SEQUENCE LISTING

<110> Ospedale San Raffaele S.r.l
Fondazione Telethon

<120> Gene therapy

<130> P115291PCT

<140> PCT/EP2019/066915
<141> 2019-06-25

<150> EP 18305807.2
<151> 2018-06-25

<160> 114

<170> PatentIn version 3.5

<210> 1
<211> 128
<212> PRT
<213> Artificial Sequence

<220>
<223> example amino acid sequence of Ad5-E4orf1

<400> 1

Met Ala Ala Ala Val Glu Ala Leu Tyr Val Val Leu Glu Arg Glu Gly
1 5 10 15

Ala Ile Leu Pro Arg Gln Glu Gly Phe Ser Gly Val Tyr Val Phe Phe
20 25 30

Ser Pro Ile Asn Phe Val Ile Pro Pro Met Gly Ala Val Met Leu Ser
35 40 45

Leu Arg Leu Arg Val Cys Ile Pro Pro Gly Tyr Phe Gly Arg Phe Leu
50 55 60

Ala Leu Thr Asp Val Asn Gln Pro Asp Val Phe Thr Glu Ser Tyr Ile
65 70 75 80

Met Thr Pro Asp Met Thr Glu Glu Leu Ser Val Val Leu Phe Asn His
85 90 95

Gly Asp Gln Phe Phe Tyr Gly His Ala Gly Met Ala Val Val Arg Leu
100 105 110

Met Leu Ile Arg Val Val Phe Pro Val Val Arg Gln Ala Ser Asn Val

115 120 125

<210> 2
<211> 150
<212> PRT
<213> Artificial Sequence

<220>
<223> example amino acid sequence of Ad5-E4orf6/7

<400> 2

Met Thr Thr Ser Gly Val Pro Phe Gly Met Thr Leu Arg Pro Thr Arg
1 5 10 15

Ser Arg Leu Ser Arg Arg Thr Pro Tyr Ser Arg Asp Arg Leu Pro Pro
20 25 30

Phe Glu Thr Glu Thr Arg Ala Thr Ile Leu Glu Asp His Pro Leu Leu
35 40 45

Pro Glu Cys Asn Thr Leu Thr Met His Asn Ala Trp Thr Ser Pro Ser
50 55 60

Pro Pro Val Lys Gln Pro Gln Val Gly Gln Gln Pro Val Ala Gln Gln
65 70 75 80

Leu Asp Ser Asp Met Asn Leu Ser Glu Leu Pro Gly Glu Phe Ile Asn
85 90 95

Ile Thr Asp Glu Arg Leu Ala Arg Gln Glu Thr Val Trp Asn Ile Thr
100 105 110

Pro Lys Asn Met Ser Val Thr His Asp Met Met Leu Phe Lys Ala Ser
115 120 125

Arg Gly Glu Arg Thr Val Tyr Ser Val Cys Trp Glu Gly Gly Gly Arg
130 135 140

Leu Asn Thr Arg Val Leu
145 150

<210> 3
<211> 393
<212> PRT
<213> Homo sapiens

<400> 3

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Met Glu Glu Pro Gln Ser Asp Pro Ser Val Glu Pro Pro Leu Ser Gln
1               5                  10                  15

Glu Thr Phe Ser Asp Leu Trp Lys Leu Leu Pro Glu Asn Asn Val Leu
            20                  25                  30

Ser Pro Leu Pro Ser Gln Ala Met Asp Asp Leu Met Leu Ser Pro Asp
        35                  40                  45

Asp Ile Glu Gln Trp Phe Thr Glu Asp Pro Gly Pro Asp Glu Ala Pro
    50                  55                  60

Arg Met Pro Glu Ala Ala Pro Pro Val Ala Pro Ala Pro Ala Ala Pro
65                  70                  75                  80

Thr Pro Ala Ala Pro Ala Pro Ala Pro Ser Trp Pro Leu Ser Ser Ser
                85                  90                  95

Val Pro Ser Gln Lys Thr Tyr Gln Gly Ser Tyr Gly Phe Arg Leu Gly
            100                 105                 110

Phe Leu His Ser Gly Thr Ala Lys Ser Val Thr Cys Thr Tyr Ser Pro
        115                 120                 125

Ala Leu Asn Lys Met Phe Cys Gln Leu Ala Lys Thr Cys Pro Val Gln
    130                 135                 140

Leu Trp Val Asp Ser Thr Pro Pro Pro Gly Thr Arg Val Arg Ala Met
145                 150                 155                 160

Ala Ile Tyr Lys Gln Ser Gln His Met Thr Glu Val Val Arg Arg Cys
                165                 170                 175

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

His Leu Ile Arg Val Glu Gly Asn Leu Arg Val Glu Tyr Leu Asp Asp
        195                 200                 205

Arg Asn Thr Phe Arg His Ser Val Val Val Pro Tyr Glu Pro Pro Glu
    210                 215                 220
```

```
Val Gly Ser Asp Cys Thr Thr Ile His Tyr Asn Tyr Met Cys Asn Ser
225                 230                 235                 240

Ser Cys Met Gly Gly Met Asn Arg Arg Pro Ile Leu Thr Ile Ile Thr
                245                 250                 255

Leu Glu Asp Ser Ser Gly Asn Leu Leu Gly Arg Asn Ser Phe Glu Val
            260                 265                 270

Arg Val Cys Ala Cys Pro Gly Arg Asp Arg Arg Thr Glu Glu Glu Asn
        275                 280                 285

Leu Arg Lys Lys Gly Glu Pro His His Glu Leu Pro Pro Gly Ser Thr
    290                 295                 300

Lys Arg Ala Leu Pro Asn Asn Thr Ser Ser Ser Pro Gln Pro Lys Lys
305                 310                 315                 320

Lys Pro Leu Asp Gly Glu Tyr Phe Thr Leu Gln Ile Arg Gly Arg Glu
                325                 330                 335

Arg Phe Glu Met Phe Arg Glu Leu Asn Glu Ala Leu Glu Leu Lys Asp
            340                 345                 350

Ala Gln Ala Gly Lys Glu Pro Gly Gly Ser Arg Ala His Ser Ser His
        355                 360                 365

Leu Lys Ser Lys Lys Gly Gln Ser Thr Ser Arg His Lys Lys Leu Met
    370                 375                 380

Phe Lys Thr Glu Gly Pro Asp Ser Asp
385                 390
```

<210> 4
<211> 3056
<212> PRT
<213> Homo sapiens

<400> 4

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Met Ser Leu Val Leu Asn Asp Leu Leu Ile Cys Cys Arg Gln Leu Glu
1               5                   10                  15

His Asp Arg Ala Thr Glu Arg Lys Lys Glu Val Glu Lys Phe Lys Arg
            20                  25                  30
```

```
Leu Ile Arg Asp Pro Glu Thr Ile Lys His Leu Asp Arg His Ser Asp
        35                  40                  45

Ser Lys Gln Gly Lys Tyr Leu Asn Trp Asp Ala Val Phe Arg Phe Leu
    50                  55                  60

Gln Lys Tyr Ile Gln Lys Glu Thr Glu Cys Leu Arg Ile Ala Lys Pro
65                  70                  75                  80

Asn Val Ser Ala Ser Thr Gln Ala Ser Arg Gln Lys Lys Met Gln Glu
                85                  90                  95

Ile Ser Ser Leu Val Lys Tyr Phe Ile Lys Cys Ala Asn Arg Arg Ala
            100                 105                 110

Pro Arg Leu Lys Cys Gln Glu Leu Leu Asn Tyr Ile Met Asp Thr Val
        115                 120                 125

Lys Asp Ser Ser Asn Gly Ala Ile Tyr Gly Ala Asp Cys Ser Asn Ile
    130                 135                 140

Leu Leu Lys Asp Ile Leu Ser Val Arg Lys Tyr Trp Cys Glu Ile Ser
145                 150                 155                 160

Gln Gln Gln Trp Leu Glu Leu Phe Ser Val Tyr Phe Arg Leu Tyr Leu
                165                 170                 175

Lys Pro Ser Gln Asp Val His Arg Val Leu Val Ala Arg Ile Ile His
            180                 185                 190

Ala Val Thr Lys Gly Cys Cys Ser Gln Thr Asp Gly Leu Asn Ser Lys
        195                 200                 205

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

Ser Ser Ser Gly Leu Asn His Ile Leu Ala Ala Leu Thr Ile Phe Leu
225                 230                 235                 240

Lys Thr Leu Ala Val Asn Phe Arg Ile Arg Val Cys Glu Leu Gly Asp
                245                 250                 255

Glu Ile Leu Pro Thr Leu Leu Tyr Ile Trp Thr Gln His Arg Leu Asn
```

```
            260                 265                 270

Asp Ser Leu Lys Glu Val Ile Ile Glu Leu Phe Gln Leu Gln Ile Tyr
        275                 280                 285

Ile His His Pro Lys Gly Ala Lys Thr Gln Glu Lys Gly Ala Tyr Glu
    290                 295                 300

Ser Thr Lys Trp Arg Ser Ile Leu Tyr Asn Leu Tyr Asp Leu Leu Val
305                 310                 315                 320

Asn Glu Ile Ser His Ile Gly Ser Arg Gly Lys Tyr Ser Ser Gly Phe
                325                 330                 335

Arg Asn Ile Ala Val Lys Glu Asn Leu Ile Glu Leu Met Ala Asp Ile
            340                 345                 350

Cys His Gln Val Phe Asn Glu Asp Thr Arg Ser Leu Glu Ile Ser Gln
        355                 360                 365

Ser Tyr Thr Thr Thr Gln Arg Glu Ser Ser Asp Tyr Ser Val Pro Cys
    370                 375                 380

Lys Arg Lys Lys Ile Glu Leu Gly Trp Glu Val Ile Lys Asp His Leu
385                 390                 395                 400

Gln Lys Ser Gln Asn Asp Phe Asp Leu Val Pro Trp Leu Gln Ile Ala
                405                 410                 415

Thr Gln Leu Ile Ser Lys Tyr Pro Ala Ser Leu Pro Asn Cys Glu Leu
            420                 425                 430

Ser Pro Leu Leu Met Ile Leu Ser Gln Leu Leu Pro Gln Gln Arg His
        435                 440                 445

Gly Glu Arg Thr Pro Tyr Val Leu Arg Cys Leu Thr Glu Val Ala Leu
    450                 455                 460

Cys Gln Asp Lys Arg Ser Asn Leu Glu Ser Ser Gln Lys Ser Asp Leu
465                 470                 475                 480

Leu Lys Leu Trp Asn Lys Ile Trp Cys Ile Thr Phe Arg Gly Ile Ser
                485                 490                 495
```

```
Ser Glu Gln Ile Gln Ala Glu Asn Phe Gly Leu Leu Gly Ala Ile Ile
            500                 505                 510

Gln Gly Ser Leu Val Glu Val Asp Arg Glu Phe Trp Lys Leu Phe Thr
        515                 520                 525

Gly Ser Ala Cys Arg Pro Ser Cys Pro Ala Val Cys Cys Leu Thr Leu
    530                 535                 540

Ala Leu Thr Thr Ser Ile Val Pro Gly Thr Val Lys Met Gly Ile Glu
545                 550                 555                 560

Gln Asn Met Cys Glu Val Asn Arg Ser Phe Ser Leu Lys Glu Ser Ile
                565                 570                 575

Met Lys Trp Leu Leu Phe Tyr Gln Leu Glu Gly Asp Leu Glu Asn Ser
            580                 585                 590

Thr Glu Val Pro Pro Ile Leu His Ser Asn Phe Pro His Leu Val Leu
        595                 600                 605

Glu Lys Ile Leu Val Ser Leu Thr Met Lys Asn Cys Lys Ala Ala Met
    610                 615                 620

Asn Phe Phe Gln Ser Val Pro Glu Cys Glu His His Gln Lys Asp Lys
625                 630                 635                 640

Glu Glu Leu Ser Phe Ser Glu Val Glu Glu Leu Phe Leu Gln Thr Thr
                645                 650                 655

Phe Asp Lys Met Asp Phe Leu Thr Ile Val Arg Glu Cys Gly Ile Glu
            660                 665                 670

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

Ser Leu Asp Arg Cys Leu Leu Gly Leu Ser Glu Gln Leu Leu Asn Asn
    690                 695                 700

Tyr Ser Ser Glu Ile Thr Asn Ser Glu Thr Leu Val Arg Cys Ser Arg
705                 710                 715                 720

Leu Leu Val Gly Val Leu Gly Cys Tyr Cys Tyr Met Gly Val Ile Ala
```

725 730 735

Glu Glu Glu Ala Tyr Lys Ser Glu Leu Phe Gln Lys Ala Lys Ser Leu
740 745 750

Met Gln Cys Ala Gly Glu Ser Ile Thr Leu Phe Lys Asn Lys Thr Asn
755 760 765

Glu Glu Phe Arg Ile Gly Ser Leu Arg Asn Met Met Gln Leu Cys Thr
770 775 780

Arg Cys Leu Ser Asn Cys Thr Lys Lys Ser Pro Asn Lys Ile Ala Ser
785 790 795 800

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

Asp Ile Cys Lys Ser Leu Ala Ser Phe Ile Lys Lys Pro Phe Asp Arg
820 825 830

Gly Glu Val Glu Ser Met Glu Asp Asp Thr Asn Gly Asn Leu Met Glu
835 840 845

Val Glu Asp Gln Ser Ser Met Asn Leu Phe Asn Asp Tyr Pro Asp Ser
850 855 860

Ser Val Ser Asp Ala Asn Glu Pro Gly Glu Ser Gln Ser Thr Ile Gly
865 870 875 880

Ala Ile Asn Pro Leu Ala Glu Glu Tyr Leu Ser Lys Gln Asp Leu Leu
885 890 895

Phe Leu Asp Met Leu Lys Phe Leu Cys Leu Cys Val Thr Thr Ala Gln
900 905 910

Thr Asn Thr Val Ser Phe Arg Ala Ala Asp Ile Arg Arg Lys Leu Leu
915 920 925

Met Leu Ile Asp Ser Ser Thr Leu Glu Pro Thr Lys Ser Leu His Leu
930 935 940

His Met Tyr Leu Met Leu Leu Lys Glu Leu Pro Gly Glu Glu Tyr Pro
945 950 955 960

```
Leu Pro Met Glu Asp Val Leu Glu Leu Leu Lys Pro Leu Ser Asn Val
               965                 970                 975

Cys Ser Leu Tyr Arg Arg Asp Gln Asp Val Cys Lys Thr Ile Leu Asn
           980                 985                 990

His Val Leu His Val Val Lys Asn  Leu Gly Gln Ser Asn  Met Asp Ser
        995                 1000                1005

Glu Asn  Thr Arg Asp Ala Gln  Gly Gln Phe Leu Thr  Val Ile Gly
    1010                1015                1020

Ala Phe  Trp His Leu Thr Lys  Glu Arg Lys Tyr Ile  Phe Ser Val
    1025                1030                1035

Arg Met  Ala Leu Val Asn Cys  Leu Lys Thr Leu Leu  Glu Ala Asp
    1040                1045                1050

Pro Tyr  Ser Lys Trp Ala Ile  Leu Asn Val Met Gly  Lys Asp Phe
    1055                1060                1065

Pro Val  Asn Glu Val Phe Thr  Gln Phe Leu Ala Asp  Asn His His
    1070                1075                1080

Gln Val  Arg Met Leu Ala Ala  Glu Ser Ile Asn Arg  Leu Phe Gln
    1085                1090                1095

Asp Thr  Lys Gly Asp Ser Ser  Arg Leu Leu Lys Ala  Leu Pro Leu
    1100                1105                1110

Lys Leu  Gln Gln Thr Ala Phe  Glu Asn Ala Tyr Leu  Lys Ala Gln
    1115                1120                1125

Glu Gly  Met Arg Glu Met Ser  His Ser Ala Glu Asn  Pro Glu Thr
    1130                1135                1140

Leu Asp  Glu Ile Tyr Asn Arg  Lys Ser Val Leu Leu  Thr Leu Ile
    1145                1150                1155

Ala Val  Val Leu Ser Cys Ser  Pro Ile Cys Glu Lys  Gln Ala Leu
    1160                1165                1170

Phe Ala  Leu Cys Lys Ser Val  Lys Glu Asn Gly Leu  Glu Pro His
```

```
    1175                1180                1185

Leu Val  Lys Lys Val Leu Glu  Lys Val Ser Glu Thr  Phe Gly Tyr
    1190                1195                1200

Arg Arg  Leu Glu Asp Phe Met  Ala Ser His Leu Asp  Tyr Leu Val
    1205                1210                1215

Leu Glu  Trp Leu Asn Leu Gln  Asp Thr Glu Tyr Asn  Leu Ser Ser
    1220                1225                1230

Phe Pro  Phe Ile Leu Leu Asn  Tyr Thr Asn Ile Glu  Asp Phe Tyr
    1235                1240                1245

Arg Ser  Cys Tyr Lys Val Leu  Ile Pro His Leu Val  Ile Arg Ser
    1250                1255                1260

His Phe  Asp Glu Val Lys Ser  Ile Ala Asn Gln Ile  Gln Glu Asp
    1265                1270                1275

Trp Lys  Ser Leu Leu Thr Asp  Cys Phe Pro Lys Ile  Leu Val Asn
    1280                1285                1290

Ile Leu  Pro Tyr Phe Ala Tyr  Glu Gly Thr Arg Asp  Ser Gly Met
    1295                1300                1305

Ala Gln  Gln Arg Glu Thr Ala  Thr Lys Val Tyr Asp  Met Leu Lys
    1310                1315                1320

Ser Glu  Asn Leu Leu Gly Lys  Gln Ile Asp His Leu  Phe Ile Ser
    1325                1330                1335

Asn Leu  Pro Glu Ile Val Val  Glu Leu Leu Met Thr  Leu His Glu
    1340                1345                1350

Pro Ala  Asn Ser Ser Ala Ser  Gln Ser Thr Asp Leu  Cys Asp Phe
    1355                1360                1365

Ser Gly  Asp Leu Asp Pro Ala  Pro Asn Pro Pro His  Phe Pro Ser
    1370                1375                1380

His Val  Ile Lys Ala Thr Phe  Ala Tyr Ile Ser Asn  Cys His Lys
    1385                1390                1395
```

```
Thr Lys  Leu Lys Ser Ile Leu  Glu Ile Leu Ser Lys  Ser Pro Asp
    1400                1405                1410

Ser Tyr  Gln Lys Ile Leu Leu  Ala Ile Cys Glu Gln  Ala Ala Glu
    1415                1420                1425

Thr Asn  Asn Val Tyr Lys Lys  His Arg Ile Leu Lys  Ile Tyr His
    1430                1435                1440

Leu Phe  Val Ser Leu Leu Leu  Lys Asp Ile Lys Ser  Gly Leu Gly
    1445                1450                1455

Gly Ala  Trp Ala Phe Val Leu  Arg Asp Val Ile Tyr  Thr Leu Ile
    1460                1465                1470

His Tyr  Ile Asn Gln Arg Pro  Ser Cys Ile Met Asp  Val Ser Leu
    1475                1480                1485

Arg Ser  Phe Ser Leu Cys Cys  Asp Leu Leu Ser Gln  Val Cys Gln
    1490                1495                1500

Thr Ala  Val Thr Tyr Cys Lys  Asp Ala Leu Glu Asn  His Leu His
    1505                1510                1515

Val Ile  Val Gly Thr Leu Ile  Pro Leu Val Tyr Glu  Gln Val Glu
    1520                1525                1530

Val Gln  Lys Gln Val Leu Asp  Leu Leu Lys Tyr Leu  Val Ile Asp
    1535                1540                1545

Asn Lys  Asp Asn Glu Asn Leu  Tyr Ile Thr Ile Lys  Leu Leu Asp
    1550                1555                1560

Pro Phe  Pro Asp His Val Val  Phe Lys Asp Leu Arg  Ile Thr Gln
    1565                1570                1575

Gln Lys  Ile Lys Tyr Ser Arg  Gly Pro Phe Ser Leu  Leu Glu Glu
    1580                1585                1590

Ile Asn  His Phe Leu Ser Val  Ser Val Tyr Asp Ala  Leu Pro Leu
    1595                1600                1605

Thr Arg  Leu Glu Gly Leu Lys  Asp Leu Arg Arg Gln  Leu Glu Leu
```

1610 1615 1620

His Lys Asp Gln Met Val Asp Ile Met Arg Ala Ser Gln Asp Asn
1625 1630 1635

Pro Gln Asp Gly Ile Met Val Lys Leu Val Val Asn Leu Leu Gln
1640 1645 1650

Leu Ser Lys Met Ala Ile Asn His Thr Gly Glu Lys Glu Val Leu
1655 1660 1665

Glu Ala Val Gly Ser Cys Leu Gly Glu Val Gly Pro Ile Asp Phe
1670 1675 1680

Ser Thr Ile Ala Ile Gln His Ser Lys Asp Ala Ser Tyr Thr Lys
1685 1690 1695

Ala Leu Lys Leu Phe Glu Asp Lys Glu Leu Gln Trp Thr Phe Ile
1700 1705 1710

Met Leu Thr Tyr Leu Asn Asn Thr Leu Val Glu Asp Cys Val Lys
1715 1720 1725

Val Arg Ser Ala Ala Val Thr Cys Leu Lys Asn Ile Leu Ala Thr
1730 1735 1740

Lys Thr Gly His Ser Phe Trp Glu Ile Tyr Lys Met Thr Thr Asp
1745 1750 1755

Pro Met Leu Ala Tyr Leu Gln Pro Phe Arg Thr Ser Arg Lys Lys
1760 1765 1770

Phe Leu Glu Val Pro Arg Phe Asp Lys Glu Asn Pro Phe Glu Gly
1775 1780 1785

Leu Asp Asp Ile Asn Leu Trp Ile Pro Leu Ser Glu Asn His Asp
1790 1795 1800

Ile Trp Ile Lys Thr Leu Thr Cys Ala Phe Leu Asp Ser Gly Gly
1805 1810 1815

Thr Lys Cys Glu Ile Leu Gln Leu Leu Lys Pro Met Cys Glu Val
1820 1825 1830

```
Lys Thr  Asp Phe Cys Gln Thr  Val Leu Pro Tyr Leu  Ile His Asp
    1835                1840                1845

Ile Leu  Leu Gln Asp Thr Asn  Glu Ser Trp Arg Asn  Leu Leu Ser
    1850                1855                1860

Thr His  Val Gln Gly Phe Phe  Thr Ser Cys Leu Arg  His Phe Ser
    1865                1870                1875

Gln Thr  Ser Arg Ser Thr Thr  Pro Ala Asn Leu Asp  Ser Glu Ser
    1880                1885                1890

Glu His  Phe Phe Arg Cys Cys  Leu Asp Lys Lys Ser  Gln Arg Thr
    1895                1900                1905

Met Leu  Ala Val Val Asp Tyr  Met Arg Arg Gln Lys  Arg Pro Ser
    1910                1915                1920

Ser Gly  Thr Ile Phe Asn Asp  Ala Phe Trp Leu Asp  Leu Asn Tyr
    1925                1930                1935

Leu Glu  Val Ala Lys Val Ala  Gln Ser Cys Ala Ala  His Phe Thr
    1940                1945                1950

Ala Leu  Leu Tyr Ala Glu Ile  Tyr Ala Asp Lys Lys  Ser Met Asp
    1955                1960                1965

Asp Gln  Glu Lys Arg Ser Leu  Ala Phe Glu Glu Gly  Ser Gln Ser
    1970                1975                1980

Thr Thr  Ile Ser Ser Leu Ser  Glu Lys Ser Lys Glu  Glu Thr Gly
    1985                1990                1995

Ile Ser  Leu Gln Asp Leu Leu  Leu Glu Ile Tyr Arg  Ser Ile Gly
    2000                2005                2010

Glu Pro  Asp Ser Leu Tyr Gly  Cys Gly Gly Gly Lys  Met Leu Gln
    2015                2020                2025

Pro Ile  Thr Arg Leu Arg Thr  Tyr Glu His Glu Ala  Met Trp Gly
    2030                2035                2040

Lys Ala  Leu Val Thr Tyr Asp  Leu Glu Thr Ala Ile  Pro Ser Ser
```

2045 2050 2055

Thr Arg Gln Ala Gly Ile Ile Gln Ala Leu Gln Asn Leu Gly Leu
2060 2065 2070

Cys His Ile Leu Ser Val Tyr Leu Lys Gly Leu Asp Tyr Glu Asn
2075 2080 2085

Lys Asp Trp Cys Pro Glu Leu Glu Glu Leu His Tyr Gln Ala Ala
2090 2095 2100

Trp Arg Asn Met Gln Trp Asp His Cys Thr Ser Val Ser Lys Glu
2105 2110 2115

Val Glu Gly Thr Ser Tyr His Glu Ser Leu Tyr Asn Ala Leu Gln
2120 2125 2130

Ser Leu Arg Asp Arg Glu Phe Ser Thr Phe Tyr Glu Ser Leu Lys
2135 2140 2145

Tyr Ala Arg Val Lys Glu Val Glu Glu Met Cys Lys Arg Ser Leu
2150 2155 2160

Glu Ser Val Tyr Ser Leu Tyr Pro Thr Leu Ser Arg Leu Gln Ala
2165 2170 2175

Ile Gly Glu Leu Glu Ser Ile Gly Glu Leu Phe Ser Arg Ser Val
2180 2185 2190

Thr His Arg Gln Leu Ser Glu Val Tyr Ile Lys Trp Gln Lys His
2195 2200 2205

Ser Gln Leu Leu Lys Asp Ser Asp Phe Ser Phe Gln Glu Pro Ile
2210 2215 2220

Met Ala Leu Arg Thr Val Ile Leu Glu Ile Leu Met Glu Lys Glu
2225 2230 2235

Met Asp Asn Ser Gln Arg Glu Cys Ile Lys Asp Ile Leu Thr Lys
2240 2245 2250

His Leu Val Glu Leu Ser Ile Leu Ala Arg Thr Phe Lys Asn Thr
2255 2260 2265

```
Gln Leu  Pro Glu Arg Ala Ile  Phe Gln Ile Lys Gln  Tyr Asn Ser
    2270                2275                2280

Val Ser  Cys Gly Val Ser Glu  Trp Gln Leu Glu Glu  Ala Gln Val
    2285                2290                2295

Phe Trp  Ala Lys Lys Glu Gln  Ser Leu Ala Leu Ser  Ile Leu Lys
    2300                2305                2310

Gln Met  Ile Lys Lys Leu Asp  Ala Ser Cys Ala Ala  Asn Asn Pro
    2315                2320                2325

Ser Leu  Lys Leu Thr Tyr Thr  Glu Cys Leu Arg Val  Cys Gly Asn
    2330                2335                2340

Trp Leu  Ala Glu Thr Cys Leu  Glu Asn Pro Ala Val  Ile Met Gln
    2345                2350                2355

Thr Tyr  Leu Glu Lys Ala Val  Glu Val Ala Gly Asn  Tyr Asp Gly
    2360                2365                2370

Glu Ser  Ser Asp Glu Leu Arg  Asn Gly Lys Met Lys  Ala Phe Leu
    2375                2380                2385

Ser Leu  Ala Arg Phe Ser Asp  Thr Gln Tyr Gln Arg  Ile Glu Asn
    2390                2395                2400

Tyr Met  Lys Ser Ser Glu Phe  Glu Asn Lys Gln Ala  Leu Leu Lys
    2405                2410                2415

Arg Ala  Lys Glu Glu Val Gly  Leu Leu Arg Glu His  Lys Ile Gln
    2420                2425                2430

Thr Asn  Arg Tyr Thr Val Lys  Val Gln Arg Glu Leu  Glu Leu Asp
    2435                2440                2445

Glu Leu  Ala Leu Arg Ala Leu  Lys Glu Asp Arg Lys  Arg Phe Leu
    2450                2455                2460

Cys Lys  Ala Val Glu Asn Tyr  Ile Asn Cys Leu Leu  Ser Gly Glu
    2465                2470                2475

Glu His  Asp Met Trp Val Phe  Arg Leu Cys Ser Leu  Trp Leu Glu
```

```
    2480                2485                2490

Asn Ser  Gly Val Ser Glu Val  Asn Gly Met Met Lys  Arg Asp Gly
    2495                2500                2505

Met Lys  Ile Pro Thr Tyr Lys  Phe Leu Pro Leu Met  Tyr Gln Leu
    2510                2515                2520

Ala Ala  Arg Met Gly Thr Lys  Met Met Gly Gly Leu  Gly Phe His
    2525                2530                2535

Glu Val  Leu Asn Asn Leu Ile  Ser Arg Ile Ser Met  Asp His Pro
    2540                2545                2550

His His  Thr Leu Phe Ile Ile  Leu Ala Leu Ala Asn  Ala Asn Arg
    2555                2560                2565

Asp Glu  Phe Leu Thr Lys Pro  Glu Val Ala Arg Arg  Ser Arg Ile
    2570                2575                2580

Thr Lys  Asn Val Pro Lys Gln  Ser Ser Gln Leu Asp  Glu Asp Arg
    2585                2590                2595

Thr Glu  Ala Ala Asn Arg Ile  Ile Cys Thr Ile Arg  Ser Arg Arg
    2600                2605                2610

Pro Gln  Met Val Arg Ser Val  Glu Ala Leu Cys Asp  Ala Tyr Ile
    2615                2620                2625

Ile Leu  Ala Asn Leu Asp Ala  Thr Gln Trp Lys Thr  Gln Arg Lys
    2630                2635                2640

Gly Ile  Asn Ile Pro Ala Asp  Gln Pro Ile Thr Lys  Leu Lys Asn
    2645                2650                2655

Leu Glu  Asp Val Val Val Pro  Thr Met Glu Ile Lys  Val Asp His
    2660                2665                2670

Thr Gly  Glu Tyr Gly Asn Leu  Val Thr Ile Gln Ser  Phe Lys Ala
    2675                2680                2685

Glu Phe  Arg Leu Ala Gly Gly  Val Asn Leu Pro Lys  Ile Ile Asp
    2690                2695                2700
```

```
Cys Val  Gly Ser Asp Gly Lys  Glu Arg Arg Gln Leu  Val Lys Gly
    2705                2710                2715

Arg Asp  Asp Leu Arg Gln Asp  Ala Val Met Gln Gln  Val Phe Gln
    2720                2725                2730

Met Cys  Asn Thr Leu Leu Gln  Arg Asn Thr Glu Thr  Arg Lys Arg
    2735                2740                2745

Lys Leu  Thr Ile Cys Thr Tyr  Lys Val Val Pro Leu  Ser Gln Arg
    2750                2755                2760

Ser Gly  Val Leu Glu Trp Cys  Thr Gly Thr Val Pro  Ile Gly Glu
    2765                2770                2775

Phe Leu  Val Asn Asn Glu Asp  Gly Ala His Lys Arg  Tyr Arg Pro
    2780                2785                2790

Asn Asp  Phe Ser Ala Phe Gln  Cys Gln Lys Lys Met  Met Glu Val
    2795                2800                2805

Gln Lys  Lys Ser Phe Glu Glu  Lys Tyr Glu Val Phe  Met Asp Val
    2810                2815                2820

Cys Gln  Asn Phe Gln Pro Val  Phe Arg Tyr Phe Cys  Met Glu Lys
    2825                2830                2835

Phe Leu  Asp Pro Ala Ile Trp  Phe Glu Lys Arg Leu  Ala Tyr Thr
    2840                2845                2850

Arg Ser  Val Ala Thr Ser Ser  Ile Val Gly Tyr Ile  Leu Gly Leu
    2855                2860                2865

Gly Asp  Arg His Val Gln Asn  Ile Leu Ile Asn Glu  Gln Ser Ala
    2870                2875                2880

Glu Leu  Val His Ile Asp Leu  Gly Val Ala Phe Glu  Gln Gly Lys
    2885                2890                2895

Ile Leu  Pro Thr Pro Glu Thr  Val Pro Phe Arg Leu  Thr Arg Asp
    2900                2905                2910

Ile Val  Asp Gly Met Gly Ile  Thr Gly Val Glu Gly  Val Phe Arg
```

2915 2920 2925

Arg Cys Cys Glu Lys Thr Met Glu Val Met Arg Asn Ser Gln Glu
2930 2935 2940

Thr Leu Leu Thr Ile Val Glu Val Leu Leu Tyr Asp Pro Leu Phe
2945 2950 2955

Asp Trp Thr Met Asn Pro Leu Lys Ala Leu Tyr Leu Gln Gln Arg
2960 2965 2970

Pro Glu Asp Glu Thr Glu Leu His Pro Thr Leu Asn Ala Asp Asp
2975 2980 2985

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Pro Arg Gln Ile Leu Cys Gln Phe Ile Asp Arg Ile Leu Thr Asp Val
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Asn Val Val Ala Val Glu Leu Val Lys Lys Thr Asp Ser Gln Pro Thr
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Ser Val Met Leu Leu Asp Phe Ile Gln His Ile Met Lys Ser Ser Pro
65                  70                  75                  80

Leu Met Phe Val Asn Val Ser Gly Ser His Glu Ala Lys Gly Ser Cys
                85                  90                  95

Ile Glu Phe Ser Asn Trp Ile Ile Thr Arg Leu Leu Arg Ile Ala Ala
            100                 105                 110

Thr Pro Ser Cys His Leu Leu His Lys Lys Ile Cys Glu Val Ile Cys
        115                 120                 125

Ser Leu Leu Phe Leu Phe Lys Ser Lys Ser Pro Ala Ile Phe Gly Val
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Leu Thr Lys Glu Leu Leu Gln Leu Phe Glu Asp Leu Val Tyr Leu His
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Arg Arg Asn Val Met Gly His Ala Val Glu Trp Pro Val Val Met Ser
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Arg Phe Leu Ser Gln Leu Asp Glu His Met Gly Tyr Leu Gln Ser Ala
            180                 185                 190

Pro Leu Gln Leu Met Ser Met Gln Asn Leu Glu Phe Ile Glu Val Thr
        195                 200                 205

Leu Leu Met Val Leu Thr Arg Ile Ile Ala Ile Val Phe Phe Arg Arg
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Gln Glu Leu Leu Leu Trp Gln Ile Gly Cys Val Leu Leu Glu Tyr Gly
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Phe Leu Glu Leu Leu Lys His Leu Val Glu Met Asp Thr Asp Gln Leu
        275                 280                 285

Lys Leu Tyr Glu Glu Pro Leu Ser Lys Leu Ile Lys Thr Leu Phe Pro
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Phe Glu Ala Glu Ala Tyr Arg Asn Ile Glu Pro Val Tyr Leu Asn Met
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Leu Leu Glu Lys Leu Cys Val Met Phe Glu Asp Gly Val Leu Met Arg
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Leu Lys Ser Asp Leu Leu Lys Ala Ala Leu Cys His Leu Leu Gln Tyr
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Phe Leu Lys Phe Val Pro Ala Gly Tyr Glu Ser Ala Leu Gln Val Arg
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Lys Val Tyr Val Arg Asn Ile Cys Lys Ala Leu Leu Asp Val Leu Gly
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Lys Met Glu Ser Met Glu Ile Ile Glu Glu Ile Gln Cys Gln Thr Gln
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Gln Glu Asn Leu Ser Ser Asn Ser Asp Gly Ile Ser Pro Lys Arg Arg
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Arg Leu Ser Ser Ser Leu Asn Pro Ser Lys Arg Ala Pro Lys Gln Thr
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Glu Glu Ile Lys His Val Asp Met Asn Gln Lys Ser Ile Leu Trp Ser
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Ala Leu Lys Gln Lys Ala Glu Ser Leu Gln Ile Ser Leu Glu Tyr Ser
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Asn Cys Arg Thr Phe Lys Asp Cys Gln His Lys Ser Lys Lys Lys Pro
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Ser Val Val Ile Thr Trp Met Ser Leu Asp Phe Tyr Thr Lys Val Leu
    530                 535                 540

Lys Ser Cys Arg Ser Leu Leu Glu Ser Val Gln Lys Leu Asp Leu Glu
545                 550                 555                 560

Ala Thr Ile Asp Lys Val Val Lys Ile Tyr Asp Ala Leu Ile Tyr Met
                565                 570                 575

Gln Val Asn Ser Ser Phe Glu Asp His Ile Leu Glu Asp Leu Cys Gly
            580                 585                 590

Met Leu Ser Leu Pro Trp Ile Tyr Ser His Ser Asp Asp Gly Cys Leu
        595                 600                 605

Lys Leu Thr Thr Phe Ala Ala Asn Leu Leu Thr Leu Ser Cys Arg Ile
    610                 615                 620

Ser Asp Ser Tyr Ser Pro Gln Ala Gln Ser Arg Cys Val Phe Leu Leu
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Thr Leu Phe Pro Arg Arg Ile Phe Leu Glu Trp Arg Thr Ala Val Tyr
                645                 650                 655

Asn Trp Ala Leu Gln Ser Ser His Glu Val Ile Arg Ala Ser Cys Val
            660                 665                 670

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

Pro Lys Ile Leu Ile Asp Lys Val Lys Asp Asp Ser Asp Ile Val Lys
    690                 695                 700
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Lys Glu Phe Ala Ser Ile Leu Gly Gln Leu Val Cys Thr Leu His Gly
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Met Phe Tyr Leu Thr Ser Ser Leu Thr Glu Pro Phe Ser Glu His Gly
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His Val Asp Leu Phe Cys Arg Asn Leu Lys Ala Thr Ser Gln His Glu
            740                 745                 750

Cys Ser Ser Ser Gln Leu Lys Ala Ser Val Cys Lys Pro Phe Leu Phe
        755                 760                 765

Leu Leu Lys Lys Lys Ile Pro Ser Pro Val Lys Leu Ala Phe Ile Asp
    770                 775                 780

Asn Leu His His Leu Cys Lys His Leu Asp Phe Arg Glu Asp Glu Thr
785                 790                 795                 800

Asp Val Lys Ala Val Leu Gly Thr Leu Leu Asn Leu Met Glu Asp Pro
                805                 810                 815

Asp Lys Asp Val Arg Val Ala Phe Ser Gly Asn Ile Lys His Ile Leu
            820                 825                 830

Glu Ser Leu Asp Ser Glu Asp Gly Phe Ile Lys Glu Leu Phe Val Leu
        835                 840                 845

Arg Met Lys Glu Ala Tyr Thr His Ala Gln Ile Ser Arg Asn Asn Glu
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Leu Lys Asp Thr Leu Ile Leu Thr Thr Gly Asp Ile Gly Arg Ala Ala
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Lys Gly Asp Leu Val Pro Phe Ala Leu Leu His Leu Leu His Cys Leu
                885                 890                 895

Leu Ser Lys Ser Ala Ser Val Ser Gly Ala Ala Tyr Thr Glu Ile Arg
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Ala Leu Val Ala Ala Lys Ser Val Lys Leu Gln Ser Phe Phe Ser Gln
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Tyr Lys Lys Pro Ile Cys Gln Phe Leu Val Glu Ser Leu His Ser Ser
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Lys Gln Asp Val Ala His Gln Arg Glu Met Ala Leu Asn Thr Leu Ser
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Glu Ile Ala Asn Val Phe Asp Phe Pro Asp Leu Asn Arg Phe Leu Thr
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Arg Thr Leu Gln Val Leu Leu Pro  Asp Leu Ala Ala Lys  Ala Ser Pro
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His Leu  Val Cys Ser Cys Ser  Lys Asp Glu Leu Glu  Arg Ala Leu
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His Tyr  Leu Lys Asn Glu Thr  Glu Ile Glu Leu Gly  Ser Leu Leu
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Arg Gln  Asp Phe Gln Gly Leu  His Asn Glu Leu Leu  Leu Arg Ile
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actgcagtaa tgtcaatggt tggttatatt ctggggcttg gagaccgtca tggtgaaaat
7440

attctctttg attctttgac tggtgaatgc gtacatgtag atttcaattg tcttttcaat
7500

aagggagaaa cctttgaagt tccagaaatt gtgccatttc gcctgactca taatatggtt
7560

aatggaatgg gtcctatggg aacagagggt ctttttcgaa gagcatgtga agttacaatg
7620

aggctgatgc gtgatcagcg agagccttta atgagtgtct taaagacttt tctacatgat
7680

cctcttgtgg aatggagtaa accagtgaaa gggcattcca aagcgccact gaatgaaact
7740

ggagaagttg tcaatgaaaa ggccaagacc catgttcttg acattgagca gcgactacaa
7800

ggtgtaatca agactcgaaa tagagtgaca ggactgccgt tatctattga aggacatgtg
7860

cattacctta tacaggaagc tactgatgaa aacttactat gccagatgta tcttggttgg
7920

actccatata tgtga
7935

<210> 8
<211> 306
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleotide sequence for mRNA translation of GSE56

<400> 8
atggatggat ggtgtcctgg gagagaccgt cggacagagg aagaaaattt ccgcaaaaaa
60

gaagagcatt gcccggagct gcccccaggg agtgcaaaga gagcactgcc caccagcaca
120

agctcctctc cccagcaaaa gaaaaaacca ctcgatggag aatatttcac ccttaagatc
180

cgtgggcgtg agcgcttcga gatgttccga gagctgaatg aggccttgga attaaaggat
240

gcccgtgctg ccgaggagtc aggagacagc agggctcact ccagctaccc gaagatagtt
300

agttag
306

<210> 9
<211> 101
<212> PRT
<213> Artificial Sequence

<220>
<223> amino acid sequence of GSE56

<400> 9

Met Asp Gly Trp Cys Pro Gly Arg Asp Arg Arg Thr Glu Glu Glu Asn
1 5 10 15

Phe Arg Lys Lys Glu Glu His Cys Pro Glu Leu Pro Pro Gly Ser Ala
20 25 30

Lys Arg Ala Leu Pro Thr Ser Thr Ser Ser Ser Pro Gln Gln Lys Lys
35 40 45

Lys Pro Leu Asp Gly Glu Tyr Phe Thr Leu Lys Ile Arg Gly Arg Glu
50 55 60

Arg Phe Glu Met Phe Arg Glu Leu Asn Glu Ala Leu Glu Leu Lys Asp
65 70 75 80

Ala Arg Ala Ala Glu Glu Ser Gly Asp Ser Arg Ala His Ser Ser Tyr
85 90 95

Pro Lys Ile Val Ser
100

<210> 10
<211> 387
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleotide sequence encoding Ad5-E4orf1

<400> 10
atggccgctg ctgtggaagc cctgtacgtg gtgcttgaaa gagagggcgc catcctgcct
60

agacaagagg gcttttctgg cgtgtacgtg ttcttcagcc ccatcaactt cgtgatccct
120

ccaatgggcg ccgtgatgct gagcctgaga ctgagagtgt gtatccctcc tggctacttc
180

ggccggtttc tggccctgac cgatgtgaac cagcctgacg tgttcaccga gagctacatc
240

atgacccctg acatgaccga ggaactgagc gtggtgctgt tcaaccacgg cgaccagttc
300

ttttatggcc acgccggaat ggccgtcgtg cggctgatgc tgatcagagt ggtgtttccc
360

gtcgtccggc aggccagcaa tgtttga
387

<210> 11
<211> 453
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleotide sequence encoding Ad5-E4orf6/7

<400> 11
atgaccacca gcggcgtgcc cttcggcatg acactcagac ctaccagaag ccggctgagc
60

agaagaaccc cttacagcag agacaggctg cctccattcg agacagagac acgggccacc
120

atcctggaag atcaccctct gctgcccgag tgtaacaccc tgaccatgca caacgcctgg
180

acaagcccat ctcctccagt gaaacagccc caagtgggac agcagcctgt tgctcagcag
240

ctggacagcg acatgaacct gtctgaactg cccggcgagt tcatcaacat caccgacgag
300

agactggccc ggcaagagac agtgtggaac atcaccccta agaacatgag cgtgacccac
360

gacatgatgc tgttcaaggc cagcagaggc gagcggacag tgtacagcgt ttgttgggaa
420

ggcggcggac ggctgaatac cagagtgctg taa
453

<210> 12
<211> 885
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleotide sequence encoding E4orf6

<400> 12
atgacaacca gcggcgtgcc cttcggcatg acactgaggc ctacaagaag ccggctgagc
60

agaagaaccc cttacagcag agacagactg cctccattcg agacagagac acgggccacc
120

atcctggaag atcaccctct gctgcccgag tgcaacaccc tgacaatgca caacgtgtcc
180

tacgtgcggg gcctgccttg tagcgttggc ttcacactga tccaagagtg ggtcgtgccc
240

tgggacatgg tgctgaccag agaggaactg gtcatcctgc ggaagtgtat gcacgtgtgc
300

ctgtgctgcg ccaacatcga catcatgacc agcatgatga tccacggcta cgagagctgg
360

gccctgcact gtcactgttc tagccctggc agcctgcagt gtattgctgg tggacaggtt
420

ctggccagct ggttcagaat ggtggtggac ggcgccatgt tcaaccagag attcatctgg
480

tacagagagg tggtcaacta caacatgccc aaagaagtga tgttcatgag cagcgttttc
540

atgcggggca gacacctgat ctacctgcgg ctttggtacg atggccacgt gggatctgtg
600

gtgcctgcca tgagctttgg ctacagcgcc ctgcattgcg gcatcctgaa caacatcgtg
660

gtgctgtgct gcagctactg cgccgatctg agcgagatca gagtgcggtg ttgtgccaga
720

cggaccagac ggctgatgct gagagccgtg cggatcattg ccgaagagac aaccgccatg
780

ctgtactctt gccggaccga gagaagaagg cagcagttca tcagagccct gctccagcac
840

caccggccta tcctgatgca cgactacgac agcaccccta tgtag
885

<210> 13
<211> 294
<212> PRT
<213> Artificial Sequence

<220>
<223> amino acid sequence of E4orf6

<400> 13

Met Thr Thr Ser Gly Val Pro Phe Gly Met Thr Leu Arg Pro Thr Arg
1 5 10 15

Ser Arg Leu Ser Arg Arg Thr Pro Tyr Ser Arg Asp Arg Leu Pro Pro
20 25 30

Phe Glu Thr Glu Thr Arg Ala Thr Ile Leu Glu Asp His Pro Leu Leu
35 40 45

Pro Glu Cys Asn Thr Leu Thr Met His Asn Val Ser Tyr Val Arg Gly
50 55 60

Leu Pro Cys Ser Val Gly Phe Thr Leu Ile Gln Glu Trp Val Val Pro
65 70 75 80

Trp Asp Met Val Leu Thr Arg Glu Glu Leu Val Ile Leu Arg Lys Cys
85 90 95

Met His Val Cys Leu Cys Cys Ala Asn Ile Asp Ile Met Thr Ser Met
100 105 110

Met Ile His Gly Tyr Glu Ser Trp Ala Leu His Cys His Cys Ser Ser
115 120 125

Pro Gly Ser Leu Gln Cys Ile Ala Gly Gly Gln Val Leu Ala Ser Trp
130 135 140

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Phe Arg Met Val Val Asp Gly Ala Met Phe Asn Gln Arg Phe Ile Trp
145                 150                 155                 160

Tyr Arg Glu Val Val Asn Tyr Asn Met Pro Lys Glu Val Met Phe Met
                165                 170                 175

Ser Ser Val Phe Met Arg Gly Arg His Leu Ile Tyr Leu Arg Leu Trp
            180                 185                 190

Tyr Asp Gly His Val Gly Ser Val Val Pro Ala Met Ser Phe Gly Tyr
        195                 200                 205

Ser Ala Leu His Cys Gly Ile Leu Asn Asn Ile Val Val Leu Cys Cys
    210                 215                 220

Ser Tyr Cys Ala Asp Leu Ser Glu Ile Arg Val Arg Cys Cys Ala Arg
225                 230                 235                 240

Arg Thr Arg Arg Leu Met Leu Arg Ala Val Arg Ile Ile Ala Glu Glu
                245                 250                 255

Thr Thr Ala Met Leu Tyr Ser Cys Arg Thr Glu Arg Arg Arg Gln Gln
            260                 265                 270

Phe Ile Arg Ala Leu Leu Gln His His Arg Pro Ile Leu Met His Asp
        275                 280                 285

Tyr Asp Ser Thr Pro Met
    290
```

<210> 14
<211> 1488
<212> DNA
<213> Artificial Sequence

<220>
<223> nucleotide sequence encoding E1B55K

<400> 14
atggaaagac ggaaccccag cgagagaggc gtgccagctg gattttctgg acacgccagc
60

gtggaaagcg gctgcgagac acaagaaagc cctgccaccg tggtgttcag accacctggc
120

gataataccg atggcggagc tgctgctgca gctggtggat ctcaggcagc agctgcaggc
180

gctgaaccta tggaacctga gagcagacct ggacctagcg gcatgaatgt ggtgcaggtc
240

gccgagctgt atcccgagct gagaagaatc ctgaccatca ccgaggatgg ccagggactg
300

aagggcgtga agagagaaag aggcgcctgc gaggccacag aggaagccag aaatctggcc
360

ttcagcctga tgaccagaca cagacccgag tgcatcacct tccagcagat caaggacaac
420

tgcgccaacg agctggacct gctggcccag aagtacagca tcgagcagct gaccacctac
480

tggctgcaac ccggcgacga tttcgaagag gccatcagag tgtacgccaa ggtggccctc
540

agacctgact gcaagtacaa gatcagcaag ctggtcaaca tccggaactg ctgctacatc
600

agcggcaatg gcgccgaggt ggaaatcgac acagaggaca gagtggcctt ccggtgcagc
660

atgatcaaca tgtggcctgg cgtgctcggc atggatggcg tggtcattat gaacgtgcgg
720

ttcacaggcc ccaacttcag cggcacagtg tttctggcca acaccaacct gatcctgcac
780

ggcgtgtcct tctacggctt caacaatacc tgcgtggaag cctggaccga cgttcgcgtt
840

agaggctgcg ccttctactg ctgttggaag ggcgtcgtgt gcagacccaa gagcagagcc
900

agcatcaaga agtgcctgtt cgagagatgc accctgggca tcctgagcga gggcaacagc
960

agagtcagac acaacgtggc cagcgactgc ggctgcttca tgctggttaa gagcgtggcc
1020

gtgatcaagc acaacatggt ctgcggcaac tgcgaggata gagccagcca gatgctgacc
1080

tgcagcgacg gcaattgtca tctgctgaaa accatccacg tggcctctca cagcagaaag
1140

gcctggcctg tgttcgagca caatatcctg acacggtgct ccctgcacct gggcaataga
1200

cggggagtgt tcctgcctta ccagtgcaac ctgagccaca ccaagatcct gctggaaccc
1260

gagtccatga gcaaagtgaa cctgaatggc gtgttcgaca tgaccatgaa gatctggaaa
1320

gtgctgcgct acgacgagac acggaccaga tgtagacctt gcgagtgtgg cggcaagcac
1380

atcagaaacc agcctgtgat gctggacgtg accgaggaac tgaggcctga tcatctggtg
1440

ctggcctgta ccagagccga gtttggcagc tccgacgagg ataccgat
1488

<210> 15
<211> 496
<212> PRT
<213> Artificial Sequence

<220>
<223> amino acid sequence of E1B55K

<400> 15

Met Glu Arg Arg Asn Pro Ser Glu Arg Gly Val Pro Ala Gly Phe Ser
1 5 10 15

Gly His Ala Ser Val Glu Ser Gly Cys Glu Thr Gln Glu Ser Pro Ala
20 25 30

Thr Val Val Phe Arg Pro Pro Gly Asp Asn Thr Asp Gly Gly Ala Ala
35 40 45

Ala Ala Ala Gly Gly Ser Gln Ala Ala Ala Ala Gly Ala Glu Pro Met
50 55 60

Glu Pro Glu Ser Arg Pro Gly Pro Ser Gly Met Asn Val Val Gln Val
65 70 75 80

Ala Glu Leu Tyr Pro Glu Leu Arg Arg Ile Leu Thr Ile Thr Glu Asp
85 90 95

Gly Gln Gly Leu Lys Gly Val Lys Arg Glu Arg Gly Ala Cys Glu Ala
100 105 110

Thr Glu Glu Ala Arg Asn Leu Ala Phe Ser Leu Met Thr Arg His Arg
115 120 125

Pro Glu Cys Ile Thr Phe Gln Gln Ile Lys Asp Asn Cys Ala Asn Glu
130 135 140

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

```
Trp Leu Gln Pro Gly Asp Asp Phe Glu Glu Ala Ile Arg Val Tyr Ala
                165                 170                 175

Lys Val Ala Leu Arg Pro Asp Cys Lys Tyr Lys Ile Ser Lys Leu Val
            180                 185                 190

Asn Ile Arg Asn Cys Cys Tyr Ile Ser Gly Asn Gly Ala Glu Val Glu
        195                 200                 205

Ile Asp Thr Glu Asp Arg Val Ala Phe Arg Cys Ser Met Ile Asn Met
    210                 215                 220

Trp Pro Gly Val Leu Gly Met Asp Gly Val Val Ile Met Asn Val Arg
225                 230                 235                 240

Phe Thr Gly Pro Asn Phe Ser Gly Thr Val Phe Leu Ala Asn Thr Asn
                245                 250                 255

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

Glu Ala Trp Thr Asp Val Arg Val Arg Gly Cys Ala Phe Tyr Cys Cys
        275                 280                 285

Trp Lys Gly Val Val Cys Arg Pro Lys Ser Arg Ala Ser Ile Lys Lys
    290                 295                 300

Cys Leu Phe Glu Arg Cys Thr Leu Gly Ile Leu Ser Glu Gly Asn Ser
305                 310                 315                 320

Arg Val Arg His Asn Val Ala Ser Asp Cys Gly Cys Phe Met Leu Val
                325                 330                 335

Lys Ser Val Ala Val Ile Lys His Asn Met Val Cys Gly Asn Cys Glu
            340                 345                 350

Asp Arg Ala Ser Gln Met Leu Thr Cys Ser Asp Gly Asn Cys His Leu
        355                 360                 365

Leu Lys Thr Ile His Val Ala Ser His Ser Arg Lys Ala Trp Pro Val
    370                 375                 380
```

Phe Glu His Asn Ile Leu Thr Arg Cys Ser Leu His Leu Gly Asn Arg
385 390 395 400

Arg Gly Val Phe Leu Pro Tyr Gln Cys Asn Leu Ser His Thr Lys Ile
405 410 415

Leu Leu Glu Pro Glu Ser Met Ser Lys Val Asn Leu Asn Gly Val Phe
420 425 430

Asp Met Thr Met Lys Ile Trp Lys Val Leu Arg Tyr Asp Glu Thr Arg
435 440 445

Thr Arg Cys Arg Pro Cys Glu Cys Gly Gly Lys His Ile Arg Asn Gln
450 455 460

Pro Val Met Leu Asp Val Thr Glu Glu Leu Arg Pro Asp His Leu Val
465 470 475 480

Leu Ala Cys Thr Arg Ala Glu Phe Gly Ser Ser Asp Glu Asp Thr Asp
485 490 495

<210> 16
<211> 131
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for adeno-associated virus integration site 1 (AAVS1), 3'-ITR

<400> 16
cctgcaggca gctgcgcgct cgctcgctca ctgaggccgc ccgggcaaag cccgggcgtc
60

gggcgacctt tggtcgcccg gcctcagtga gcgagcgagc gcgcagagag ggagtggcca
120

actccatcac t
131

<210> 17
<211> 796
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for AAVS1, Homologous arm-left

<400> 17

tgctttctct gaccagcatt ctctcccctg ggcctgtgcc gctttctgtc tgcagcttgt
60

ggcctgggtc acctctacgg ctggcccaga tccttccctg ccgcctcctt caggttccgt
120

cttcctccac tccctcttcc ccttgctctc tgctgtgttg ctgcccaagg atgctctttc
180

cggagcactt ccttctcggc gctgcaccac gtgatgtcct ctgagcggat cctccccgtg
240

tctgggtcct ctccgggcat ctctcctccc tcacccaacc ccatgccgtc ttcactcgct
300

gggttccctt ttccttctcc ttctggggcc tgtgccatct ctcgtttctt aggatggcct
360

tctccgacgg atgtctccct tgcgtcccgc ctccccttct tgtaggcctg catcatcacc
420

gtttttctgg acaaccccaa agtaccccgt ctccctggct ttagccacct ctccatcctc
480

ttgctttctt tgcctggaca ccccgttctc ctgtggattc gggtcacctc tcactccttt
540

catttgggca gctcccctac ccccccttacc tctctagtct gtgctagctc ttccagcccc
600

ctgtcatggc atcttccagg ggtccgagag ctcagctagt cttcttcctc caacccgggc
660

ccctatgtcc acttcaggac agcatgtttg ctgcctccag ggatcctgtg tccccgagct
720

gggaccacct tatattccca gggccggtta atgtggctct ggttctgggt acttttatct
780

gtcccctcca ccccac
796

<210> 18
<211> 514
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for AAVS1, hPGK promoter (without SA)

<400> 18
ccacggggtt ggggttgcgc cttttccaag gcagccctgg gtttgcgcag ggacgcggct
60

gctctgggcg tggttccggg aaacgcagcg gcgccgaccc tgggtctcgc acattcttca
120

cgtccgttcg cagcgtcacc cggatcttcg ccgctaccct tgtgggcccc ccggcgacgc
180

ttcctgctcc gcccctaagt cgggaaggtt ccttgcggtt cgcggcgtgc cggacgtgac
240

aaacggaagc cgcacgtctc actagtaccc tcgcagacgg acagcgccag ggagcaatgg
300

cagcgcgccg accgcgatgg gctgtggcca atagcggctg ctcagcaggg cgcgccgaga
360

gcagcggccg ggaaggggcg gtgcgggagg cggggtgtgg ggcggtagtg tgggccctgt
420

tcctgcccgc gcggtgttcc gcattctgca agcctccgga gcgcacgtcg gcagtcggct
480

ccctcgttga ccgaatcacc gacctctctc ccca
514

<210> 19
<211> 720
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for AAVS1, eGFP

<400> 19
atggtgagca agggcgagga gctgttcacc ggggtggtgc ccatcctggt cgagctggac
60

ggcgacgtaa acggccacaa gttcagcgtg tccggcgagg gcgagggcga tgccacctac
120

ggcaagctga ccctgaagtt catctgcacc accggcaagc tgcccgtgcc ctggcccacc
180

ctcgtgacca ccctgaccta cggcgtgcag tgcttcagcc gctaccccga ccacatgaag
240

cagcacgact tcttcaagtc cgccatgccc gaaggctacg tccaggagcg caccatcttc
300

ttcaaggacg acggcaacta caagacccgc gccgaggtga agttcgaggg cgacaccctg
360

gtgaaccgca tcgagctgaa gggcatcgac ttcaaggagg acggcaacat cctggggcac
420

aagctggagt acaactacaa cagccacaac gtctatatca tggccgacaa gcagaagaac
480

ggcatcaagg tgaacttcaa gatccgccac aacatcgagg acggcagcgt gcagctcgcc
540

gaccactacc agcagaacac ccccatcggc gacggccccg tgctgctgcc cgacaaccac
600

tacctgagca cccagtccgc cctgagcaaa gaccccaacg agaagcgcga tcacatggtc
660

ctgctggagt tcgtgaccgc cgccgggatc actctcggca tggacgagct gtacaagtaa
720

<210> 20
<211> 226
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for AAVS1, bGH-pA

<400> 20
actgtgcctt ctagttgcca gccatctgtt gtttgcccct cccccgtgcc ttccttgacc
60

ctggaaggtg ccactcccac tgtcctttcc taataaaatg aggaaattgc atcgcattgt
120

ctgagtaggt gtcattctat tctgggggggt ggggtggggc aggacagcaa gggggaggat
180

tgggaagaca atagcaggca tgctggggat gcggtgggct ctatgg
226

<210> 21
<211> 258
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for AAVS1, Homologous arm-right

<400> 21
tagggacagg attggtgaca gaaaagcccc atccttaggc ctcctccttc ctagtctcct
60

gatattgggt ctaaccccca cctcctgtta ggcagattcc ttatctggtg acacaccccc
120

atttcctgga gccatctctc tccttgccag aacctctaag gtttgcttac gatggagcca
180

gagaggatcc tgggagggag agcttggcag ggggtgggag ggaagggggg gatgcgtgac
240

ctgcccggtt ctcagtgg
258

<210> 22

<211> 120
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for AAVS1, 5'-ITR

<400> 22
agtgatggag ttggccactc cctctctgcg cgctcgctcg ctcactgagg ccgggcgacc
60

aaaggtcgcc cgacgcccgg gcggcctcag tgagcgagcg agcgcgcagc tgcctgcagg
120

<210> 23
<211> 131
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for Interleukin 2 Receptor Subunit Gamma
(IL2RG), 3'-ITR

<400> 23
cctgcaggca gctgcgcgct cgctcgctca ctgaggccgc ccgggcaaag cccgggcgtc
60

gggcgacctt tggtcgcccg gcctcagtga gcgagcgagc gcgcagagag ggagtggcca
120

actccatcac t
131

<210> 24
<211> 290
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Homologous arm-left

<400> 24
agaggaaacg tgtgggtggg gaggggtagt gggtgaggga cccaggttcc tgacacagac
60

agactacacc cagggaatga agagcaagcg ccatgttgaa gccatcatta ccattcacat
120

ccctcttatt cctgcagctg cccctgctgg gagtggggct gaacacgaca attctgacgc
180

ccaatgggaa tgaagacacc acagctggtg ggaaatctgg gactggaggg ggctggtgag
240

aagggtggct gtgggaaggg gccgtacaga gatctggtgc ctgccactgg
290

<210> 25
<211> 154
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon2

<400> 25
atttctttct gaccaccatg cccaccgaca gcctgagcgt gagcaccctg cccctgcccg
60

aggtgcagtg cttcgtgttc aacgtggagt acatgaactg cacctggaac agcagcagcg
120

agccccagcc caccaatctg accctgcact actg
154

<210> 26
<211> 185
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon3

<400> 26
gtacaagaac agcgacaacg acaaggtgca gaagtgcagc cactacctgt tcagcgagga
60

aatcaccagc ggctgccagc tgcagaagaa agagatccac ctgtaccaga ccttcgtggt
120

gcagctgcag gacccccggg agccccgcag gcaggccacc cagatgctga agctgcagaa
180

cctgg
185

<210> 27
<211> 140
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon4

<400> 27
tgatcccctg ggcccctgag aacctgacac tgcacaagct gtccgagagc cagctggaac
60

tgaactggaa caaccgcttc ctgaaccact gcctggaaca cctggtgcag taccggaccg
120

actgggacca cagctggacc
140

<210> 28
<211> 163
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon5

<400> 28
gagcagagcg tggactaccg gcacaagttc agcctgccca gcgtggacgg ccagaagcgg
60

tacaccttca gagtgcggag ccggttcaac cccctgtgcg gcagcgccca gcactggtcc
120

gagtggagcc accccatcca ctggggcagc aacaccagca aag
163

<210> 29
<211> 97
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon6

<400> 29
agaacccctt cctgttcgcc ctggaagccg tggtgatcag cgtgggcagc atgggcctga
60

tcatctccct gctgtgcgtg tacttctggc tggaacg
97

<210> 30
<211> 70
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon7

<400> 30
gaccatgccc agaatcccca ccctgaagaa cctggaagat ctggtgaccg agtaccacgg
60

caacttcagc
70

<210> 31
<211> 186
<212> DNA

<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Exon8

<400> 31
gcctggtccg gcgtgagcaa gggcctggcc gagagcctgc agcccgacta cagcgagcgg
60

ctgtgcctgg tgtccgagat ccccccccaaa ggcggagccc tgggcgaagg ccctggcgcc
120

agcccctgca accagcacag cccctactgg gcccctcctt gctacaccct gaagcccgag
180

acctga
186

<210> 32
<211> 330
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, 3'-UTR

<400> 32
tgaaccccaa tcctctgaca gaagaacccc agggtcctgt agccctaagt ggtactaact
60

ttccttcatt caacccactg cgtctcatac tcacctcacc ccactgtggc tgatttggaa
120

ttttgtgccc ccatgtaagc acccttcat ttggcattcc ccacttgaga attacccttt
180

tgccccgaac atgtttttct tctccctcag tctggccctt ccttttcgca ggattcttcc
240

tccccccctc tttccctccc ttcctctttc catctaccct ccgattgttc ctgaaccgat
300

gagaaataaa gtttctgttg ataatcatcg
330

<210> 33
<211> 226
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, bGH-pA

<400> 33
actgtgcctt ctagttgcca gccatctgtt gtttgcccct cccccgtgcc ttccttgacc
60

ctggaaggtg ccactcccac tgccctttcc taataaaatg aggaaattgc atcgcattgt
120

ctgagtaggt gtcattctat tctgggggggt ggggtggggc aggacagcaa gggggaggat
180

tgggaagaca atagcaggca tgctggggat gcggtgggct ctatgg
226

<210> 34
<211> 516
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, hPGK promoter

<400> 34
ccacggggtt ggggttgcgc cttttccaag gcagccctgg gtttgcgcag ggacgcggct
60

gctctgggcg tggttccggg aaacgcagcg gcgccgaccc tgggtctcgc acattcttca
120

cgtccgttcg cagcgtcacc cggatcttcg ccgctaccct tgtgggcccc ccggcgacgc
180

ttcctgctcc gcccctaagt cgggaaggtt ccttgcggtt cgcggcgtgc cggacgtgac
240

aaacggaagc cgcacgtctc actagtaccc tcgcagacgg acagcgccag ggagcaatgg
300

cagcgcgccg accgcgatgg gctgtggcca atagcggctg ctcagcaggg cgcgccgaga
360

gcagcggccg ggaaggggcg gtgcgggagg cggggtgtgg ggcggtagtg tgggccctgt
420

tcctgcccgc gcggtgttcc gcattctgca agcctccgga gcgcacgtcg gcagtcggct
480

ccctcgttga ccgaatcacc gacctctctc cccagg
516

<210> 35
<211> 720
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, eGFP

<400> 35

atggtgagca agggcgagga gctgttcacc ggggtggtgc ccatcctggt cgagctggac
60

ggcgacgtaa acggccacaa gttcagcgtg tccggcgagg gcgagggcga tgccacctac
120

ggcaagctga ccctgaagtt catctgcacc accggcaagc tgcccgtgcc ctggcccacc
180

ctcgtgacca ccctgaccta cggcgtgcag tgcttcagcc gctaccccga ccacatgaag
240

cagcacgact tcttcaagtc cgccatgccc gaaggctacg tccaggagcg caccatcttc
300

ttcaaggacg acggcaacta caagacccgc gccgaggtga agttcgaggg cgacaccctg
360

gtgaaccgca tcgagctgaa gggcatcgac ttcaaggagg acggcaacat cctggggcac
420

aagctggagt acaactacaa cagccacaac gtctatatca tggccgacaa gcagaagaac
480

ggcatcaagg tgaacttcaa gatccgccac aacatcgagg acggcagcgt gcagctcgcc
540

gaccactacc agcagaacac ccccatcggc gacggccccg tgctgctgcc cgacaaccac
600

tacctgagca cccagtccgc cctgagcaaa gaccccaacg agaagcgcga tcacatggtc
660

ctgctggagt tcgtgaccgc cgccgggatc actctcggca tggacgagct gtacaagtaa
720

<210> 36
<211> 244
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, SV40-pA

<400> 36
tgagatccag acatgataag atacattgat gagtttggac aaaccaaaac tagaatgcag
60

tgaaaaaaat gccttatttg tgaaatttgt gatgctattg ccttatttgt aaccattata
120

agctgcaata aacaagttaa caacaacaat tgcattcatt ttatgtttca ggttcagggg
180

gaggtgtggg aggtttttta aagcaagtaa aacctctaca aatgtggtat ggctgattat
240

gatc
244

<210> 37
<211> 267
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, Homologous arm-right

<400> 37
tacaatcatg tgggcagaat tgaaaagtgg agtgggaagg gcaaggggga gggttccctg
60

cctcacgcta cttcttcttt ctttcttgtt tgtttgtttc tttctttctt ttgaggcagg
120

gtctcactat gttgcctagg ctggtctcaa actcctggcc tctagtgatc ctcctgcctc
180

agcctttcaa agcaccagga ttacagacat gagccaccgt gcttggcctc ctccttctga
240

ccatcatttc tctttccctc cctgcct
267

<210> 38
<211> 120
<212> DNA
<213> Artificial Sequence

<220>
<223> AAV donor cassette for IL2RG, 5'-ITR

<400> 38
agtgatggag ttggccactc cctctctgcg cgctcgctcg ctcactgagg ccgggcgacc
60

aaaggtcgcc cgacgcccgg gcggcctcag tgagcgagcg agcgcgcagc tgcctgcagg
120

<210> 39
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 guide RNA (gRNA)

<400> 39
gtcaccaatc ctgtccctag tgg
23

<210> 40
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> IL2RG gRNA

<400> 40
actggccatt acaatcatgt ggg
23

<210> 41
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> NHEJ AAVS1 FW primer

<400> 41
cttcaggaca gcatgtttgc
20

<210> 42
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> NHEJ AAVS1 RV primer

<400> 42
acaggaggtg ggggttagac
20

<210> 43
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> NHEJ Intron 1 IL2RG FW primer

<400> 43
caccctctgt aaagccctgg
20

<210> 44
<211> 20
<212> DNA
<213> Artificial Sequence

<220>

<223> NHEJ Intron 1 IL2RG RV primer

<400> 44
aagaaatcta gattggggag
20

<210> 45
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Intron 1 IL2RG 3' integration junction ddPCR FW primer

<400> 45
ctagattggg gagaaaatga
20

<210> 46
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Intron 1 IL2RG 3' integration junction ddPCR RV primer

<400> 46
gtgggaaggg gccgtacag
19

<210> 47
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Intron 1 IL2RG 3' integration junction ddPCR probe

<400> 47
gtagctccta tgctaggcgt agcc
24

<210> 48
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 3' integration junction ddPCR FW primer

<400> 48
gattgggaag acaatagcag
20

<210> 49
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 3' integration junction ddPCR RV primer

<400> 49
tcttgggaag tgtaaggaag
20

<210> 50
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 3' integration junction ddPCR FW probe

<400> 50
ccagataagg aatctgccta
20

<210> 51
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 gRNA

<400> 51
gtcaccaatc ctgtccctag tgg
23

<210> 52
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> NHEJ AAVS1 FW primer

<400> 52
cttcaggaca gcatgtttgc
20

<210> 53
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> NHEJ AAVS1 RV primer

<400> 53
ggactagaaa ggtgaagagc c
21

<210> 54
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 3' integration junction ddPCR FW primer

<400> 54
gattgggaag acaatagcag
20

<210> 55
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 3' integration junction ddPCR RV primer

<400> 55
tcttgggaag tgtaaggaag
20

<210> 56
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> AAVS1 3' integration junction ddPCR probe

<400> 56
ccagataagg aatctgccta
20

<210> 57
<211> 128
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad1-E4orf1

<400> 57

Met Ala Ala Ala Val Glu Ala Leu Tyr Val Val Leu Glu Arg Glu Gly

1 5 10 15

Ala Ile Leu Pro Arg Gln Glu Gly Phe Ser Gly Val Tyr Val Phe Phe
20 25 30

Ser Pro Ile Asn Phe Val Ile Pro Pro Met Gly Ala Val Met Leu Pro
35 40 45

Leu Arg Leu Arg Val Cys Ile Pro Pro Gly Tyr Phe Gly Arg Phe Leu
50 55 60

Ala Leu Thr Asp Val Asn Gln Pro Asp Val Phe Thr Glu Ser Tyr Ile
65 70 75 80

Met Thr Pro Asp Met Thr Glu Glu Leu Ser Val Val Leu Phe Asn His
85 90 95

Gly Asp Gln Phe Phe Tyr Gly His Ala Gly Met Ala Val Val Arg Leu
100 105 110

Met Leu Ile Arg Val Val Phe Pro Val Val Arg Gln Ala Ser Asn Val
115 120 125

<210> 58
<211> 128
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad2-E4orf1

<400> 58

Met Ala Ala Ala Val Glu Ala Leu Tyr Val Val Leu Glu Arg Glu Gly
1 5 10 15

Ala Ile Leu Pro Arg Gln Glu Gly Phe Ser Gly Val Tyr Val Phe Phe
20 25 30

Ser Pro Ile Asn Phe Val Ile Pro Pro Met Gly Ala Val Met Leu Ser
35 40 45

Leu Arg Leu Arg Val Cys Ile Pro Pro Gly Tyr Phe Gly Arg Phe Leu
50 55 60

Ala Leu Thr Asp Val Asn Gln Pro Asp Val Phe Thr Glu Ser Tyr Ile

65 70 75 80

Met Thr Pro Asp Met Ile Glu Glu Leu Ser Val Val Leu Phe Asn His
85 90 95

Gly Asp Gln Phe Phe Tyr Gly His Ala Gly Met Ala Val Val Arg Leu
100 105 110

Met Leu Ile Arg Val Val Phe Pro Val Val Arg Gln Ala Ser Asn Val
115 120 125

<210> 59
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad3-E4orf1

<400> 59

Met Ala Asp Glu Ala Leu Tyr Val Tyr Leu Glu Gly Pro Gly Ala Thr
1 5 10 15

Leu Pro Glu Gln Gln Gln Arg Asn Asn Tyr Ile Phe Tyr Ser Pro Val
20 25 30

Pro Phe Thr Leu Tyr Pro Arg Gly Val Ala Leu Leu Tyr Leu Lys Leu
35 40 45

Ser Ile Ile Ile Pro Arg Gly Tyr Val Gly Cys Phe Phe Ser Leu Thr
50 55 60

Asp Ala Asn Met Ser Gly Leu Tyr Ala Ser Ser Arg Ile Ile His Ala
65 70 75 80

Gly His Arg Glu Glu Leu Ser Val Leu Leu Phe Asn His Asn Asp Arg
85 90 95

Phe Tyr Glu Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Met Glu
100 105 110

Arg Leu Ile Phe Pro Pro Val Arg Gln Ala Thr Met Ile
115 120 125

<210> 60

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

<220>
<223> E4orf1 amino acid sequence, Ad4-E4orf1

<400> 60

Met Asp Ala Gln Val Leu Tyr Val Phe Leu Glu Gly Ala Gly Ala Leu
1 5 10 15

Leu Pro Val Gln Lys Gly Ser Asn Tyr Ile Phe Tyr Ala Pro Ala Asn
20 25 30

Phe Val Leu His Pro His Gly Val Ala Leu Leu Glu Leu Arg Leu Ser
35 40 45

Ile Val Val Pro Gln Gly Phe Ile Gly Arg Phe Phe Ser Leu Thr Asp
50 55 60

Ala Asn Val Pro Gly Val Tyr Ala Ser Ser Arg Ile Ile His Ala Gly
65 70 75 80

His Arg Glu Gly Leu Ser Val Met Leu Phe Asn His Asn Val Ser Phe
85 90 95

Tyr Asn Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Leu Glu Arg
100 105 110

Val Ile Tyr Pro Pro Val Arg Gln Ala Ser Met Val
115 120

<210> 61
<211> 128
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad6-E4orf1

<400> 61

Met Ala Ala Ala Val Glu Ala Leu Tyr Val Val Leu Glu Arg Glu Gly
1 5 10 15

Ala Ile Leu Pro Arg Gln Glu Gly Phe Ser Gly Val Tyr Val Phe Phe
20 25 30

```
Ser Pro Ile Asn Phe Val Ile Pro Pro Met Gly Ala Val Met Leu Ser
        35                  40                  45

Leu Arg Leu Arg Val Cys Ile Pro Pro Gly Tyr Phe Gly Arg Phe Leu
    50                  55                  60

Ala Leu Thr Asp Val Ser Gln Pro Asp Val Phe Thr Glu Ser Tyr Ile
65                  70                  75                  80

Met Thr Pro Asp Met Thr Glu Glu Leu Ser Val Val Leu Phe Asn His
                85                  90                  95

Gly Asp Gln Phe Phe Tyr Gly His Ala Gly Met Ala Val Val Arg Leu
            100                 105                 110

Met Leu Ile Arg Val Val Phe Pro Val Val Arg Gln Ala Ser Asn Val
        115                 120                 125
```

<210> 62
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad7-E4orf1

<400> 62

```
Met Ala Asp Glu Ala Leu Tyr Val Tyr Leu Glu Gly Pro Gly Ala Thr
1               5                   10                  15

Leu Pro Glu Gln Gln Gln Arg Asn Asn Tyr Ile Phe Tyr Ser Pro Val
            20                  25                  30

Pro Phe Thr Leu Tyr Pro Arg Gly Val Ala Leu Leu Tyr Leu Arg Leu
        35                  40                  45

Ser Ile Ile Ile Pro Arg Gly Tyr Val Gly Cys Phe Phe Ser Leu Thr
    50                  55                  60

Asp Ala Asn Met Ser Gly Leu Tyr Ala Ser Ser Arg Ile Ile His Ala
65                  70                  75                  80

Gly His Arg Glu Glu Leu Ser Val Leu Leu Phe Asn His Asp Asp Arg
                85                  90                  95
```

Phe Tyr Glu Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Met Glu
100 105 110

Arg Leu Ile Tyr Pro Pro Val Arg Gln Ala Thr Met Ile
115 120 125

<210> 63
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad9-E4orf1

<400> 63

Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1 5 10 15

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

Ser Phe His Ile Pro Pro His Gly Val Val Leu Leu His Leu Lys Val
35 40 45

Ser Val Leu Val Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
50 55 60

Asp Tyr His Ala Arg Asp Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65 70 75 80

Gly Arg Arg Gln Glu Leu Thr Val Leu Leu Phe Asn His Thr Asp Arg
85 90 95

Phe Leu Tyr Val Arg Lys Gly His Pro Val Gly Thr Leu Leu Leu Glu
100 105 110

Arg Val Ile Phe Pro Ser Val Lys Ile Ala Thr Leu Val
115 120 125

<210> 64
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad14-E4orf1

<400> 64

Met Ala Asp Glu Ala Leu Tyr Val Tyr Leu Glu Gly Pro Gly Ala Thr
1 5 10 15

Leu Pro Glu Gln Gln Gln Arg Asn Asn Tyr Ile Phe Tyr Ser Pro Val
20 25 30

Pro Phe Thr Leu Tyr Pro Arg Gly Val Ala Leu Leu Tyr Leu Arg Leu
35 40 45

Ser Ile Ile Ile Pro Arg Gly Tyr Ile Gly Cys Phe Leu Ser Leu Thr
50 55 60

Asp Ala Asn Met Phe Gly Leu Tyr Ala Ser Ser Arg Ile Ile His Ala
65 70 75 80

Gly His Arg Glu Glu Leu Ser Val Leu Leu Phe Asn His Asp Asp Arg
85 90 95

Phe Tyr Glu Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Met Glu
100 105 110

Arg Leu Ile Tyr Pro Pro Val Arg Gln Ala Thr Leu Ile
115 120 125

<210> 65
<211> 126
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad16-E4orf1

<400> 65

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

Leu Pro Glu Gln Gln Gln Gln Arg Asn Asn Tyr Ile Phe Tyr Ser Pro
20 25 30

Val Pro Phe Thr Leu Tyr Pro Arg Gly Val Ala Leu Leu Tyr Leu Arg
35 40 45

Leu Ser Ile Ile Ile Pro Arg Gly Tyr Val Gly Cys Phe Phe Ser Leu

50 55 60

Thr Asp Ala Asn Met Ser Gly Leu Tyr Ala Ser Ser Arg Ile Ile His
65 70 75 80

Ala Gly His Arg Glu Glu Leu Ser Val Leu Leu Phe Asn His Asp Asp
85 90 95

Arg Phe Tyr Glu Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Met
100 105 110

Glu Arg Leu Ile Tyr Pro Pro Val Arg Gln Ala Thr Met Ile
115 120 125

<210> 66
<211> 127
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad18-E4orf1

<400> 66

Met Ala Ala Leu Gln Ala Leu Tyr Val Tyr Phe Lys Gly Pro Gly Ala
1 5 10 15

Met Leu Pro Glu Gln Glu Gly Tyr Ser Asn Ala Tyr Val Leu Phe Ser
20 25 30

Pro Ala Asn Phe Val Ile Pro Pro His Gly Val Val Leu Leu Tyr Leu
35 40 45

His Ile Ala Val Asp Ile Pro Pro Gly Tyr Leu Gly Thr Leu Phe Ser
50 55 60

Leu Ser Asp Met Asn Ala Arg Gly Val Phe Val Gly Ala Glu Thr Leu
65 70 75 80

Tyr Pro Gly Ser Arg Met Glu Leu Ser Val Leu Leu Phe Asn His Ser
85 90 95

Asp Val Phe Cys Asp Val Arg Ala Lys Gln Pro Val Ala Arg Leu Leu
100 105 110

Leu Ser Arg Val Ile Phe Pro Pro Val Arg Gln Ala Ser Leu Leu

115 120 125

<210> 67
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad20-E4orf1

<400> 67

Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1 5 10 15

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

Ser Phe His Ile Pro Pro His Gly Val Val Leu Leu His Leu Lys Val
35 40 45

Ser Val Leu Val Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
50 55 60

Asp Tyr His Ala Arg Asp Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65 70 75 80

Gly Arg Arg Gln Glu Leu Thr Val Leu Leu Phe Asn His Thr Asp Arg
85 90 95

Phe Leu Tyr Val Arg Lys Gly His Pro Val Gly Thr Leu Leu Leu Glu
100 105 110

Arg Val Ile Phe Pro Ser Val Lys Ile Ala Thr Leu Val
115 120 125

<210> 68
<211> 123
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad21-E4orf1

<400> 68

Met Ala Glu Val Leu Tyr Val Ile Leu Glu Gly Pro Gly Ala Arg Leu
1 5 10 15

```
Pro Val Gln Glu Gly Asn Asn Tyr Ile Phe Tyr Ala Pro Val Asp Phe
            20                  25                  30

Thr Leu His Pro Arg Gly Val Ala Leu Leu His Leu Arg Leu Ser Ile
        35                  40                  45

Ile Val Pro Arg Cys Tyr Ile Gly Arg Phe Phe Ser Leu Thr Asp Thr
    50                  55                  60

Asn Thr Ser Gly Leu Tyr Ala Ser Ser Gln Ile Ile Phe Ala Ala His
65                  70                  75                  80

Gln Gln Pro Leu Ser Val Met Leu Phe Asn His Thr Asp Arg Phe Tyr
                85                  90                  95

Glu Gly Arg Val Gly Asp Pro Val Ala Cys Leu Val Leu Glu Arg Val
            100                 105                 110

Ile Tyr Pro Ser Val Arg Gln Ala Ser Met Met
        115                 120
```

<210> 69
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad23-E4orf1

<400> 69

```
Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1               5                   10                  15

Pro Val Gln Glu Gly Ser Ser Asn Arg Tyr Asn Phe Phe Cys Pro Glu
            20                  25                  30

Ser Phe His Ile Pro Pro His Gly Val Val Leu Leu His Leu Arg Val
        35                  40                  45

Ser Val Leu Ile Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
    50                  55                  60

Asp Tyr His Ala Arg Gly Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65                  70                  75                  80
```

```
Gly Arg Arg His Glu Leu Thr Val Leu Leu Phe Asn His Thr Asp Arg
                85                  90                  95

Phe Leu Tyr Val Arg Glu Gly His Pro Val Gly Thr Leu Leu Leu Glu
            100                 105                 110

Arg Val Ile Phe Pro Ser Val Arg Leu Ala Thr Leu Val
        115                 120                 125
```

<210> 70
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad25-E4orf1

<400> 70

```
Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1               5                   10                  15

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

Ser Phe His Ile Pro Pro His Gly Val Val Leu Val His Leu Arg Val
        35                  40                  45

Ser Val Leu Ile Pro Asn Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
    50                  55                  60

Asp Tyr His Ser Arg Gly Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65                  70                  75                  80

Gly Arg Arg Gln Glu Leu Thr Val Leu Leu Phe Asn His Thr Asp Arg
                85                  90                  95

Phe Leu Tyr Val Arg Glu Gly His Pro Val Gly Thr Leu Leu Leu Glu
            100                 105                 110

Arg Val Ile Phe Pro Ser Val Arg Leu Ala Thr Leu Val
        115                 120                 125
```

<210> 71
<211> 125
<212> PRT

<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad30-E4orf1

<400> 71

Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1 5 10 15

Pro Val Gln Glu Gly Ala Ser Asn Arg Tyr Thr Phe Phe Cys Pro Glu
20 25 30

Ser Phe His Ile Pro Pro His Gly Val Ile Leu Leu His Leu Arg Val
35 40 45

Ser Val Leu Val Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
50 55 60

Asp Tyr His Ala Arg Gly Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65 70 75 80

Gly Arg Arg His Asp Leu Ser Val Leu Leu Phe Asn His Thr Asp Arg
85 90 95

Phe Leu Tyr Val Arg Glu Gly His Pro Val Gly Thr Leu Leu Leu Glu
100 105 110

Arg Val Ile Phe Pro Ser Val Arg Leu Ala Thr Leu Val
115 120 125

<210> 72
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad36-E4orf1

<400> 72

Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1 5 10 15

Pro Val Gln Glu Gly Ala Ser Asn Arg Tyr Ile Phe Phe Cys Pro Glu
20 25 30

Ser Phe His Ile Pro Pro His Gly Val Ile Leu Leu His Leu Arg Val

```
        35                  40                  45

Ser Val Leu Val Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
    50                  55                  60

Asp Tyr His Ala Arg Gly Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65                  70                  75                  80

Gly Arg Arg His Asp Leu Ser Val Leu Leu Phe Asn His Thr Asp Arg
                85                  90                  95

Phe Leu Tyr Val Arg Glu Gly His Pro Val Gly Thr Leu Leu Leu Glu
            100                 105                 110

Arg Val Ile Phe Pro Ser Val Arg Ile Ala Thr Leu Val
        115                 120                 125
```

<210> 73
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad50-E4orf1

<400> 73

```
Met Ala Asp Glu Ala Leu Tyr Val Tyr Leu Asp Gly Pro Gly Ala Thr
1               5                   10                  15

Leu Pro Glu Gln Gln Gln Arg Asn Asn Tyr Ile Phe Tyr Ser Pro Val
            20                  25                  30

Pro Phe Thr Leu Tyr Pro Arg Gly Val Ala Leu Leu Tyr Leu Arg Leu
        35                  40                  45

Ser Ile Ile Ile Pro Arg Gly Tyr Val Gly Cys Phe Phe Ser Leu Thr
    50                  55                  60

Asp Ala Asn Met Ser Gly Leu Tyr Ala Ser Ser Arg Ile Ile His Ala
65                  70                  75                  80

Gly His Arg Glu Glu Leu Ser Val Leu Leu Phe Asn His Asp Asp Arg
                85                  90                  95

Phe Tyr Glu Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Met Glu
```

100 105 110

Arg Leu Ile Tyr Pro Pro Val Arg Gln Ala Thr Met Ile
115 120 125

<210> 74
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad55-E4orf1

<400> 74

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

Leu Pro Glu Gln Gln Gln Arg Asn Asn Tyr Ile Phe Tyr Ser Pro Val
20 25 30

Pro Phe Thr Leu Tyr Pro Arg Gly Val Ala Leu Leu Tyr Leu Arg Leu
35 40 45

Ser Ile Ile Ile Pro Arg Gly Tyr Ile Gly Cys Phe Leu Ser Leu Thr
50 55 60

Asp Ala Asn Met Phe Gly Leu Tyr Ala Ser Ser Arg Ile Ile His Ala
65 70 75 80

Gly His Arg Glu Glu Leu Ser Val Leu Leu Phe Asn His Asp Asp Arg
85 90 95

Phe Tyr Glu Gly Arg Ala Gly Asp Pro Val Ala Cys Leu Val Met Glu
100 105 110

Arg Leu Ile Tyr Pro Pro Val Arg Gln Ala Thr Leu Ile
115 120 125

<210> 75
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad62-E4orf1

<400> 75

```
Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1               5                  10                  15

Pro Val Gln Glu Gly Ala Ser Asn Arg Tyr Ile Phe Phe Cys Pro Glu
            20                  25                  30

Ser Phe His Ile Pro Pro His Gly Val Ile Leu Leu His Leu Arg Val
        35                  40                  45

Ser Val Met Val Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
    50                  55                  60

Asp Tyr His Ala Arg Gly Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65                  70                  75                  80

Gly Arg Arg His Asp Leu Ser Val Leu Leu Phe Asn His Thr Asp Arg
                85                  90                  95

Phe Leu Tyr Val Arg Glu Gly His Pro Val Gly Thr Leu Leu Leu Glu
            100                 105                 110

Arg Val Ile Phe Pro Ser Val Arg Ile Ala Thr Leu Val
        115                 120                 125
```

<210> 76
<211> 125
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf1 amino acid sequence, Ad71-E4orf1

<400> 76

```
Met Ala Glu Ser Leu Tyr Ala Phe Ile Asp Ser Pro Gly Gly Ile Ala
1               5                  10                  15

Pro Val Gln Glu Gly Thr Ser Asn Arg Tyr Asp Phe Phe Cys Pro Glu
            20                  25                  30

Ser Phe His Ile Pro Pro His Gly Val Val Leu Leu His Leu Arg Val
        35                  40                  45

Ser Val Leu Ile Pro Thr Gly Tyr Gln Gly Arg Phe Met Ala Leu Asn
    50                  55                  60
```

```
Asp Tyr His Ala Arg Gly Ile Leu Thr Gln Ser Asp Val Ile Phe Ala
65                  70                  75                  80

Gly Arg Arg His Glu Leu Thr Val Leu Leu Phe Asn His Thr Asp Arg
                85                  90                  95

Phe Leu Tyr Val Arg Glu Gly His Pro Val Gly Thr Leu Leu Leu Glu
            100                 105                 110

Arg Val Ile Phe Pro Ser Val Arg Leu Ala Thr Leu Val
        115                 120                 125
```

<210> 77
<211> 150
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad1-E4orf6/7

<400> 77

```
Met Thr Thr Ser Gly Val Pro Phe Gly Met Thr Leu Arg Pro Thr Arg
1               5                   10                  15

Ser Arg Leu Ser Arg Arg Thr Pro Tyr Ser Arg Asp Arg Leu Pro Pro
            20                  25                  30

Phe Glu Thr Glu Thr Arg Ala Thr Ile Leu Glu Asp His Pro Leu Leu
        35                  40                  45

Pro Glu Cys Asn Thr Leu Thr Met His Asn Ala Trp Thr Ser Pro Ser
    50                  55                  60

Pro Pro Val Glu Gln Pro Gln Val Gly Gln Gln Pro Val Ala Gln Gln
65                  70                  75                  80

Leu Asp Ser Asn Met Asn Leu Arg Glu Leu Pro Gly Glu Phe Ile Asn
                85                  90                  95

Ile Thr Asp Glu Arg Leu Ala Arg Gln Glu Thr Val Trp Asn Ile Thr
            100                 105                 110

Pro Lys Asn Met Ser Val Thr His Asp Met Met Leu Phe Lys Ala Ser
        115                 120                 125
```

Arg Gly Glu Arg Thr Val Tyr Ser Val Cys Trp Glu Gly Gly Gly Arg
130 135 140

Leu Asn Thr Arg Val Leu
145 150

<210> 78
<211> 150
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad2-E4orf6/7

<400> 78

Met Thr Thr Ser Gly Val Pro Phe Gly Met Thr Leu Arg Pro Thr Arg
1 5 10 15

Ser Arg Leu Ser Arg Arg Thr Pro Tyr Ser Arg Asp Arg Leu Pro Pro
20 25 30

Phe Glu Thr Glu Thr Arg Ala Thr Ile Leu Glu Asp His Pro Leu Leu
35 40 45

Pro Glu Cys Asn Thr Leu Thr Met His Asn Ala Trp Thr Ser Pro Ser
50 55 60

Pro Pro Val Glu Gln Pro Gln Val Gly Gln Gln Pro Val Ala Gln Gln
65 70 75 80

Leu Asp Ser Asp Met Asn Leu Ser Glu Leu Pro Gly Glu Phe Ile Asn
85 90 95

Ile Thr Asp Glu Arg Leu Ala Arg Gln Glu Thr Val Trp Asn Ile Thr
100 105 110

Pro Lys Asn Met Ser Val Thr His Asp Met Met Leu Phe Lys Ala Ser
115 120 125

Arg Gly Glu Arg Thr Val Tyr Ser Val Cys Trp Glu Gly Gly Gly Arg
130 135 140

Leu Asn Thr Arg Val Leu
145 150

<210> 79
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad3-E4orf6/7

<400> 79

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

Ser Cys Ala Arg His His Pro Tyr Thr Arg Ala Gln Leu Pro Arg Cys
20 25 30

Glu Glu Asn Glu Thr Arg Ala Ser Met Thr Glu Asp His Pro Leu Leu
35 40 45

Pro Asp Cys Asp Thr Met Thr Met His Ser Met Thr Val Ile Gln Thr
50 55 60

Pro Glu Ser His Pro Gln Gln Leu Asp Cys Glu Ser Ala Leu Lys Asp
65 70 75 80

Tyr Pro Asp Ala Phe Leu Cys Ile Thr Asp Pro Arg Leu Ala Arg Ser
85 90 95

Glu Thr Val Trp Asn Val Glu Ser Lys Thr Met Ser Ile Ser Asn Gly
100 105 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Leu Val Tyr Ser Val
115 120 125

Lys Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ile Leu
130 135 140

<210> 80
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad4-E4orf6/7

<400> 80

Met Ser Gly Asn Ser Ser Ile Met Thr Arg Ser Arg Thr Arg Leu Ala

```
1               5                   10                  15

Leu Ser Arg His His Pro Tyr Gln Pro Pro Ala Thr Leu Pro Arg Cys
            20                  25                  30

Glu Glu Thr Glu Ser Arg Ala Ser Leu Val Glu Asp His Pro Val Leu
        35                  40                  45

Pro Asp Cys Asp Thr Leu Ser Met His Asn Ile Thr Val Ile Pro Ile
    50                  55                  60

Thr Glu Asp Ser Pro Gln Leu Leu Asn Cys Glu Val Gln Met Gln Glu
65                  70                  75                  80

Cys Pro Glu Gly Phe Ile Ser Leu Thr Asp Pro Arg Leu Ser Arg Ser
                85                  90                  95

Glu Thr Val Trp Asn Val Glu Ile Lys Thr Met Ser Ile Thr Asn Ser
            100                 105                 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Ile Val Tyr Ser Met
        115                 120                 125

Arg Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ile Leu
    130                 135                 140
```

<210> 81
<211> 150
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad6-E4orf6/7

<400> 81

```
Met Thr Thr Ser Gly Val Pro Phe Gly Met Thr Leu Arg Pro Thr Arg
1               5                   10                  15

Ser Arg Leu Ser Arg Arg Thr Pro Tyr Ser Arg Asp Arg Leu Pro Pro
            20                  25                  30

Phe Glu Thr Glu Thr Arg Ala Thr Ile Leu Glu Asp His Pro Leu Leu
        35                  40                  45

Pro Glu Cys Asn Thr Leu Thr Met His Asn Ala Trp Thr Ser Pro Ser
```

```
    50                  55                  60

Pro Ser Val Lys Arg Pro Gln Val Gly Gln Gln Pro Val Ala Gln Gln
65                  70                  75                  80

Leu Asp Ser Asp Met Asn Leu Ser Glu Leu Pro Gly Glu Phe Ile Asn
                85                  90                  95

Ile Thr Asp Glu Arg Leu Ala Arg Gln Glu Thr Val Trp Asn Ile Thr
            100                 105                 110

Pro Lys Asn Met Ser Val Thr His Asp Met Met Leu Phe Lys Ala Ser
        115                 120                 125

Arg Gly Glu Arg Thr Val Tyr Ser Val Cys Trp Glu Gly Gly Gly Arg
    130                 135                 140

Leu Asn Thr Arg Val Leu
145                 150
```

<210> 82
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad7-E4orf6/7

<400> 82

```
Met Ser Gly Ser Asn Ser Ile Met Thr Arg Leu Arg Ala Arg Ser Thr
1               5                   10                  15

Ser Cys Ala Arg His His Pro Tyr Thr Arg Ala Gln Leu Pro Arg Cys
            20                  25                  30

Glu Glu Asn Glu Thr Arg Ala Ser Met Thr Glu Asp His Pro Leu Leu
        35                  40                  45

Pro Asp Cys Asp Thr Met Thr Met His Ser Met Thr Val Ile Gln Thr
    50                  55                  60

Pro Glu Ser His Pro Gln Gln Leu Asp Cys Glu Ser Ala Leu Lys Asp
65                  70                  75                  80

Tyr Pro Asp Ala Phe Leu Cys Ile Thr Asp Pro Arg Leu Ala Arg Phe
```

85 90 95

Glu Thr Val Trp Asn Val Glu Ser Lys Thr Met Ser Ile Cys Asn Gly
100 105 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Leu Val Tyr Ser Val
115 120 125

Lys Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ile Leu
130 135 140

<210> 83
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad11-E4orf6/7

<400> 83

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

Ser Cys Ala Arg His His Pro Tyr Thr Arg Ala Gln Leu Pro Arg Cys
20 25 30

Glu Glu Asn Glu Thr Arg Ala Ser Met Thr Glu Asp His Pro Leu Leu
35 40 45

Pro Asp Cys Asp Thr Met Thr Met His Ser Met Thr Val Ile Gln Thr
50 55 60

Pro Glu Ser Gln Pro Gln Gln Leu Asp Cys Glu Ser Ala Leu Lys Asp
65 70 75 80

Tyr Pro Asp Ala Phe Leu Ser Ile Thr Asp Pro Arg Leu Ala Arg Ser
85 90 95

Glu Thr Val Trp Asn Val Glu Ser Lys Thr Met Ser Ile Ser Asn Gly
100 105 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Leu Val Tyr Ser Val
115 120 125

Lys Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ile Leu

130 135 140

<210> 84
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad14-E4orf6/7

<400> 84

Met Ser Gly Ser Asn Ser Ile Met Thr Arg Leu Cys Ala Arg Ser Thr
1 5 10 15

Ser Cys Ala Arg His His Pro Tyr Thr Arg Ala Gln Leu Pro Arg Cys
20 25 30

Glu Glu Asn Glu Thr Arg Ala Ser Met Thr Glu Asp His Pro Leu Leu
35 40 45

Pro Asp Cys Asp Thr Met Thr Met His Ser Met Thr Val Ile Gln Thr
50 55 60

Pro Glu Ser His Pro Gln Gln Leu Asp Cys Glu Ser Ala Leu Lys Asp
65 70 75 80

Tyr Pro Ala Gly Phe Leu Ser Ile Thr Asp Pro Arg Leu Ala Arg Tyr
85 90 95

Glu Thr Val Trp Asn Val Glu Ser Lys Thr Met Ser Ile Ser Asn Gly
100 105 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Leu Val Tyr Ser Val
115 120 125

Lys Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ser Leu
130 135 140

<210> 85
<211> 126
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad18-E4orf6/7

<400> 85

```
Met Gln Arg Asn Arg Arg Tyr Pro Tyr Arg Leu Ala Pro Tyr Gly Lys
1               5                  10                  15

Tyr Pro Leu Pro Pro Cys Glu Lys Glu Met Arg Ala Ser Leu Phe Gly
            20                  25                  30

Pro Glu Asn Ser Ser Val Ser Glu Cys Asn Ser Leu Thr Leu His Asn
        35                  40                  45

Val Ile Asn Met Asp Leu Val Leu Asp Gly Glu Ser Tyr Leu Ser Asp
    50                  55                  60

Cys Val Gly Glu Gly Phe Val Ser Ile Ile Asp His Arg Phe Ala Arg
65                  70                  75                  80

Lys Glu Thr Ile Trp Thr Val Thr Pro Lys Asn Leu Ser Arg Asn Met
                85                  90                  95

His Met Gln Leu Phe Ser Ala Ile Lys Gly Glu Arg Val Val Tyr Lys
            100                 105                 110

Ile Lys Trp Glu Gly Gly Gly Ser Leu Thr Thr Arg Ile Val
        115                 120                 125
```

<210> 86
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad19-E4orf6/7

<400> 86

```
Met Gln Thr Glu Asp Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1               5                  10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60
```

```
Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Leu Ser Ser Arg Thr Asn Gln Asn Ile Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Thr Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
```

<210> 87
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad20-E4orf6/7

<400> 87

```
Met Gln Thr Glu Ile Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Ser
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Thr Val Tyr Thr Val Lys Trp
            100                 105                 110
```

```
Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125


Asp Thr
    130


<210>  88
<211>  130
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  E4orf6/7 amino acid sequence, Ad23-E4orf6/7

<400>  88

Met Ser Thr Glu Glu Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1               5                   10                  15


Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30


Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45


Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60


Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80


Trp Ile Ile Asp Thr Lys Thr Ser Ser Arg Thr Asn Asn Asn Ile Pro
                85                  90                  95


Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110


Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125


Asp Thr
    130


<210>  89
<211>  130
<212>  PRT
```

<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad25-E4orf6/7

<400> 89

Met Ser Thr Glu Glu Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
35 40 45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
50 55 60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65 70 75 80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Ser
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Thr Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
115 120 125

Asp Thr
130

<210> 90
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad27-E4orf6/7

<400> 90

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

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

```
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Phe Ser Ser Arg Thr Asn Gln Asn Ile Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
```

<210> 91
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad29-E4orf6/7

<400> 91

```
Met Gln Thr Glu Asp Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Glu Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
```

65 70 75 80

Trp Leu Ile Asp Thr Lys Ser Ser Ser Arg Ala Asn Gln Asn Ile Pro
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
115 120 125

Asp Thr
130

<210> 92
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad30-E4orf6/7

<400> 92

Met Ser Thr Glu Glu Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
35 40 45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
50 55 60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65 70 75 80

Trp Ile Ile Asp Ser Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Pro
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys

115 120 125

Asp Pro
130

<210> 93
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad32-E4orf6/7

<400> 93

Met Ser Thr Glu Glu Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Cys Asp Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
35 40 45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
50 55 60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65 70 75 80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Phe
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
115 120 125

Asp Thr
130

<210> 94
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad34-E4orf6/7

<400> 94

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

Ser Cys Ala Arg His His Pro Tyr Thr Arg Ala Gln Leu Pro Arg Cys
20 25 30

Glu Glu Asn Glu Thr Arg Ala Ser Met Thr Glu Asp His Pro Leu Leu
35 40 45

Pro Asp Cys Asp Thr Met Thr Met His Ser Met Thr Val Ile Gln Thr
50 55 60

Pro Glu Ser His Pro Gln Gln Leu Asp Cys Glu Ser Ala Leu Lys Asp
65 70 75 80

Tyr Pro Asp Ala Phe Leu Ser Ile Thr Asp Pro Arg Leu Ala Arg Ser
85 90 95

Glu Thr Val Trp Asn Val Glu Ser Lys Thr Met Ser Ile Ser Asn Gly
100 105 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Leu Val Tyr Ser Val
115 120 125

Lys Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ile Leu
130 135 140

<210> 95
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad36-E4orf6/7

<400> 95

Met Ser Thr Glu Glu Gln Ser Thr Ser Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Ser Glu Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

```
Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Glu Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Glu Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Thr Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
```

<210> 96
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad38-E4orf6/7

<400> 96

```
Met Ser Thr Glu Glu Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80
```

```
Trp Ile Ile Asp Thr Lys Ser Ser Ser Arg Ser Asn Asn Asn Ile Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Ser
    130
```

<210> 97
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad39-E4orf6/7

<400> 97

```
Met Ser Thr Glu Glu Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Glu Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Thr Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125
```

Asp Thr
130

<210> 98
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad43-E4orf6/7

<400> 98

Met Ser Thr Glu Glu Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Cys Glu Gln Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Glu Tyr His Asn
35 40 45

Thr Val Thr Leu Asp Cys Glu Pro Arg Leu Glu Asp Phe Ser Glu Asp
50 55 60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65 70 75 80

Trp Leu Ile Asp Thr Lys Thr Ser Ser Arg Thr Asn Gln Asn Ile Pro
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Thr Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
115 120 125

Asp Thr
130

<210> 99
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad44-E4orf6/7

<400> 99

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

Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
35 40 45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Glu Asp Phe Ser Glu Asp
50 55 60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65 70 75 80

Trp Leu Ile Asp Thr Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Pro
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Thr Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
115 120 125

Asp Thr
130

<210> 100
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad45-E4orf6/7

<400> 100

Met Ser Thr Glu Glu Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Cys Glu Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn

```
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Ser
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
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<210> 101
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad47-E4orf6/7

<400> 101

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Met Ser Thr Glu Glu Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Glu Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Pro
```

85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
100 105 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
115 120 125

Asp Thr
130

<210> 102
<211> 141
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad50-E4orf6/7

<400> 102

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

Ser Cys Ala Arg His His Pro Tyr Thr Arg Ala Gln Leu Pro Arg Cys
20 25 30

Glu Glu Asn Glu Thr Arg Ala Ser Met Thr Glu Asp His Pro Leu Leu
35 40 45

Pro Asp Cys Asp Thr Met Thr Met His Ser Met Thr Val Ile Gln Thr
50 55 60

Pro Glu Ser His Pro Gln Gln Leu Asp Cys Glu Ser Ala Leu Lys Asp
65 70 75 80

Tyr Pro Asp Ala Phe Leu Cys Ile Thr Asp Pro Arg Leu Ala Arg Ser
85 90 95

Glu Thr Val Trp Asn Val Glu Thr Lys Thr Met Ser Ile Ser Asn Gly
100 105 110

Ile Gln Met Phe Lys Ala Val Arg Gly Glu Arg Leu Val Tyr Ser Val
115 120 125

Lys Trp Glu Gly Gly Gly Lys Ile Thr Thr Arg Ile Leu

130 135 140

<210> 103
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad53-E4orf6/7

<400> 103

Met Gln Thr Glu Ile Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1 5 10 15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
20 25 30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
35 40 45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
50 55 60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65 70 75 80

Trp Ile Ile Asn Pro Lys Ser Ser Ser Arg Thr Asn Glu Asn Phe Pro
85 90 95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
100 105 110

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

Asp Thr
130

<210> 104
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad54-E4orf6/7

<400> 104

```
Met Ser Thr Glu Glu Gln Ser Thr Leu Leu Arg His His Pro Tyr Arg
1               5                  10                  15

Arg Ala Arg Leu Ser Arg Tyr Asp Lys Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Leu Ser Lys Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Glu Asn Phe Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Thr Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

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

Asp Thr
    130
```

<210> 105
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad58-E4orf6/7

<400> 105

```
Met Gln Thr Glu Ile Gln Ser Ser Leu Leu Arg His His Pro Tyr Arg
1               5                  10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45
```

```
Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Leu Ile Asp Thr Lys Ser Ser Ser Arg Ala Asn Gln Asn Ile Pro
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
```

<210> 106
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad64-E4orf6/7

<400> 106

```
Met Gln Thr Glu Ile Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Ser Asn Ser Arg Thr Asn Glu Asn Ile Ser
                85                  90                  95
```

```
Leu Phe Lys Ala Thr Arg Ala Glu Arg Thr Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Ser Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
```

<210> 107
<211> 130
<212> PRT
<213> Artificial Sequence

<220>
<223> E4orf6/7 amino acid sequence, Ad69-E4orf6/7

<400> 107

```
Met Gln Thr Glu Ile Gln Ser Ser Ser Leu Arg His His Pro Tyr Arg
1               5                   10                  15

Arg Ala Arg Leu Pro Arg Ser Asp Glu Glu Thr Arg Ala Ser Leu Thr
            20                  25                  30

Glu Gln His Pro Leu Leu Pro Asp Cys Asp His Ala Asp Tyr His Asn
        35                  40                  45

Thr Val Thr Leu Asp Cys Glu Ala Arg Leu Asp Asp Phe Ser Glu Asp
    50                  55                  60

Gly Phe Ile Ser Ile Thr Asp Pro Arg Leu Ala Arg Gln Glu Thr Val
65                  70                  75                  80

Trp Ile Ile Asp Pro Lys Ser Ser Ser Arg Thr Asn Gln Asn Ile Ser
                85                  90                  95

Leu Phe Lys Ala Thr Arg Ala Glu Arg Ile Val Tyr Thr Val Lys Trp
            100                 105                 110

Ala Gly Gly Gly Arg Leu Thr Thr Arg Ala Gly Val Lys Ile Asn Lys
        115                 120                 125

Asp Thr
    130
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<210> 108
<211> 2607
<212> DNA
<213> Artificial Sequence

<220>
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<220>
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<222> (259)..(260)
<223> n is a, c, g, or t

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<222> (262)..(264)
<223> n is a, c, g, or t

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<222> (266)..(266)
<223> n is a, c, g, or t

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<222> (268)..(271)
<223> n is a, c, g, or t

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<222> (274)..(274)
<223> n is a, c, g, or t

<220>
<221> misc_feature
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<223> n is a, c, g, or t

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ccctcccagg atcctctctg gctccatcgt aagcaaacct tagaggttct ggcaaggaga
120

gagatggctc caggaaatgg gggtgtgtca ccagataagg aatctgccta acaggaggtg
180

ggggttagac ccaatatcag gagactagga aggaggaggc ctaaggatgg ggcttttctg
240

tcaccaatcc tgtccctann ynnntntnnn nrtndnnnhh ccatagagcc caccgcatcc
300

ccagcatgcc tgctattgtc ttcccaatcc tccccccttgc tgtcctgccc caccccaccc
360

cccagaatag aatgacacct actcagacaa tgcgatgcaa tttcctcatt ttattaggaa
420

aggacagtgg gagtggcacc ttccagggtc aaggaaggca cgggggaggg gcaaacaaca
480

gatggctggc aactagaagg cacagtcgag gctgatcagc gggtttaaac gggccctcta
540

gactcgacgc ggccgcttta cttgtacagc tcgtccatgc cgagagtgat cccggcggcg
600

gtcacgaact ccagcaggac catgtgatcg cgcttctcgt tggggtcttt gctcagggcg
660

gactgggtgc tcaggtagtg gttgtcgggc agcagcacgg ggccgtcgcc gatgggggtg
720

ttctgctggt agtggtcggc gagctgcacg ctgccgtcct cgatgttgtg gcggatcttg
780

aagttcacct tgatgccgtt cttctgcttg tcggccatga tatagacgtt gtggctgttg
840

tagttgtact ccagcttgtg ccccaggatg ttgccgtcct ccttgaagtc gatgcccttc
900

agctcgatgc ggttcaccag ggtgtcgccc tcgaacttca cctcggcgcg ggtcttgtag
960

ttgccgtcgt ccttgaagaa gatggtgcgc tcctggacgt agccttcggg catggcggac
1020

ttgaagaagt cgtgctgctt catgtggtcg gggtagcggc tgaagcactg cacgccgtag
1080

gtcagggtgg tcacgagggt gggccagggc acgggcagct tgccggtggt gcagatgaac
1140

ttcagggtca gcttgccgta ggtggcatcg ccctcgccct cgccggacac gctgaacttg
1200

tggccgttta cgtcgccgtc cagctcgacc aggatgggca ccaccccggt gaacagctcc
1260

tcgcccttgc tcaccatggt ggcgaccggt ggggagagag gtcggtgatt cggtcaacga
1320

gggagccgac tgccgacgtg cgctccggag gcttgcagaa tgcggaacac cgcgcgggca
1380

ggaacagggc ccacactacc gccccacacc ccgcctcccg caccgccgct tcccggccgc
1440

tgctctcggc gcgccctgct gagcagccgc tattggccac agcccatcgc ggtcggcgcg
1500

ctgccattgc tccctggcgc tgtccgtctg cgagggtact agtgagacgt gcggcttccg
1560

tttgtcacgt ccggcacgcc gcgaaccgca aggaaccttc ccgacttagg ggcggagcag
1620

gaagcgtcgc cgggggggccc acaagggtag cggcgaagat ccgggtgacg ctgcgaacgg
1680

acgtgaagaa tgtgcgagac ccagggtcgg cgccgctgcg tttcccggaa ccacgcccag
1740

agcagccgcg tccctgcgca aacccagggc tgccttggaa aaggcgcaac cccaaccccg
1800

tggaagcttg cgtggggtgg aggggacaga taaaagtacc cagaaccaga gccacattaa
1860

ccggccctgg gaatataagg tggtcccagc tcggggacac aggatccctg gaggcagcaa
1920

acatgctgtc ctgaagtgga catagggcc cgggttggag gaagaagact agctgagctc
1980

tcggacccct ggaagatgcc atgacagggg gctggaagag ctagcacaga ctagagaggt
2040

aaggggggta ggggagctgc ccaaatgaaa ggagtgagag gtgacccgaa tccacaggag
2100

aacggggtgt ccaggcaaag aaagcaagag gatggagagg tggctaaagc cagggagacg
2160

gggtactttg gggttgtcca gaaaaacggt gatgatgcag gcctacaaga aggggaggcg
2220

ggacgcaagg gagacatccg tcggagaagg ccatcctaag aaacgagaga tggcacaggc
2280

cccagaagga gaaggaaaag ggaacccagc gagtgaagac ggcatggggt tgggtgaggg
2340

aggagagatg cccggagagg acccagacac ggggaggatc cgctcagagg acatcacgtg
2400

gtgcagcgcc gagaaggaag tgctccggaa agagcatcct tgggcagcaa cacagcagag
2460

agcaaggggа agagggagtg gaggaagacg gaacctgaag gaggcggcag ggaaggatct
2520

gggccagccg tagaggtgac ccaggccaca agctgcagac agaaagcggc acaggcccag
2580

gggagagaat gctggtcaga gaaagca
2607

<210> 109
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> ChrX-chr14 translocation ddPCR FW primer

<400> 109
gtggtgacca ccttaatcca gtga
24

<210> 110
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> ChrX-chr14 translocation ddPCR probe

<400> 110
atgaaggcag ggagggaaag agaaatga
28

<210> 111
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> ssODN amplification primer, Bar AAVS1 sense

<400> 111
agactaggaa ggaggaggcc taaggatg
28

<210> 112
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> ssODN amplification primer, Bar AAVS1 antisense

<400> 112
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24

<210> 113
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<220>

<223> ssODN sequence

<220>
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<223> n is a, c, g, or t

<220>
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<222> (61)..(63)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (65)..(65)
<223> n is a, c, g, or t

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<222> (67)..(70)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (73)..(73)
<223> n is a, c, g, or t

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<222> (75)..(77)
<223> n is a, c, g, or t

<400> 113
agactaggaa ggaggaggcc taaggatggg gcttttctgt caccaatcct gtccctanny
60

nnntntnnnn rtndnnnhhc catagagccc accgcatccc cagcatgcct gctattgt
118

<210> 114
<211> 22
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<220>
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<222> (1)..(2)
<223> n is a, c, g, or t

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<222> (4)..(6)

<223> n is a, c, g, or t

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<223> n is a, c, g, or t

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<223> n is a, c, g, or t

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<222> (16)..(16)
<223> n is a, c, g, or t

<220>
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<222> (18)..(20)
<223> n is a, c, g, or t

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22