu Pro
        595                 600                 605

Gly Asn His Thr Thr Leu Ile Leu Ala Met Leu Ala Ile Gly Val Phe
    610                 615                 620

Ser Leu Gly Ala Phe Ile Lys Ile Ile Gln Leu Arg Lys Asn Asn
625                 630                 635
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<210> 6
<211> 1170
<212> DNA
<213> Artificial Sequence

<220>
<223> Recombinant nucleotide encoding a truncated ActA protein

<400> 6

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atatttgcag cgacagatag cgaagattct agtctaaaca cagatgaatg ggaagaagaa      120

aaaacagaag agcaaccaag cgaggtaaat acgggaccaa gatacgaaac tgcacgtgaa      180

gtaagttcac gtgatattaa agaactagaa aaatcgaata aagtgagaaa tacgaacaaa      240

gcagacctaa tagcaatgtt gaaagaaaaa gcagaaaaag gtccaaatat caataataac      300

aacagtgaac aaactgagaa tgcggctata aatgaagagg cttcaggagc cgaccgacca      360

gctatacaag tggagcgtcg tcatccagga ttgccatcgg atagcgcagc ggaaattaaa      420

aaaagaagga aagccatagc atcatcggat agtgagcttg aaagccttac ttatccggat      480

aaaccaacaa aagtaaataa gaaaaaagtg gcgaaagagt cagttgcgga tgcttctgaa      540

agtgacttag attctagcat gcagtcagca gatgagtctt caccacaacc tttaaaagca      600

aaccaacaac catttttccc taaagtattt aaaaaaataa aagatgcggg gaaatgggta      660

cgtgataaaa tcgacgaaaa tcctgaagta aagaaagcga ttgttgataa aagtgcaggg      720

ttaattgacc aattattaac caaaaagaaa agtgaagagg taaatgcttc ggacttcccg      780

ccaccaccta cggatgaaga gttaagactt gctttgccag agacaccaat gcttcttggt      840

tttaatgctc ctgctacatc agaaccgagc tcattcgaat ttccaccacc acctacggat      900

gaagagttaa gacttgcttt gccagagacg ccaatgcttc ttggttttaa tgctcctgct      960

acatcggaac cgagctcgtt cgaatttcca ccgcctccaa cagaagatga actagaaatc     1020
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atccgggaaa cagcatcctc gctagattct agttttacaa gaggggattt agctagtttg 1080

agaaatgcta ttaatcgcca tagtcaaaat ttctctgatt tcccaccaat cccaacagaa 1140

gaagagttga acgggagagg cggtagacca 1170

<210> 7
<211> 639
<212> PRT
<213> Artificial Sequence

<220>
<223> ActA protein

<400> 7

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Met Gly Leu Asn Arg Phe Met Arg Ala Met Met Val Val Phe Ile Thr
1               5                  10                  15

Ala Asn Cys Ile Thr Ile Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp
            20                  25                  30

Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr
        35                  40                  45

Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala
    50                  55                  60

Arg Glu Val Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys Ser Asn Lys
65                  70                  75                  80

Val Lys Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu Lys Ala Lys
                85                  90                  95

Ala Glu Lys Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu Gln Thr Gly
            100                 105                 110

Asn Val Ala Ile Asn Glu Glu Ala Ser Gly Val Asp Arg Pro Thr Leu
        115                 120                 125

Gln Val Glu Arg Arg His Pro Gly Leu Ser Ser Asp Ser Ala Ala Glu
    130                 135                 140

Ile Lys Lys Arg Arg Lys Ala Ile Ala Ser Ser Asp Ser Glu Leu Glu
145                 150                 155                 160

Ser Leu Thr Tyr Pro Asp Lys Pro Thr Lys Ala Asn Lys Arg Lys Val
                165                 170                 175

Ala Lys Glu Ser Val Val Asp Ala Ser Glu Ser Asp Leu Asp Ser Ser
            180                 185                 190
```

```
Met Gln Ser Ala Asp Glu Ser Thr Pro Gln Pro Leu Lys Ala Asn Gln
        195                 200                 205

Lys Pro Phe Phe Pro Lys Val Phe Lys Lys Ile Lys Asp Ala Gly Lys
    210                 215                 220

Trp Val Arg Asp Lys Ile Asp Glu Asn Pro Glu Val Lys Lys Ala Ile
225                 230                 235                 240

Val Asp Lys Ser Ala Gly Leu Ile Asp Gln Leu Leu Thr Lys Lys Lys
                245                 250                 255

Ser Glu Glu Val Asn Ala Ser Asp Phe Pro Pro Pro Pro Thr Asp Glu
            260                 265                 270

Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro Met Leu Leu Gly Phe Asn
        275                 280                 285

Ala Pro Thr Pro Ser Glu Pro Ser Ser Phe Glu Phe Pro Pro Pro Pro
    290                 295                 300

Thr Asp Glu Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro Met Leu Leu
305                 310                 315                 320

Gly Phe Asn Ala Pro Ala Thr Ser Glu Pro Ser Ser Phe Glu Phe Pro
                325                 330                 335

Pro Pro Pro Thr Glu Asp Glu Leu Glu Ile Met Arg Glu Thr Ala Pro
            340                 345                 350

Ser Leu Asp Ser Ser Phe Thr Ser Gly Asp Leu Ala Ser Leu Arg Ser
        355                 360                 365

Ala Ile Asn Arg His Ser Glu Asn Phe Ser Asp Phe Pro Pro Ile Pro
    370                 375                 380

Thr Glu Glu Glu Leu Asn Gly Arg Gly Gly Arg Pro Thr Ser Glu Glu
385                 390                 395                 400

Phe Ser Ser Leu Asn Ser Gly Asp Phe Thr Asp Asp Glu Asn Ser Glu
                405                 410                 415

Thr Thr Glu Glu Glu Ile Asp Arg Leu Ala Asp Leu Arg Asp Arg Gly
            420                 425                 430

Thr Gly Lys His Ser Arg Asn Ala Gly Phe Leu Pro Leu Asn Pro Phe
```

435 440 445

Ile Ser Ser Pro Val Pro Ser Leu Thr Pro Lys Val Pro Lys Ile Ser
450 455 460

Ala Pro Ala Leu Ile Ser Asp Ile Thr Lys Lys Ala Pro Phe Lys Asn
465 470 475 480

Pro Ser Gln Pro Leu Asn Val Phe Asn Lys Lys Thr Thr Thr Lys Thr
485 490 495

Val Thr Lys Lys Pro Thr Pro Val Lys Thr Ala Pro Lys Leu Ala Glu
500 505 510

Leu Pro Ala Thr Lys Pro Gln Glu Thr Val Leu Arg Glu Asn Lys Thr
515 520 525

Pro Phe Ile Glu Lys Gln Ala Glu Thr Asn Lys Gln Ser Ile Asn Met
530 535 540

Pro Ser Leu Pro Val Ile Gln Lys Glu Ala Thr Glu Ser Asp Lys Glu
545 550 555 560

Glu Met Lys Pro Gln Thr Glu Glu Lys Met Val Glu Glu Ser Glu Ser
565 570 575

Ala Asn Asn Ala Asn Gly Lys Asn Arg Ser Ala Gly Ile Glu Glu Gly
580 585 590

Lys Leu Ile Ala Lys Ser Ala Glu Asp Glu Lys Ala Lys Glu Glu Pro
595 600 605

Gly Asn His Thr Thr Leu Ile Leu Ala Met Leu Ala Ile Gly Val Phe
610 615 620

Ser Leu Gly Ala Phe Ile Lys Ile Ile Gln Leu Arg Lys Asn Asn
625 630 635

<210> 8
<211> 390
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 8

Met Arg Ala Met Met Val Val Phe Ile Thr Ala Asn Cys Ile Thr Ile
1 5 10 15

```
Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp Ser Glu Asp Ser Ser Leu
            20                  25                  30

Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr Glu Glu Gln Pro Ser Glu
        35                  40                  45

Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala Arg Glu Val Ser Ser Arg
    50                  55                  60

Asp Ile Lys Glu Leu Glu Lys Ser Asn Lys Val Arg Asn Thr Asn Lys
65                  70                  75                  80

Ala Asp Leu Ile Ala Met Leu Lys Glu Lys Ala Glu Lys Gly Pro Asn
                85                  90                  95

Ile Asn Asn Asn Asn Ser Glu Gln Thr Glu Asn Ala Ala Ile Asn Glu
            100                 105                 110

Glu Ala Ser Gly Ala Asp Arg Pro Ala Ile Gln Val Glu Arg Arg His
        115                 120                 125

Pro Gly Leu Pro Ser Asp Ser Ala Ala Glu Ile Lys Lys Arg Arg Lys
    130                 135                 140

Ala Ile Ala Ser Ser Asp Ser Glu Leu Glu Ser Leu Thr Tyr Pro Asp
145                 150                 155                 160

Lys Pro Thr Lys Val Asn Lys Lys Lys Val Ala Lys Glu Ser Val Ala
                165                 170                 175

Asp Ala Ser Glu Ser Asp Leu Asp Ser Ser Met Gln Ser Ala Asp Glu
            180                 185                 190

Ser Ser Pro Gln Pro Leu Lys Ala Asn Gln Gln Pro Phe Phe Pro Lys
        195                 200                 205

Val Phe Lys Lys Ile Lys Asp Ala Gly Lys Trp Val Arg Asp Lys Ile
    210                 215                 220

Asp Glu Asn Pro Glu Val Lys Lys Ala Ile Val Asp Lys Ser Ala Gly
225                 230                 235                 240

Leu Ile Asp Gln Leu Leu Thr Lys Lys Lys Ser Glu Glu Val Asn Ala
                245                 250                 255

Ser Asp Phe Pro Pro Pro Pro Thr Asp Glu Glu Leu Arg Leu Ala Leu
```

260 265 270

Pro Glu Thr Pro Met Leu Leu Gly Phe Asn Ala Pro Ala Thr Ser Glu
275 280 285

Pro Ser Ser Phe Glu Phe Pro Pro Pro Thr Asp Glu Glu Leu Arg
290 295 300

Leu Ala Leu Pro Glu Thr Pro Met Leu Leu Gly Phe Asn Ala Pro Ala
305 310 315 320

Thr Ser Glu Pro Ser Ser Phe Glu Phe Pro Pro Pro Pro Thr Glu Asp
325 330 335

Glu Leu Glu Ile Ile Arg Glu Thr Ala Ser Ser Leu Asp Ser Ser Phe
340 345 350

Thr Arg Gly Asp Leu Ala Ser Leu Arg Asn Ala Ile Asn Arg His Ser
355 360 365

Gln Asn Phe Ser Asp Phe Pro Pro Ile Pro Thr Glu Glu Glu Leu Asn
370 375 380

Gly Arg Gly Gly Arg Pro
385 390

<210> 9
<211> 100
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 9

Met Gly Leu Asn Arg Phe Met Arg Ala Met Met Val Val Phe Ile Thr
1 5 10 15

Ala Asn Cys Ile Thr Ile Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp
20 25 30

Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr
35 40 45

Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala
50 55 60

Arg Glu Val Ser Ser Arg Asp Ile Lys Glu Leu Glu Lys Ser Asn Lys
65 70 75 80

Val Arg Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu Lys Glu Lys
85 90 95

Ala Glu Lys Gly
100

<210> 10
<211> 390
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 10

Met Arg Ala Met Met Val Val Phe Ile Thr Ala Asn Cys Ile Thr Ile
1 5 10 15

Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp Ser Glu Asp Ser Ser Leu
20 25 30

Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr Glu Glu Gln Pro Ser Glu
35 40 45

Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala Arg Glu Val Ser Ser Arg
50 55 60

Asp Ile Lys Glu Leu Glu Lys Ser Asn Lys Val Arg Asn Thr Asn Lys
65 70 75 80

Ala Asp Leu Ile Ala Met Leu Lys Glu Lys Ala Glu Lys Gly Pro Asn
85 90 95

Ile Asn Asn Asn Asn Ser Glu Gln Thr Glu Asn Ala Ala Ile Asn Glu
100 105 110

Glu Ala Ser Gly Ala Asp Arg Pro Ala Ile Gln Val Glu Arg Arg His
115 120 125

Pro Gly Leu Pro Ser Asp Ser Ala Ala Glu Ile Lys Lys Arg Arg Lys
130 135 140

Ala Ile Ala Ser Ser Asp Ser Glu Leu Glu Ser Leu Thr Tyr Pro Asp
145 150 155 160

Lys Pro Thr Lys Val Asn Lys Lys Lys Val Ala Lys Glu Ser Val Ala
165 170 175

```
Asp Ala Ser Glu Ser Asp Leu Asp Ser Ser Met Gln Ser Ala Asp Glu
            180                 185                 190

Ser Ser Pro Gln Pro Leu Lys Ala Asn Gln Gln Pro Phe Phe Pro Lys
        195                 200                 205

Val Phe Lys Lys Ile Lys Asp Ala Gly Lys Trp Val Arg Asp Lys Ile
    210                 215                 220

Asp Glu Asn Pro Glu Val Lys Lys Ala Ile Val Asp Lys Ser Ala Gly
225                 230                 235                 240

Leu Ile Asp Gln Leu Leu Thr Lys Lys Lys Ser Glu Glu Val Asn Ala
                245                 250                 255

Ser Asp Phe Pro Pro Pro Pro Thr Asp Glu Glu Leu Arg Leu Ala Leu
            260                 265                 270

Pro Glu Thr Pro Met Leu Leu Gly Phe Asn Ala Pro Ala Thr Ser Glu
        275                 280                 285

Pro Ser Ser Phe Glu Phe Pro Pro Pro Pro Thr Asp Glu Glu Leu Arg
    290                 295                 300

Leu Ala Leu Pro Glu Thr Pro Met Leu Leu Gly Phe Asn Ala Pro Ala
305                 310                 315                 320

Thr Ser Glu Pro Ser Ser Phe Glu Phe Pro Pro Pro Pro Thr Glu Asp
                325                 330                 335

Glu Leu Glu Ile Ile Arg Glu Thr Ala Ser Ser Leu Asp Ser Ser Phe
            340                 345                 350

Thr Arg Gly Asp Leu Ala Ser Leu Arg Asn Ala Ile Asn Arg His Ser
        355                 360                 365

Gln Asn Phe Ser Asp Phe Pro Pro Ile Pro Thr Glu Glu Glu Leu Asn
    370                 375                 380

Gly Arg Gly Gly Arg Pro
385                 390
```

<210> 11
<211> 100
<212> PRT
<213> Artificial Sequence

<220>

<223> Truncated ActA protein

<400> 11

Met Gly Leu Asn Arg Phe Met Arg Ala Met Met Val Val Phe Ile Thr
1 5 10 15

Ala Asn Cys Ile Thr Ile Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp
20 25 30

Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr
35 40 45

Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala
50 55 60

Arg Glu Val Ser Ser Arg Asp Ile Lys Glu Leu Glu Lys Ser Asn Lys
65 70 75 80

Val Arg Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu Lys Glu Lys
85 90 95

Ala Glu Lys Gly
100

<210> 12
<211> 93
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 12

Ala Thr Asp Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu
1 5 10 15

Glu Lys Thr Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr
20 25 30

Glu Thr Ala Arg Glu Val Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys
35 40 45

Ser Asn Lys Val Lys Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu
50 55 60

Lys Ala Lys Ala Glu Lys Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu
65 70 75 80

Gln Thr Gly Asn Val Ala Ile Asn Glu Glu Ala Ser Gly

85 90

<210> 13
<211> 124
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 13

Met Arg Ala Met Met Val Val Phe Ile Thr Ala Asn Cys Ile Thr Ile
1 5 10 15

Asn Pro Asp Ile Ile Phe Ala Ala Thr Asp Ser Glu Asp Ser Ser Leu
20 25 30

Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr Glu Glu Gln Pro Ser Glu
35 40 45

Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala Arg Glu Val Ser Ser Arg
50 55 60

Asp Ile Glu Glu Leu Glu Lys Ser Asn Lys Val Lys Asn Thr Asn Lys
65 70 75 80

Ala Asp Leu Ile Ala Met Leu Lys Ala Lys Ala Glu Lys Gly Pro Asn
85 90 95

Asn Asn Asn Asn Asn Gly Glu Gln Thr Gly Asn Val Ala Ile Asn Glu
100 105 110

Glu Ala Ser Gly Val Asp Arg Pro Thr Leu Gln Val
115 120

<210> 14
<211> 101
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 14

Ala Thr Asp Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu
1 5 10 15

Glu Lys Thr Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr
20 25 30

Glu Thr Ala Arg Glu Val Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys
35 40 45

Ser Asn Lys Val Lys Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu
50 55 60

Lys Ala Lys Ala Glu Lys Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu
65 70 75 80

Gln Thr Gly Asn Val Ala Ile Asn Glu Glu Ala Ser Gly Val Asp Arg
85 90 95

Pro Thr Leu Gln Val
100

<210> 15
<211> 200
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 15

Ala Thr Asp Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu
1 5 10 15

Glu Lys Thr Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr
20 25 30

Glu Thr Ala Arg Glu Val Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys
35 40 45

Ser Asn Lys Val Lys Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu
50 55 60

Lys Ala Lys Ala Glu Lys Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu
65 70 75 80

Gln Thr Gly Asn Val Ala Ile Asn Glu Glu Ala Ser Gly Val Asp Arg
85 90 95

Pro Thr Leu Gln Val Glu Arg Arg His Pro Gly Leu Ser Ser Asp Ser
100 105 110

Ala Ala Glu Ile Lys Lys Arg Arg Lys Ala Ile Ala Ser Ser Asp Ser
115 120 125

Glu Leu Glu Ser Leu Thr Tyr Pro Asp Lys Pro Thr Lys Ala Asn Lys

130 135 140

Arg Lys Val Ala Lys Glu Ser Val Val Asp Ala Ser Glu Ser Asp Leu
145 150 155 160

Asp Ser Ser Met Gln Ser Ala Asp Glu Ser Thr Pro Gln Pro Leu Lys
165 170 175

Ala Asn Gln Lys Pro Phe Phe Pro Lys Val Phe Lys Lys Ile Lys Asp
180 185 190

Ala Gly Lys Trp Val Arg Asp Lys
195 200

<210> 16
<211> 303
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 16

Ala Thr Asp Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu
1 5 10 15

Glu Lys Thr Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr
20 25 30

Glu Thr Ala Arg Glu Val Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys
35 40 45

Ser Asn Lys Val Lys Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu
50 55 60

Lys Ala Lys Ala Glu Lys Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu
65 70 75 80

Gln Thr Gly Asn Val Ala Ile Asn Glu Glu Ala Ser Gly Val Asp Arg
85 90 95

Pro Thr Leu Gln Val Glu Arg Arg His Pro Gly Leu Ser Ser Asp Ser
100 105 110

Ala Ala Glu Ile Lys Lys Arg Arg Lys Ala Ile Ala Ser Ser Asp Ser
115 120 125

Glu Leu Glu Ser Leu Thr Tyr Pro Asp Lys Pro Thr Lys Ala Asn Lys
130 135 140

```
Arg Lys Val Ala Lys Glu Ser Val Val Asp Ala Ser Glu Ser Asp Leu
145                 150                 155                 160

Asp Ser Ser Met Gln Ser Ala Asp Glu Ser Thr Pro Gln Pro Leu Lys
                165                 170                 175

Ala Asn Gln Lys Pro Phe Phe Pro Lys Val Phe Lys Lys Ile Lys Asp
            180                 185                 190

Ala Gly Lys Trp Val Arg Asp Lys Ile Asp Glu Asn Pro Glu Val Lys
        195                 200                 205

Lys Ala Ile Val Asp Lys Ser Ala Gly Leu Ile Asp Gln Leu Leu Thr
    210                 215                 220

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

Thr Asp Glu Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro Met Leu Leu
                245                 250                 255

Gly Phe Asn Ala Pro Thr Pro Ser Glu Pro Ser Ser Phe Glu Phe Pro
            260                 265                 270

Pro Pro Pro Thr Asp Glu Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro
        275                 280                 285

Met Leu Leu Gly Phe Asn Ala Pro Ala Thr Ser Glu Pro Ser Ser
    290                 295                 300
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<210> 17
<211> 370
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA protein

<400> 17

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Ala Thr Asp Ser Glu Asp Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu
1               5                   10                  15

Glu Lys Thr Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr
            20                  25                  30

Glu Thr Ala Arg Glu Val Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys
        35                  40                  45
```

```
Ser Asn Lys Val Lys Asn Thr Asn Lys Ala Asp Leu Ile Ala Met Leu
    50                  55                  60

Lys Ala Lys Ala Glu Lys Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu
65                  70                  75                  80

Gln Thr Gly Asn Val Ala Ile Asn Glu Glu Ala Ser Gly Val Asp Arg
                85                  90                  95

Pro Thr Leu Gln Val Glu Arg Arg His Pro Gly Leu Ser Ser Asp Ser
            100                 105                 110

Ala Ala Glu Ile Lys Lys Arg Arg Lys Ala Ile Ala Ser Ser Asp Ser
        115                 120                 125

Glu Leu Glu Ser Leu Thr Tyr Pro Asp Lys Pro Thr Lys Ala Asn Lys
    130                 135                 140

Arg Lys Val Ala Lys Glu Ser Val Val Asp Ala Ser Glu Ser Asp Leu
145                 150                 155                 160

Asp Ser Ser Met Gln Ser Ala Asp Glu Ser Thr Pro Gln Pro Leu Lys
                165                 170                 175

Ala Asn Gln Lys Pro Phe Phe Pro Lys Val Phe Lys Lys Ile Lys Asp
            180                 185                 190

Ala Gly Lys Trp Val Arg Asp Lys Ile Asp Glu Asn Pro Glu Val Lys
        195                 200                 205

Lys Ala Ile Val Asp Lys Ser Ala Gly Leu Ile Asp Gln Leu Leu Thr
    210                 215                 220

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

Thr Asp Glu Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro Met Leu Leu
                245                 250                 255

Gly Phe Asn Ala Pro Thr Pro Ser Glu Pro Ser Ser Phe Glu Phe Pro
            260                 265                 270

Pro Pro Pro Thr Asp Glu Glu Leu Arg Leu Ala Leu Pro Glu Thr Pro
        275                 280                 285

Met Leu Leu Gly Phe Asn Ala Pro Ala Thr Ser Glu Pro Ser Ser Phe
    290                 295                 300
```

```
Glu Phe Pro Pro Pro Pro Thr Glu Asp Glu Leu Glu Ile Met Arg Glu
305                 310                 315                 320

Thr Ala Pro Ser Leu Asp Ser Ser Phe Thr Ser Gly Asp Leu Ala Ser
                325                 330                 335

Leu Arg Ser Ala Ile Asn Arg His Ser Glu Asn Phe Ser Asp Phe Pro
            340                 345                 350

Leu Ile Pro Thr Glu Glu Glu Leu Asn Gly Arg Gly Gly Arg Pro Thr
        355                 360                 365

Ser Glu
    370
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<210> 18
<211> 226
<212> PRT
<213> Artificial Sequence

<220>
<223> Truncated ActA fused to hly signal peptide

<400> 18

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

Pro Ile Ala Gln Gln Thr Glu Ala Ser Arg Ala Thr Asp Ser Glu Asp
            20                  25                  30

Ser Ser Leu Asn Thr Asp Glu Trp Glu Glu Glu Lys Thr Glu Glu Gln
        35                  40                  45

Pro Ser Glu Val Asn Thr Gly Pro Arg Tyr Glu Thr Ala Arg Glu Val
    50                  55                  60

Ser Ser Arg Asp Ile Glu Glu Leu Glu Lys Ser Asn Lys Val Lys Asn
65                  70                  75                  80

Thr Asn Lys Ala Asp Leu Ile Ala Met Leu Lys Ala Lys Ala Glu Lys
                85                  90                  95

Gly Pro Asn Asn Asn Asn Asn Asn Gly Glu Gln Thr Gly Asn Val Ala
            100                 105                 110

Ile Asn Glu Glu Ala Ser Gly Val Asp Arg Pro Thr Leu Gln Val Glu
        115                 120                 125
```

```
Arg Arg His Pro Gly Leu Ser Ser Asp Ser Ala Ala Glu Ile Lys Lys
    130                 135                 140

Arg Arg Lys Ala Ile Ala Ser Ser Asp Ser Glu Leu Glu Ser Leu Thr
145                 150                 155                 160

Tyr Pro Asp Lys Pro Thr Lys Ala Asn Lys Arg Lys Val Ala Lys Glu
                165                 170                 175

Ser Val Val Asp Ala Ser Glu Ser Asp Leu Asp Ser Ser Met Gln Ser
            180                 185                 190

Ala Asp Glu Ser Thr Pro Gln Pro Leu Lys Ala Asn Gln Lys Pro Phe
        195                 200                 205

Phe Pro Lys Val Phe Lys Lys Ile Lys Asp Ala Gly Lys Trp Val Arg
    210                 215                 220

Asp Lys
225
```

<210> 19
<211> 678
<212> DNA
<213> Artificial Sequence

<220>
<223> Sequence encoding a truncated ActA fused to hly signal peptide

<400> 19
atgaaaaaaa taatgctagt ttttattaca cttatattag ttagtctacc aattgcgcaa 60

caaactgaag catctagagc gacagatagc gaagattcca gtctaaacac agatgaatgg 120

gaagaagaaa aaacagaaga gcagccaagc gaggtaaata cgggaccaag atacgaaact 180

gcacgtgaag taagttcacg tgatattgag gaactagaaa aatcgaataa agtgaaaaat 240

acgaacaaag cagacctaat agcaatgttg aaagcaaaag cagagaaagg tccgaataac 300

aataataaca acggtgagca aacaggaaat gtggctataa atgaagaggc ttcaggagtc 360

gaccgaccaa ctctgcaagt ggagcgtcgt catccaggtc tgtcatcgga tagcgcagcg 420

gaaattaaaa aaagaagaaa agccatagcg tcgtcggata gtgagcttga aagccttact 480

tatccagata aaccaacaaa agcaaataag agaaaagtgg cgaaagagtc agttgtggat 540

gcttctgaaa gtgacttaga ttctagcatg cagtcagcag acgagtctac accacaacct 600

ttaaaagcaa atcaaaaacc atttttccct aaagtattta aaaaaataaa agatgcgggg 660

aaatgggtac gtgataaa 678

<210> 20
<211> 1170
<212> DNA
<213> Artificial Sequence

<220>
<223> Recombinant nucleotide encoding a truncated ActA protein

<400> 20
atgcgtgcga tgatggtggt tttcattact gccaattgca ttacgattaa ccccgacata 60

atatttgcag cgacagatag cgaagattct agtctaaaca cagatgaatg ggaagaagaa 120

aaaacagaag agcaaccaag cgaggtaaat acgggaccaa gatacgaaac tgcacgtgaa 180

gtaagttcac gtgatattaa agaactagaa aaatcgaata aagtgagaaa tacgaacaaa 240

gcagacctaa tagcaatgtt gaaagaaaaa gcagaaaaag gtccaaatat caataataac 300

aacagtgaac aaactgagaa tgcggctata aatgaagagg cttcaggagc cgaccgacca 360

gctatacaag tggagcgtcg tcatccagga ttgccatcgg atagcgcagc ggaaattaaa 420

aaaagaagga aagccatagc atcatcggat agtgagcttg aaagccttac ttatccggat 480

aaaccaacaa aagtaaataa gaaaaaagtg gcgaaagagt cagttgcgga tgcttctgaa 540

agtgacttag attctagcat gcagtcagca gatgagtctt caccacaacc tttaaaagca 600

aaccaacaac catttttccc taaagtattt aaaaaaataa aagatgcggg gaaatgggta 660

cgtgataaaa tcgacgaaaa tcctgaagta aagaaagcga ttgttgataa aagtgcaggg 720

ttaattgacc aattattaac caaaaagaaa agtgaagagg taaatgcttc ggacttcccg 780

ccaccaccta cggatgaaga gttaagactt gctttgccag agacaccaat gcttcttggt 840

tttaatgctc ctgctacatc agaaccgagc tcattcgaat ttccaccacc acctacggat 900

gaagagttaa gacttgcttt gccagagacg ccaatgcttc ttggttttaa tgctcctgct 960

acatcggaac cgagctcgtt cgaatttcca ccgcctccaa cagaagatga actagaaatc 1020

atccgggaaa cagcatcctc gctagattct agttttacaa gaggggattt agctagtttg 1080

agaaatgcta ttaatcgcca tagtcaaaat ttctctgatt tcccaccaat cccaacagaa 1140

gaagagttga acgggagagg cggtagacca 1170

<210> 21
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 21
ggctcgagca tggagataca cc 22

<210> 22

<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 22
ggggactagt ttatggtttc tgagaaca 28

<210> 23
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 23
gggggctagc cctcctttga ttagtatatt c 31

<210> 24
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 24
ctccctcgag atcataattt acttcatc 28

<210> 25
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 25
gactacaagg acgatgaccg acaagtgata acccgggatc taaataaatc cgttt 55

<210> 26
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 26
cccgtcgacc agctcttctt ggtgaag 27

<210> 27
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 27
gcggatccca tggagataca cctac 25

<210> 28
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 28
gctctagatt atggtttctg ag 22

<210> 29
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 29
ggggtctaga cctcctttga ttagtatatt c 31

<210> 30
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 30
atcttcgcta tctgtcgccg cggcgcgtgc ttcagtttgt tgcgc 45

<210> 31
<211> 45
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 31
gcgcaacaaa ctgaagcagc ggccgcggcg acagatagcg aagat 45

<210> 32
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 32
tgtaggtgta tctccatgct cgagagctag gcgatcaatt tc 42

<210> 33
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 33
ggaattgatc gcctagctct cgagcatgga gatacaccta ca 42

<210> 34
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 34
aaacggattt atttagatcc cgggttatgg tttctgagaa ca 42

<210> 35
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 35
tgttctcaga aaccataacc cgggatctaa ataaatccgt tt 42

<210> 36
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 36
gggggtcgac cagctcttct tggtgaag 28

<210> 37
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 37
ccatggtgac aggctggcat c 21

<210> 38
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 38
gctagcctaa tggatgtatt ttctagg 27

<210> 39
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 39
ttaattaaca aatagttggt atagtcc 27

<210> 40
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 40
gacgatgcca gcctgtcacc atggaaaact cctctc 36

<210> 41
<211> 156
<212> DNA
<213> Artificial Sequence

<220>
<223> truncated p60 promoter

<400> 41
caaatagttg gtatagtcct ctttagcctt tggagtatta tctcatcatt tgtttttag 60

gtgaaaactg ggtaaactta gtattatcaa tataaaatta attctcaaat acttaattac 120

gtactgggat tttctgaaaa aagagaggag ttttcc 156

<210> 42
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Sequence NarI/EheI site was added upstream of

<400> 42

ggcgccacta actcaacgct agtag 25

<210> 43
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Sequence NarI/EheI site was added downstream of

<400> 43
gctagccagc aaagaaaaac aaacacg 27

<210> 44
<211> 38
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 44
gtcgacggtc accggcgcca ctaactcaac gctagtag 38

<210> 45
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 45
ttaattaagc tagccagcaa agaaaaacaa acacg 35

<210> 46
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 46
atgaaaaaaa taatgctagt ttttattac 29

<210> 47
<211> 48
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 47
gcggccgctt aatgatgatg atgatgatgt ggtttctgag aacagatg 48

<210> 48
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 48
gcaagtgtga ctctacgctt cg 22

<210> 49
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 49
tgcccattaa caggtcttcc a 21

<210> 50
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 50
tgcgtacaaa gcacacacgt agacattcgt ac 32

<210> 51
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 51
tgacatcgtt tgtgtttgag ctag 24

<210> 52
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 52
gcagcgctct ctataccagg tac 23

<210> 53
<211> 38
<212> DNA

<213> Artificial Sequence

<220>
<223> Primer

<400> 53
ttaatgtcca tgttatgtct ccgttatagc tcatcgta 38

<210> 54
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 54
tgggatggcc aagaaattc 19

<210> 55
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 55
ctaccatgtc ttccgttgct tg 22

<210> 56
<211> 1256
<212> DNA
<213> Artificial Sequence

<220>
<223> Lm-dd?actA

<400> 56
gcgccaaatc attggttgat tggtgaggat gtctgtgtgc gtgggtcgcg agatgggcga 60

ataagaagca ttaaagatcc tgacaaatat aatcaagcgg ctcatatgaa agattacgaa 120

tcgcttccac tcacagagga aggcgactgg ggcggagttc attataatag tggtatcccg 180

aataaagcag cctataatac tatcactaaa cttggaaaag aaaaaacaga acagctttat 240

tttcgcgcct taaagtacta tttaacgaaa aaatcccagt ttaccgatgc gaaaaaagcg 300

cttcaacaag cagcgaaaga tttatatggt gaagatgctt ctaaaaaagt tgctgaagct 360

tgggaagcag ttggggttaa ctgattaaca aatgttagag aaaaattaat tctccaagtg 420

atattcttaa aataattcat gaatattttt tcttatatta gctaattaag aagataacta 480

actgctaatc caatttttaa cggaacaaat tagtgaaaat gaaggccgaa ttttccttgt 540

tctaaaaagg ttgtattagc gtatcacgag gagggagtat aagtgggatt aaacagattt 600

atgcgtgcga tgatggtggt tttcattact gccaattgca ttacgattaa ccccgacgtc 660

gacccatacg acgttaattc ttgcaatgtt agctattggc gtgttctctt taggggcgtt 720

tatcaaaatt attcaattaa gaaaaaataa ttaaaaacac agaacgaaag aaaaagtgag 780

gtgaatgata tgaaattcaa aaaggtggtt ctaggtatgt gcttgatcgc aagtgttcta 840

gtctttccgg taacgataaa agcaaatgcc tgttgtgatg aatacttaca aacacccgca 900

gctccgcatg atattgacag caaattacca cataaactta gttggtccgc ggataacccg 960

acaaatactg acgtaaatac gcactattgg ctttttaaac aagcggaaaa aatactagct 1020

aaagatgtaa atcatatgcg agctaattta atgaatgaac ttaaaaaatt cgataaacaa 1080

atagctcaag gaatatatga tgcggatcat aaaaatccat attatgatac tagtacattt 1140

ttatctcatt tttataatcc tgatagagat aatacttatt tgccgggttt tgctaatgcg 1200

aaaataacag gagcaaagta tttcaatcaa tcggtgactg attaccgaga agggaa 1256

<210> 57
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 57
tgatctcgag acccacctgg acatgctc 28

<210> 58
<211> 49
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 58
ctaccaggac acgattttgt ggaagaatat ccaggagttt gctggctgc 49

<210> 59
<211> 49
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 59
gcagccagca aactcctgga tattcttcca caaaatcgtg tcctggtag 49

<210> 60
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 60
ctgccaccag ctgtgcgccc gagggcagca gaagatccgg aagtacacga 50

<210> 61
<211> 50
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 61
tcgtgtactt ccggatcttc tgctgccctc gggcgcacag ctggtggcag 50

<210> 62
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 62
gtggcccggg tctagattag tctaagaggc agccatagg 39

<210> 63
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 63
ccgcctcgag gccgcgagca cccaagtg 28

<210> 64
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 64
cgcgactagt ttaatcctct gctgtcacct c 31

<210> 65
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 65
ccgcctcgag tacctttcta cggacgtg 28

<210> 66
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 66
cgcgactagt ttactctggc cggttggcag 30

<210> 67
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 67
ccgcctcgag cagcagaaga tccggaagta c 31

<210> 68
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 68
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<213> Artificial Sequence

<220>
<223> HLA-A2 restricted epitopes

<400> 70

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<210> 71
<211> 2015
<212> DNA
<213> Artificial Sequence

<220>
<223> DNA sequence present upstream and downstream of the inlC region on the genome of Listeria strain

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atatatgtag tttcaagatt agccattgtt gcggcagtag tttacttctt atacttattg 240

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