<110> WALLECHA, Anu
PETIT, Robert

<120> RECOMBINANT LISTERIA VACCINE STRAINS AND METHODS OF PRODUCING THE SAME

<130> P-77775-USP

<140> US 14/999,999
<141> 2014-03-31

<160> 36

<170> PatentIn version 3.5

<210> 1
<211> 32
<212> PRT
<213> Listeria monocytogenes

<400> 1

Lys Glu Asn Ser Ile Ser Ser Met Ala Pro Pro Ala Ser Pro Pro Ala
1 5 10 15

Ser Pro Lys Thr Pro Ile Glu Lys Lys His Ala Asp Glu Ile Asp Lys
20 25 30

<210> 2
<211> 441
<212> PRT
<213> Listeria monocytogenes

<400> 2

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 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

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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
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<210> 3
<211> 529
<212> PRT
<213> Listeria monocytogenes

<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 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> 4
<211> 416
<212> PRT
<213> Listeria monocytogenes

<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 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
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<210> 5
<211> 390
<212> PRT
<213> Listeria monocytogenes

<400> 5

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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
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<210> 6
<211> 1170
<212> DNA
<213> Listeria monocytogenes

<400> 6

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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 cattttccc 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> 14
<212> PRT
<213> Listeria monocytogenes

<400> 7

Lys Thr Glu Glu Gln Pro Ser Glu Val Asn Thr Gly Pro Arg
1 5 10

<210> 8
<211> 28
<212> PRT
<213> Listeria monocytogenes

<400> 8

Lys Ala Ser Val Thr Asp Thr Ser Glu Gly Asp Leu Asp Ser Ser Met
1 5 10 15

Gln Ser Ala Asp Glu Ser Thr Pro Gln Pro Leu Lys
20 25

<210> 9
<211> 20
<212> PRT
<213> Listeria monocytogenes

<400> 9

Lys Asn Glu Glu Val Asn Ala Ser Asp Phe Pro Pro Pro Pro Thr Asp
1 5 10 15

Glu Glu Leu Arg
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<210> 10
<211> 33
<212> PRT
<213> Listeria monocytogenes

<400> 10

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

Asp Phe Thr Asp Asp Glu Asn Ser Glu Thr Thr Glu Glu Glu Ile Asp
20 25 30

Arg

<210> 11
<211> 17

<212> PRT
<213> Streptococcus sp. G148

<400> 11

Lys Gln Asn Thr Ala Ser Thr Glu Thr Thr Thr Thr Asn Glu Gln Pro
1 5 10 15

Lys

<210> 12
<211> 17
<212> PRT
<213> Streptococcus equisimilis

<400> 12

Lys Gln Asn Thr Ala Asn Thr Glu Thr Thr Thr Thr Asn Glu Gln Pro
1 5 10 15

Lys

<210> 13
<211> 98
<212> PRT
<213> Human papillomavirus type 16

<400> 13

Met His Gly Asp Thr Pro Thr Leu His Glu Tyr Met Leu Asp Leu Gln
1 5 10 15

Pro Glu Thr Thr Asp Leu Tyr Cys Tyr Glu Gln Leu Asn Asp Ser Ser
20 25 30

Glu Glu Glu Asp Glu Ile Asp Gly Pro Ala Gly Gln Ala Glu Pro Asp
35 40 45

Arg Ala His Tyr Asn Ile Val Thr Phe Cys Cys Lys Cys Asp Ser Thr
50 55 60

Leu Arg Leu Cys Val Gln Ser Thr His Val Asp Ile Arg Thr Leu Glu
65 70 75 80

Asp Leu Leu Met Gly Thr Leu Gly Ile Val Cys Pro Ile Cys Ser Gln
85 90 95

Lys Pro

<210> 14
<211> 105
<212> PRT
<213> Human papillomavirus type 16

<400> 14

```
Met His Gly Pro Lys Ala Thr Leu Gln Asp Ile Val Leu His Leu Glu
1               5                   10                  15

Pro Gln Asn Glu Ile Pro Val Asp Leu Leu Cys His Glu Gln Leu Ser
            20                  25                  30

Asp Ser Glu Glu Glu Asn Asp Glu Ile Asp Gly Val Asn His Gln His
        35                  40                  45

Leu Pro Ala Arg Arg Ala Glu Pro Gln Arg His Thr Met Leu Cys Met
    50                  55                  60

Cys Cys Lys Cys Glu Ala Arg Ile Glu Leu Val Val Glu Ser Ser Ala
65                  70                  75                  80

Asp Asp Leu Arg Ala Phe Gln Gln Leu Phe Leu Asn Thr Leu Ser Phe
                85                  90                  95

Val Cys Pro Trp Cys Ala Ser Gln Gln
            100                 105
```

<210> 15
<211> 158
<212> PRT
<213> Human papillomavirus type 16

<400> 15

```
Met His Gln Lys Arg Thr Ala Met Phe Gln Asp Pro Gln Glu Arg Pro
1               5                   10                  15

Arg Lys Leu Pro Gln Leu Cys Thr Glu Leu Gln Thr Thr Ile His Asp
            20                  25                  30

Ile Ile Leu Glu Cys Val Tyr Cys Lys Gln Gln Leu Leu Arg Arg Glu
        35                  40                  45

Val Tyr Asp Phe Ala Phe Arg Asp Leu Cys Ile Val Tyr Arg Asp Gly
    50                  55                  60

Asn Pro Tyr Ala Val Cys Asp Lys Cys Leu Lys Phe Tyr Ser Lys Ile
65                  70                  75                  80

Ser Glu Tyr Arg His Tyr Cys Tyr Ser Leu Tyr Gly Thr Thr Leu Glu
                85                  90                  95

Gln Gln Tyr Asn Lys Pro Leu Cys Asp Leu Leu Ile Arg Cys Ile Asn
            100                 105                 110

Cys Gln Lys Pro Leu Cys Pro Glu Glu Lys Gln Arg His Leu Asp Lys
        115                 120                 125

Lys Gln Arg Phe His Asn Ile Arg Gly Arg Trp Thr Gly Arg Cys Met
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130 135 140

Ser Cys Cys Arg Ser Ser Arg Thr Arg Arg Glu Thr Gln Leu
145 150 155

<210> 16
<211> 158
<212> PRT
<213> Human papillomavirus type 16

<400> 16

Met Ala Arg Phe Glu Asp Pro Thr Arg Arg Pro Tyr Lys Leu Pro Asp
1 5 10 15

Leu Cys Thr Glu Leu Asn Thr Ser Leu Gln Asp Ile Glu Ile Thr Cys
20 25 30

Val Tyr Cys Lys Thr Val Leu Glu Leu Thr Glu Val Phe Glu Phe Ala
35 40 45

Phe Lys Asp Leu Phe Val Val Tyr Arg Asp Ser Ile Pro His Ala Ala
50 55 60

Cys His Lys Cys Ile Asp Phe Tyr Ser Arg Ile Arg Glu Leu Arg His
65 70 75 80

Tyr Ser Asp Ser Val Tyr Gly Asp Thr Leu Glu Lys Leu Thr Asn Thr
85 90 95

Gly Leu Tyr Asn Leu Leu Ile Arg Cys Leu Arg Cys Gln Lys Pro Leu
100 105 110

Asn Pro Ala Glu Lys Leu Arg His Leu Asn Glu Lys Arg Arg Phe His
115 120 125

Asn Ile Ala Gly His Tyr Arg Gly Gln Cys His Ser Cys Cys Asn Arg
130 135 140

Ala Arg Gln Glu Arg Leu Gln Arg Arg Arg Glu Thr Gln Val
145 150 155

<210> 17
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 17
ggctcgagca tggagataca cc 22

<210> 18
<211> 28
<212> DNA

<213> Artificial Sequence

<220>
<223> Primer

<400> 18
ggggactagt ttatggtttc tgagaaca 28

<210> 19
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 19
gggggctagc cctcctttga ttagtatatt c 31

<210> 20
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 20
ctccctcgag atcataattt acttcatc 28

<210> 21
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 21
cccgtcgacc agctcttctt ggtgaag 27

<210> 22
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 22
gcggatccca tggagataca cctac 25

<210> 23
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 23
gctctagatt atggtttctg ag 22

<210> 24
<211> 9
<212> PRT
<213> Human papillomavirus type 16

<400> 24

Arg Ala His Tyr Asn Ile Val Thr Phe
1 5

<210> 25
<211> 9
<212> PRT
<213> Human immunodeficiency virus

<400> 25

Ala Met Gln Met Leu Lys Glu Thr Ile
1 5

<210> 26
<211> 9
<212> PRT
<213> Listeria monocytogenes

<400> 26

Gly Tyr Lys Asp Gly Asn Glu Tyr Ile
1 5

<210> 27
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 27
gactacaagg acgatgaccg acaagtgata acccgggatc taaataaatc cgttt 55

<210> 28
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> ADV451 forward primer for amplification of prfA gene and discernment of D133V mutation

<400> 28
cctagctaaa tttaatgt 18

<210> 29
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> ADV452 forward primer for amplification of prfA gene

<400> 29
cctagctaaa tttaatga 18

<210> 30
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> ADV453 reverse primer for amplification of prfA gene

<400> 30
taattttccc caagtagcag g 21

<210> 31
<211> 714
<212> DNA
<213> Listeria monocytogenes

<400> 31
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caatttcata aaaaagaact tatttttaac caatgggatc cacaagaata ttgtattttt 120

ctatatgatg gtatcacaaa gctcacgagt attagcgaga acgggaccat catgaattta 180

caatactaca aaggggcttt cgttataatg tctggcttta ttgatacaga aacatcggtt 240

ggctattata atttagaagt cattagcgag caggctaccg catacgttat caaaataaac 300

gaactaaaag aactactgag caaaaatctt acgcactttt tctatgtttt ccaaacccta 360

caaaaacaag tttcatacag cctagctaaa tttaatgatt tttcgattaa cgggaagctt 420

ggctctattt gcggtcaact tttaatcctg acctatgtgt atggtaaaga aactcctgat 480

ggcatcaaga ttacactgga taatttaaca atgcaggagt taggatattc aagtggcatc 540

gcacatagct cagctgttag cagaattatt tccaaattaa agcaagagaa agttatcgtg 600

tataaaaatt catgctttta tgtacaaaat cttgattatc tcaaaagata tgcccctaaa 660

ttagatgaat ggttttattt agcatgtcct gctacttggg gaaaattaaa ttaa 714

<210> 32
<211> 237
<212> PRT
<213> Listeria monocytogenes

<400> 32

Met Asn Ala Gln Ala Glu Glu Phe Lys Lys Tyr Leu Glu Thr Asn Gly
1 5 10 15

Ile Lys Pro Lys Gln Phe His Lys Lys Glu Leu Ile Phe Asn Gln Trp
20 25 30

Asp Pro Gln Glu Tyr Cys Ile Phe Leu Tyr Asp Gly Ile Thr Lys Leu
35 40 45

Thr Ser Ile Ser Glu Asn Gly Thr Ile Met Asn Leu Gln Tyr Tyr Lys
50 55 60

Gly Ala Phe Val Ile Met Ser Gly Phe Ile Asp Thr Glu Thr Ser Val
65 70 75 80

```
Gly Tyr Tyr Asn Leu Glu Val Ile Ser Glu Gln Ala Thr Ala Tyr Val
                85                  90                  95

Ile Lys Ile Asn Glu Leu Lys Glu Leu Leu Ser Lys Asn Leu Thr His
            100                 105                 110

Phe Phe Tyr Val Phe Gln Thr Leu Gln Lys Gln Val Ser Tyr Ser Leu
        115                 120                 125

Ala Lys Phe Asn Asp Phe Ser Ile Asn Gly Lys Leu Gly Ser Ile Cys
    130                 135                 140

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

Gly Ile Lys Ile Thr Leu Asp Asn Leu Thr Met Gln Glu Leu Gly Tyr
                165                 170                 175

Ser Ser Gly Ile Ala His Ser Ser Ala Val Ser Arg Ile Ile Ser Lys
            180                 185                 190

Leu Lys Gln Glu Lys Val Ile Val Tyr Lys Asn Ser Cys Phe Tyr Val
        195                 200                 205

Gln Asn Leu Asp Tyr Leu Lys Arg Tyr Ala Pro Lys Leu Asp Glu Trp
    210                 215                 220

Phe Tyr Leu Ala Cys Pro Ala Thr Trp Gly Lys Leu Asn
225                 230                 235
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<210> 33
<211> 714
<212> DNA
<213> Listeria monocytogenes

<400> 33
atgaacgctc aagcagaaga attcaaaaaa tatttagaaa ctaacgggat aaaaccaaaa 60

caatttcata aaaaagaact tatttttaac caatgggatc cacaagaata ttgtattttt 120

ctatatgatg gtatcacaaa gctcacgagt attagcgaga acgggaccat catgaattta 180

caatactaca aaggggcttt cgttataatg tctggcttta ttgatacaga aacatcggtt 240

ggctattata atttagaagt cattagcgag caggctaccg catacgttat caaaataaac 300

gaactaaaag aactactgag caaaaatctt acgcactttt tctatgtttt ccaaacccta 360

caaaaacaag tttcatacag cctagctaaa tttaatgttt tttcgattaa cgggaagctt 420

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