

# SEQUENCE LISTING

<110> BRAIN Biotech AG

<120> NOVEL, NON-NATURALLY OCCURRING CRISPR-CAS NUCLEASES FOR GENOME EDITING

<130> PA-1696/017-003

<150> EP 20 00 0329.1

<151> 2020-09-10

<150> EP 20 00 0262.4

<151> 2020-07-21

<160> 42

<170> BiSSAP 1.3.6

<210> 1

<211> 1231

<212> PRT

<213> Artificial Sequence

<220>

<223> AA Sequence of BEC85

<400> 1

```

Met Lys Ser Phe Glu Asn Ser Cys Gln Ile Ser Lys Thr Leu Arg Phe
1          5          10          15
Gly Ala Thr Leu Lys Glu Asp Lys Lys Cys Lys Ser His Leu Glu
20        25        30
Leu Gln Glu Phe Val Asp Ile Ser Tyr Lys Thr Leu Lys Ser Ser Ala
35        40        45
Thr Ile Ala Glu Ser Leu Asn Glu Ile Glu Leu Val Lys Lys Cys Glu
50        55        60
Arg Cys Tyr Ser Glu Ile Ile Lys Phe His Glu Ala Trp Gly Gln Ile
65        70        75        80
Tyr Cys Arg Thr Asn Gln Ile Ala Val Tyr Lys Asp Trp Tyr Arg Gln
85        90        95
Leu Ala Arg Lys Ala Arg Phe Asp Val Gly Asp Gln Asn Ser Gln Leu
100       105       110
Ile Thr Leu Ser Ser Leu Ser Ser Lys His Asn Val Tyr Gln Gly Leu
115       120       125
Lys Arg Ser Gln His Ile Thr Asn Tyr Trp Lys Asp Asn Ile Ala Arg
130       135       140
Gln Lys Ser Phe Leu Lys Asp Phe Ser Gln Gln Leu Lys Gln Tyr Lys
145       150       155       160
Arg Ala Leu Glu Asn Ser Asp Lys Ala His Thr Lys Pro Asn Leu Ile
165       170       175
Asn Phe Asn Lys Thr Phe Ser Ile Leu Ala Asn Leu Val Asn Glu Ile
180       185       190
Val Ile Pro Leu Ser Asn Gly Ala Ile Ser Phe Pro Asn Ile Ser Lys
195       200       205

```

|            |            |            |            |            |            |            |            |            |            |            |            |     |     |     |            |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----|-----|-----|------------|
| Leu<br>210 | Glu<br>215 | Asp        | Gly        | Glu        | Glu        | Ser        | Arg        | His        | Leu        | Ile        | Glu<br>220 | Phe | Ala | Leu | Asn        |
| Asp<br>225 | Tyr        | Ser        | Asp        | Leu        | Val        | Gly        | Ser        | Ile        | Gly        | Glu<br>235 | Leu        | Lys | Asp | Ala | Ile<br>240 |
| Ala        | Thr        | Asn        | Gly        | Gly<br>245 | Tyr        | Thr        | Pro        | Phe        | Ala<br>250 | Lys        | Val        | Thr | Leu | Asn | His<br>255 |
| Tyr        | Thr        | Ala        | Glu<br>260 | Gln        | Lys        | Pro        | His        | Val<br>265 | Phe        | Lys        | Asn        | Asp | Ile | Asp | Ala        |
| Lys        | Ile        | Arg<br>275 | Glu        | Leu        | Lys        | Leu        | Ile        | Glu<br>280 | Leu        | Val        | Glu        | Lys | Leu | Lys | Asn        |
| Lys        | Thr<br>290 | Ser        | Lys        | Gln        | Ile        | Glu        | Glu        | Tyr<br>295 | Phe        | Ser        | Lys        | Phe | Asp | Lys | Phe        |
| Lys<br>305 | Ile        | Tyr        | Asp        | Asp        | Arg<br>310 | Asn        | Ile        | Ser        | Val        | Ile        | Ile        | Arg | Thr | Gln | Cys<br>320 |
| Phe        | Lys        | Tyr        | Lys        | Pro<br>325 | Ile        | Pro        | Phe        | Leu        | Val<br>330 | Lys        | His        | Glu | Leu | Ala | Lys        |
| Tyr        | Ile        | Ala        | Glu<br>340 | Asp        | Glu        | Asp        | Ala        | Val<br>345 | Leu        | Lys        | Val        | Leu | Asp | Ala | Ile        |
| Gly        | Ala        | Thr<br>355 | Arg        | Ser        | Pro        | Ala        | His<br>360 | Asp        | Tyr        | Ala        | His        | Asn | Glu | Asp | Val        |
| Phe<br>370 | Asp        | Leu        | Asn        | His        | Tyr        | Pro<br>375 | Ile        | Lys        | Val        | Ala        | Phe        | Asp | Tyr | Ala | Trp        |
| Glu<br>385 | Gln        | Leu        | Ala        | Asn        | Ser<br>390 | Leu        | Tyr        | Thr        | Thr        | Val<br>395 | Thr        | Phe | Pro | Lys | Glu<br>400 |
| Gln        | Cys        | Glu        | Lys        | Tyr<br>405 | Leu        | Lys        | Asp        | Val        | Phe<br>410 | Asp        | Cys        | Glu | Val | Ser | Lys        |
| Glu        | Pro        | Val        | Phe<br>420 | Lys        | Phe        | Tyr        | Ala        | Asp<br>425 | Leu        | Leu        | Tyr        | Ile | Arg | Lys | Asn        |
| Leu        | Ala        | Val<br>435 | Leu        | Glu        | His        | Lys        | Asn<br>440 | Asn        | Leu        | Pro        | Ser        | Asn | Gln | Glu | Glu        |
| Phe        | Ile<br>450 | Cys        | Lys        | Ile        | Asn        | Asn        | Thr<br>455 | Phe        | Glu        | Asn        | Ile        | Val | Leu | Pro | Tyr        |
| Lys<br>465 | Ile        | Ser        | Gln        | Phe        | Glu<br>470 | Thr        | Tyr        | Lys        | Lys        | Asp<br>475 | Ile        | Leu | Ala | Trp | Ile<br>480 |
| Asn        | Asp        | Gly        | Arg        | Gly<br>485 | His        | Glu        | Lys        | Tyr        | Thr<br>490 | Asp        | Ala        | Lys | Gln | Gln | Leu        |
| Gly        | Phe        | Ile        | Arg<br>500 | Gly        | Gly        | Leu        | Lys        | Gly<br>505 | Arg        | Ile        | Lys        | Ala | Gln | Lys | Met        |
| Phe        | Arg        | Lys<br>515 | Asp        | Lys        | Tyr        | Gly        | Lys<br>520 | Ile        | Lys        | Ser        | Tyr        | Tyr | Glu | Asn | Pro        |
| Tyr        | Thr<br>530 | Lys        | Leu        | Thr        | Asn        | Glu<br>535 | Phe        | Lys        | Gln        | Ile        | Ser<br>540 | Ser | Thr | Tyr | Gly        |
| Lys<br>545 | Thr        | Phe        | Ala        | Glu        | Leu<br>550 | Arg        | Asp        | Lys        | Phe        | Lys<br>555 | Glu        | Lys | Asn | Asn | Ile<br>560 |
| Thr        | Lys        | Ile        | Thr        | His<br>565 | Phe        | Gly        | Ile        | Ile        | Ile<br>570 | Glu        | Asp        | Lys | Asn | Arg | Asp        |
| Arg        | Tyr        | Leu        | Leu<br>580 | Ala        | Asn        | Gly        | Leu        | Gln<br>585 | His        | Glu        | Gln        | Ile | Asn | His | Val        |
| Ser        | Thr        | Ile<br>595 | Leu        | Asn        | Lys        | Leu        | Asp<br>600 | Lys        | Ser        | Ser        | Glu        | Phe | Ile | Thr | Tyr        |
| Gln        | Val<br>610 | Lys        | Ser        | Leu        | Thr        | Ser<br>615 | Lys        | Thr        | Leu        | Ile        | Lys<br>620 | Leu | Ile | Lys | Asn        |
| His<br>625 | Thr        | Thr        | Lys        | Lys        | Gly<br>630 | Ala        | Ile        | Ser        | Pro        | Tyr<br>635 | Ala        | Asp | Phe | His | Thr<br>640 |

|      |      |     |      |     |      |      |      |      |      |      |      |      |      |     |      |  |
|------|------|-----|------|-----|------|------|------|------|------|------|------|------|------|-----|------|--|
| Ser  | Lys  | Thr | Gly  | Phe | Asn  | Lys  | Asn  | Glu  | Ile  | Glu  | Lys  | Asn  | Trp  | Asp | Asn  |  |
|      |      |     |      | 645 |      |      |      |      | 650  |      |      |      |      | 655 |      |  |
| Tyr  | Lys  | Arg | Glu  | Gln | Val  | Leu  | Val  | Glu  | Tyr  | Val  | Lys  | Asp  | Cys  | Leu | Thr  |  |
|      |      |     | 660  |     |      |      |      | 665  |      |      |      |      | 670  |     |      |  |
| Asp  | Ser  | Thr | Met  | Ala | Lys  | Asn  | Gln  | Asn  | Trp  | Ala  | Glu  | Phe  | Gly  | Trp | Asn  |  |
|      |      | 675 |      |     |      |      | 680  |      |      |      |      | 685  |      |     |      |  |
| Phe  | Glu  | Lys | Cys  | Asn | Ser  | Tyr  | Glu  | Asp  | Ile  | Glu  | His  | Glu  | Ile  | Asp | Gln  |  |
|      | 690  |     |      |     |      | 695  |      |      |      |      | 700  |      |      |     |      |  |
| Lys  | Ser  | Tyr | Ile  | Leu | Gln  | Lys  | His  | Thr  | Ile  | Ser  | Lys  | Gln  | Ser  | Ile | Ala  |  |
| 705  |      |     |      |     | 710  |      |      |      |      | 715  |      |      |      |     | 720  |  |
| Ser  | Leu  | Val | Glu  | Gly | Gly  | Cys  | Leu  | Leu  | Leu  | Pro  | Ile  | Ile  | Asn  | Gln | Asp  |  |
|      |      |     |      | 725 |      |      |      |      | 730  |      |      |      |      | 735 |      |  |
| Ile  | Thr  | Ser | Lys  | Glu | Arg  | Lys  | Asp  | Lys  | Asn  | Gln  | Phe  | Ser  | Lys  | Asp | Trp  |  |
|      |      |     | 740  |     |      |      |      | 745  |      |      |      |      | 750  |     |      |  |
| Lys  | Gln  | Ile | Phe  | Glu | Gly  | Ser  | Lys  | Glu  | Phe  | Arg  | Leu  | His  | Pro  | Glu | Phe  |  |
|      | 755  |     |      |     |      |      | 760  |      |      |      |      | 765  |      |     |      |  |
| Ala  | Val  | Ser | Tyr  | Arg | Thr  | Pro  | Ile  | Glu  | Gly  | Tyr  | Pro  | Val  | Gln  | Lys | Arg  |  |
|      | 770  |     |      |     |      | 775  |      |      |      |      | 780  |      |      |     |      |  |
| Tyr  | Gly  | Arg | Leu  | Gln | Phe  | Val  | Cys  | Ala  | Phe  | Asn  | Cys  | Glu  | Ile  | Ile | Pro  |  |
| 785  |      |     |      |     | 790  |      |      |      |      | 795  |      |      |      |     | 800  |  |
| Gln  | Asn  | Gly | Glu  | Phe | Ile  | Asn  | Leu  | Lys  | Lys  | Gln  | Ile  | Glu  | Asn  | Phe | Asn  |  |
|      |      |     |      | 805 |      |      |      |      | 810  |      |      |      |      | 815 |      |  |
| Asp  | Glu  | Asp | Ala  | Gln | Lys  | Glu  | Ala  | Val  | Glu  | Glu  | Phe  | Asn  | Lys  | Lys | Val  |  |
|      |      |     | 820  |     |      |      |      | 825  |      |      |      | 830  |      |     |      |  |
| Asn  | His  | Ala | Leu  | Ser | Asp  | Lys  | Glu  | Tyr  | Val  | Val  | Ile  | Gly  | Ile  | Asp | Arg  |  |
|      |      | 835 |      |     |      |      | 840  |      |      |      |      | 845  |      |     |      |  |
| Gly  | Leu  | Lys | Gln  | Leu | Ala  | Thr  | Leu  | Cys  | Val  | Leu  | Asp  | Lys  | Arg  | Gly | Lys  |  |
|      | 850  |     |      |     |      | 855  |      |      |      |      | 860  |      |      |     |      |  |
| Ile  | Leu  | Gly | Asp  | Phe | Glu  | Ile  | Tyr  | Lys  | Lys  | Glu  | Phe  | Val  | Arg  | Ala | Glu  |  |
| 865  |      |     |      |     | 870  |      |      |      |      | 875  |      |      |      |     | 880  |  |
| Lys  | Arg  | Ser | Glu  | Ser | His  | Trp  | Glu  | His  | Thr  | Gln  | Ala  | Glu  | Thr  | Arg | His  |  |
|      |      |     |      | 885 |      |      |      |      | 890  |      |      |      |      | 895 |      |  |
| Ile  | Leu  | Asp | Leu  | Ser | Asn  | Leu  | Arg  | Val  | Glu  | Thr  | Thr  | Ile  | Glu  | Gly | Lys  |  |
|      |      | 900 |      |     |      |      | 905  |      |      |      |      |      | 910  |     |      |  |
| Lys  | Val  | Leu | Val  | Asp | Gln  | Ser  | Leu  | Thr  | Leu  | Val  | Lys  | Lys  | Asn  | Arg | Asp  |  |
|      | 915  |     |      |     |      | 920  |      |      |      |      | 925  |      |      |     |      |  |
| Thr  | Pro  | Asp | Glu  | Glu | Ala  | Thr  | Glu  | Glu  | Asn  | Lys  | Gln  | Lys  | Ile  | Lys | Leu  |  |
|      | 930  |     |      |     |      | 935  |      |      |      |      | 940  |      |      |     |      |  |
| Lys  | Gln  | Leu | Ser  | Tyr | Ile  | Arg  | Lys  | Leu  | Gln  | His  | Lys  | Met  | Gln  | Thr | Asn  |  |
| 945  |      |     |      |     | 950  |      |      |      |      | 955  |      |      |      |     | 960  |  |
| Glu  | Gln  | Asp | Val  | Leu | Asp  | Leu  | Ile  | Asn  | Asn  | Glu  | Pro  | Ser  | Asp  | Glu | Glu  |  |
|      |      |     |      | 965 |      |      |      |      | 970  |      |      |      |      | 975 |      |  |
| Phe  | Lys  | Lys | Arg  | Ile | Glu  | Gly  | Leu  | Ile  | Ser  | Ser  | Phe  | Gly  | Glu  | Gly | Gln  |  |
|      |      |     | 980  |     |      |      | 985  |      |      |      |      | 990  |      |     |      |  |
| Lys  | Tyr  | Ala | Asp  | Leu | Pro  | Ile  | Asn  | Thr  | Met  | Arg  | Glu  | Met  | Ile  | Ser | Asp  |  |
|      | 995  |     |      |     |      |      | 1000 |      |      |      |      | 1005 |      |     |      |  |
| Leu  | Gln  | Gly | Val  | Ile | Ala  | Arg  | Gly  | Asn  | Asn  | Gln  | Thr  | Glu  | Lys  | Asn | Lys  |  |
|      | 1010 |     |      |     |      | 1015 |      |      |      |      | 1020 |      |      |     |      |  |
| Ile  | Ile  | Glu | Leu  | Asp | Ala  | Ala  | Asp  | Asn  | Leu  | Lys  | Gln  | Gly  | Ile  | Val | Ala  |  |
| 1025 |      |     |      |     | 1030 |      |      |      |      | 1035 |      |      |      |     | 1040 |  |
| Asn  | Met  | Ile | Gly  | Ile | Val  | Asn  | Tyr  | Ile  | Phe  | Ala  | Lys  | Tyr  | Ser  | Tyr | Lys  |  |
|      |      |     | 1045 |     |      |      |      |      | 1050 |      |      |      | 1055 |     |      |  |
| Ala  | Tyr  | Ile | Ser  | Leu | Glu  | Asp  | Leu  | Ser  | Arg  | Ala  | Tyr  | Gly  | Gly  | Ala | Lys  |  |
|      |      |     | 1060 |     |      |      |      | 1065 |      |      |      |      | 1070 |     |      |  |

|     |      |      |      |     |      |      |      |      |      |      |      |      |     |      |      |
|-----|------|------|------|-----|------|------|------|------|------|------|------|------|-----|------|------|
| Ser | Gly  | Tyr  | Asp  | Gly | Arg  | Tyr  | Leu  | Pro  | Ser  | Thr  | Ser  | Gln  | Asp | Glu  | Asp  |
|     | 1075 |      |      |     |      |      | 1080 |      |      |      |      | 1085 |     |      |      |
| Val | Asp  | Phe  | Lys  | Glu | Gln  | Gln  | Asn  | Gln  | Met  | Leu  | Ala  | Gly  | Leu | Gly  | Thr  |
|     | 1090 |      |      |     |      |      | 1095 |      |      |      |      | 1100 |     |      |      |
| Tyr | Gln  | Phe  | Phe  | Glu | Met  | Gln  | Leu  | Leu  | Lys  | Lys  | Leu  | Gln  | Lys | Ile  | Gln  |
|     | 1105 |      |      |     |      | 1110 |      |      |      | 1115 |      |      |     |      | 1120 |
| Ser | Asp  | Asn  | Thr  | Val | Leu  | Arg  | Phe  | Val  | Pro  | Ala  | Phe  | Arg  | Ser | Ala  | Asp  |
|     |      |      | 1125 |     |      |      |      |      | 1130 |      |      |      |     | 1135 |      |
| Asn | Tyr  | Arg  | Asn  | Ile | Leu  | Arg  | Leu  | Glu  | Glu  | Thr  | Lys  | Tyr  | Lys | Ser  | Lys  |
|     |      |      | 1140 |     |      |      |      | 1145 |      |      |      |      |     | 1150 |      |
| Pro | Phe  | Gly  | Val  | Val | His  | Phe  | Ile  | Asp  | Pro  | Lys  | Phe  | Thr  | Ser | Lys  | Lys  |
|     |      | 1155 |      |     |      |      | 1160 |      |      |      |      | 1165 |     |      |      |
| Cys | Pro  | Val  | Cys  | Ser | Lys  | Thr  | Asn  | Val  | Tyr  | Arg  | Asp  | Lys  | Asp | Asp  | Ile  |
|     | 1170 |      |      |     |      | 1175 |      |      |      |      | 1180 |      |     |      |      |
| Leu | Val  | Cys  | Lys  | Glu | Cys  | Gly  | Phe  | Arg  | Ser  | Asp  | Ser  | Gln  | Leu | Lys  | Glu  |
|     | 1185 |      |      |     | 1190 |      |      |      | 1195 |      |      |      |     |      | 1200 |
| Arg | Glu  | Asn  | Asn  | Ile | His  | Tyr  | Ile  | His  | Asn  | Gly  | Asp  | Asp  | Asn | Gly  | Ala  |
|     |      |      | 1205 |     |      |      |      | 1210 |      |      |      |      |     | 1215 |      |
| Tyr | His  | Ile  | Ala  | Leu | Lys  | Ser  | Val  | Glu  | Asn  | Leu  | Ile  | Gln  | Met | Lys  |      |
|     |      |      | 1220 |     |      |      |      | 1225 |      |      |      |      |     | 1230 |      |

<210> 2

<211> 3696

<212> DNA

<213> Artificial Sequence

<220>

<223> NT Sequence of BEC85 (Codon optimized for *S. Cerevisiae*)

<400> 2

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| atgaagtcct tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg  | 60  |
| aaagaggata agaaaaagtg caagtccac ttggaattgc aagaattcgt tgacatttcc   | 120 |
| tacaagacct tgaagtcac tgctaccatt gctgaatcct tgaacgaaat cgaattggtc   | 180 |
| aaaaagtgcg aaagggtgcta ctccgaaatt atcaagttcc atgaagcttg ggggtcaaac | 240 |
| tactgtagaa ctaaccaaatt tgccgtctac aaggactggt atagacaatt ggctagaaag | 300 |
| gccagattcg atgttggtga tcaaaaactct caactgatca cttgtcatc cttatcttct  | 360 |
| aagcacaacg tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac  | 420 |
| aacattgccg gacaaaagt cttcctgaag gatttctctc aacaattgaa gcagtacaag   | 480 |
| agagctttgg aaaattctga taaggctcat accaagccaa acctgattaa cttcaacaag  | 540 |
| accttctcca ttttgccaa cttgggttaac gaaattgtca tccattgtc caacggtgct   | 600 |
| atttcttttc caaacatctc caagttggaa gatggtgaag aatccagaca tttgattgaa  | 660 |
| ttcgctctga acgattactc cgatttggtt ggttctattg gtgaattgaa ggatgctatt  | 720 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gctaccaatg gtggttatac tccatttgct aaggttacct tgaaccatta cactgctgaa  | 780  |
| caaaagccac acgttttcaa gaacgatatt gatgccaaaga tccgtgagtt gaagttgatt | 840  |
| gagttggctg aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag  | 900  |
| ttcgacaagt tcaagatcta cgatgataga aacatctccg ttatcattag aacccaatgc  | 960  |
| tttaagtaca agcccattcc attttttggtc aagcacgaat tggctaagta tatcgtgaa  | 1020 |
| gatgaagatg ccgttttgaa ggttttggat gcaattgggtg ctactagatc tccagctcat | 1080 |
| gattacgctc ataatgaaga tgtttttgac ttgaatcact acccaatcaa ggttgctttt  | 1140 |
| gattacgcat gggaacaatt ggctaactcc ttgtacacta ctgttacttt cccaaaagaa  | 1200 |
| cagtgcgaga agtacttgaa ggatgttttt gattgcgaag tctccaaaga accagttttt  | 1260 |
| aagttctacg ccgacctgtt gtacatcaga aagaatttgg ctgttttgga gcacaagaac  | 1320 |
| aacctgccat ctaatcaaga ggaattcatc tgcaagatta acaacacctt cgagaacatc  | 1380 |
| gttctgccat acaagatttc tcaattcgaa acctacaaga aggatatctt ggcctggatt  | 1440 |
| aacgatggta gaggtcacga aaagtacacc gatgctaaac aacagttggg ttttattaga  | 1500 |
| ggtggctctga aaggtagaat caaggctcaa aagatgttca gaaaagacaa gtacggtaag | 1560 |
| atcaagtcct actacgaaaa cccatacact aagttgacca acgaattcaa gcaaattctt  | 1620 |
| tctacctacg gtaaaacctt cgctgaattg agagacaagt tcaaagaaaa gaacaacatc  | 1680 |
| accaagatca cccatttcgg tattatcatc gaagataaga acagggacag atacttgttg  | 1740 |
| gccaacggtt tgcaacacga acaaatcaac catgtctcca ccatcttgaa caagttggat  | 1800 |
| aagtcatccg aattcatcac ctaccaagtt aagtctttga cctctaagac cctgatcaag  | 1860 |
| ctgattaaga atcataccac caagaagggt gcaatttctc catatgctga tttccatact  | 1920 |
| tctaagaccg gctttaacaa aaacgagatc gaaaagaact gggacaacta caagagagaa  | 1980 |
| caagtcttgg ttgaatacgt taaggattgc ttgaccgatt ctaccatggc taagaatcaa  | 2040 |
| aattgggctg aatttggttg gaacttcgag aagtgttaact cctacgaaga tatcgaacac | 2100 |
| gaaatcgatc agaagtctta catcttgcaa aagcatacca tttccaagca atctattgct  | 2160 |
| tctttggttg aaggtggttg tttgttggtg ccaattatca accaggacat cacctctaaa  | 2220 |
| gaacgtaagg acaagaatca gttctccaag gattggaagc aaatcttcga aggttccaaa  | 2280 |
| gaattcagat tgcattccaga attcgccgtt tcttacagaa ctccaattga aggttaccca | 2340 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gtccaaaaaa gatacggtag attgcaattc gtttgcgctt ttaactgcga aatcatccca  | 2400 |
| caaaatgggtg agttcatcaa cttgaagaag cagatcgaga acttcaacga cgaagatgct | 2460 |
| caaaaagaag ccgtcgaaga gttcaacaaa aaggttaacc atgccttgct cgacaaagaa  | 2520 |
| tacgttgta ttggtatcga cagaggcttg aagcaattag ctactttgtg tgttttggac   | 2580 |
| aagaggggta agattttggg tgactttgaa atctacaaaa aagagttcgt cagagccgaa  | 2640 |
| aagagatctg aatctcattg ggaacatact caagctgaaa ccagacatat cttggacttg  | 2700 |
| tctaacttga gagttgaaac taccattgag ggcaaaaagg tgttggttga tcaatctttg  | 2760 |
| acactgggtca agaagaacag agatactcca gatgaagaag ctaccgaaga aaacaagcag | 2820 |
| aagattaagt tgaagcagct gtcctacatt agaaagttgc aacacaagat gcagaccaat  | 2880 |
| gaacaagatg tcttggacct gatcaacaac gaaccatctg atgaagaatt caaaaagagg  | 2940 |
| atcgagggtc tgatttcttc attcggtgaa ggtcaaaagt acgctgattt gcctattaac  | 3000 |
| accatgaggg aaatgatctc tgacttgcaa ggtgttattg ccagaggaaa caatcagact  | 3060 |
| gagaaaaaca agatcatcga attggatgct gccgacaatt tgaaacaagg tatcgttgct  | 3120 |
| aacatgatcg gtatcgtaa ctacattttc gccaagtact cctacaaggc ctacatttct   | 3180 |
| ttagaagatt tgtccagagc ttacgggtgt gcaaaatctg gttatgatgg tagatatttg  | 3240 |
| ccatccacct ctcaagatga ggatgttgac tttaaagaac agcagaatca aatgttggtc  | 3300 |
| ggcttgggta cttaccaatt ttttgaaatg cagctgctga aaaagctgca gaagatccaa  | 3360 |
| tctgataaca ccgttttgag atttgttcca gcttttagat ccgccgataa ctacagaaat  | 3420 |
| atcttgagat tggaagagac taagtacaag tctaagccat tcggtgttgt tcatttcac   | 3480 |
| gatccaaagt tcacatctaa gaagtgtcca gtttgctcta agactaacgt ttacagagat  | 3540 |
| aaggatgaca tcctggctc taaagaatgt ggttttaggt ccgactcaca gttgaaagaa   | 3600 |
| agggaaaaca acatccacta catccacaat ggtgatgata atggtgctta ccatattgcc  | 3660 |
| ttgaagtccg tcgaaaactt gattcagatg aagtaa                            | 3696 |

<210> 3

<211> 1231

<212> PRT

<213> Artificial Sequence

<220>

<223> AA Sequence of BEC67

<400> 3

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Lys | Ser | Phe | Glu | Asn | Ser | Cys | Gln | Ile | Ser | Lys | Thr | Leu | Arg | Phe |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |
| Gly | Ala | Thr | Leu | Lys | Glu | Asp | Lys | Lys | Lys | Cys | Lys | Ser | His | Leu | Glu |
|     |     |     | 20  |     |     |     | 25  |     |     |     |     |     | 30  |     |     |
| Leu | Gln | Glu | Phe | Val | Asp | Ile | Ser | Tyr | Lys | Thr | Leu | Lys | Ser | Ser | Ala |
|     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Thr | Ile | Ala | Glu | Ser | Leu | Asn | Glu | Ile | Glu | Leu | Val | Lys | Lys | Cys | Glu |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Arg | Cys | Tyr | Ser | Glu | Ile | Ile | Lys | Phe | His | Glu | Ala | Trp | Gly | Gln | Ile |
| 65  |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |     |
| Tyr | Cys | Arg | Thr | Asn | Gln | Ile | Ala | Val | Tyr | Lys | Asp | Trp | Tyr | Arg | Gln |
|     |     |     | 85  |     |     |     |     | 90  |     |     |     |     |     | 95  |     |
| Leu | Ala | Arg | Lys | Ala | Arg | Phe | Asp | Val | Gly | Asp | Gln | Asn | Ser | Gln | Leu |
|     |     |     | 100 |     |     |     | 105 |     |     |     |     |     | 110 |     |     |
| Ile | Thr | Leu | Ser | Ser | Leu | Ser | Ser | Lys | His | Asn | Val | Tyr | Gln | Gly | Leu |
|     | 115 |     |     |     |     | 120 |     |     |     |     |     | 125 |     |     |     |
| Lys | Arg | Ser | Gln | His | Ile | Thr | Asn | Tyr | Trp | Lys | Asp | Asn | Ile | Ala | Arg |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Gln | Lys | Ser | Phe | Leu | Lys | Asp | Phe | Ser | Gln | Gln | Leu | Lys | Gln | Tyr | Lys |
| 145 |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |     |
| Arg | Ala | Leu | Glu | Asn | Ser | Asp | Lys | Ala | His | Thr | Lys | Pro | Asn | Leu | Ile |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |
| Asn | Phe | Asn | Lys | Thr | Phe | Ser | Ile | Leu | Ala | Asn | Leu | Val | Asn | Glu | Ile |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Val | Ile | Pro | Leu | Ser | Asn | Gly | Ala | Ile | Ser | Phe | Pro | Asn | Ile | Ser | Lys |
|     | 195 |     |     |     |     | 200 |     |     |     |     |     | 205 |     |     |     |
| Leu | Glu | Asp | Gly | Glu | Glu | Ser | Arg | His | Leu | Ile | Glu | Phe | Ala | Leu | Asn |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Asp | Tyr | Ser | Asp | Leu | Val | Gly | Ser | Ile | Gly | Glu | Leu | Lys | Asp | Ala | Ile |
| 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |     |
| Ala | Thr | Asn | Gly | Gly | Tyr | Thr | Pro | Phe | Ala | Lys | Val | Thr | Leu | Asn | His |
|     |     |     | 245 |     |     |     |     | 250 |     |     |     |     |     | 255 |     |
| Tyr | Thr | Ala | Glu | Gln | Lys | Pro | His | Val | Phe | Lys | Asn | Asp | Ile | Asp | Ala |
|     |     | 260 |     |     |     | 265 |     |     |     |     |     | 270 |     |     |     |
| Lys | Ile | Arg | Glu | Leu | Lys | Leu | Ile | Glu | Leu | Val | Glu | Lys | Leu | Lys | Asn |
|     | 275 |     |     |     |     | 280 |     |     |     |     |     | 285 |     |     |     |
| Lys | Thr | Ser | Lys | Gln | Ile | Glu | Glu | Tyr | Phe | Ser | Lys | Phe | Asp | Lys | Phe |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Lys | Ile | Tyr | Asp | Asp | Arg | Asn | Ile | Ser | Val | Ile | Ile | Arg | Thr | Gln | Cys |
| 305 |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |     |
| Phe | Lys | Tyr | Lys | Pro | Ile | Pro | Phe | Leu | Val | Lys | His | Glu | Leu | Ala | Lys |
|     |     |     | 325 |     |     |     |     | 330 |     |     |     |     |     | 335 |     |
| Tyr | Ile | Ala | Glu | Asp | Glu | Asp | Ala | Val | Leu | Lys | Val | Leu | Asp | Ala | Ile |
|     |     | 340 |     |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Gly | Ala | Thr | Arg | Ser | Pro | Ala | His | Asp | Tyr | Ala | His | Asn | Glu | Asp | Val |
|     | 355 |     |     |     |     | 360 |     |     |     |     |     | 365 |     |     |     |
| Phe | Asp | Leu | Asn | His | Tyr | Pro | Ile | Lys | Val | Ala | Phe | Asp | Tyr | Ala | Trp |
|     | 370 |     |     |     |     | 375 |     |     |     | 380 |     |     |     |     |     |
| Glu | Gln | Leu | Ala | Asn | Ser | Leu | Tyr | Thr | Thr | Val | Thr | Phe | Pro | Lys | Glu |
| 385 |     |     |     | 390 |     |     |     |     |     | 395 |     |     |     |     | 400 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Gln | Cys | Glu | Lys | Tyr | Leu | Lys | Asp | Val | Phe | Asp | Cys | Glu | Val | Ser | Lys |  |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
| Glu | Pro | Val | Phe | Lys | Phe | Tyr | Ala | Asp | Leu | Leu | Tyr | Ile | Arg | Lys | Asn |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| Leu | Ala | Val | Leu | Glu | His | Lys | Asn | Asn | Leu | Pro | Ser | Asn | Gln | Glu | Glu |  |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
| Phe | Ile | Cys | Lys | Ile | Asn | Asn | Thr | Phe | Glu | Asn | Ile | Val | Leu | Pro | Tyr |  |
|     | 450 |     |     |     | 455 |     |     |     |     |     | 460 |     |     |     |     |  |
| Lys | Ile | Ser | Gln | Phe | Glu | Thr | Tyr | Lys | Lys | Asp | Ile | Leu | Ala | Trp | Ile |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
| Asn | Asp | Gly | Arg | Gly | His | Glu | Lys | Tyr | Thr | Asp | Ser | Lys | Arg | Glu | Leu |  |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
| Gly | Phe | Ile | Arg | Gly | Gly | Leu | Lys | Gly | Arg | Ile | Lys | Ala | Gln | Lys | Met |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| Phe | Arg | Lys | Asp | Lys | Tyr | Gly | Lys | Ile | Lys | Ser | Tyr | Tyr | Glu | Asn | Pro |  |
|     | 515 |     |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
| Tyr | Thr | Lys | Leu | Thr | Glu | Glu | Phe | Lys | Asn | Leu | Ala | Ile | Thr | Tyr | Gly |  |
|     | 530 |     |     |     | 535 |     |     |     |     |     | 540 |     |     |     |     |  |
| Lys | Thr | Phe | Ala | Glu | Leu | Arg | Asp | Lys | Phe | Lys | Glu | Lys | Asn | Asn | Ile |  |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |
| Thr | Lys | Ile | Thr | His | Phe | Gly | Ile | Ile | Ile | Glu | Asp | Lys | Asn | Arg | Asp |  |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |  |
| Arg | Tyr | Leu | Leu | Ala | Asn | Gly | Leu | Gln | His | Glu | Gln | Ile | Asn | His | Val |  |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |  |
| Ser | Thr | Ile | Leu | Asn | Lys | Leu | Asp | Lys | Ser | Ser | Glu | Phe | Ile | Thr | Tyr |  |
|     | 595 |     |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |  |
| Gln | Val | Lys | Ser | Leu | Thr | Ser | Lys | Thr | Leu | Ile | Lys | Leu | Ile | Lys | Asn |  |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |  |
| His | Thr | Thr | Lys | Lys | Gly | Ala | Ile | Ser | Pro | Tyr | Ala | Asp | Phe | His | Thr |  |
| 625 |     |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |  |
| Ser | Lys | Thr | Gly | Phe | Asn | Lys | Asn | Glu | Ile | Glu | Lys | Asn | Trp | Asp | Asn |  |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     | 655 |     |     |  |
| Tyr | Lys | Arg | Glu | Gln | Val | Leu | Val | Glu | Tyr | Val | Lys | Asp | Cys | Leu | Thr |  |
|     |     | 660 |     |     |     |     |     | 665 |     |     |     |     | 670 |     |     |  |
| Asp | Ser | Thr | Met | Ala | Lys | Asn | Gln | Asn | Trp | Ala | Glu | Phe | Gly | Trp | Asp |  |
|     | 675 |     |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |  |
| Leu | Glu | Ser | Cys | Asn | Ser | Tyr | Glu | Asp | Ile | Glu | His | Glu | Ile | Asp | Gln |  |
|     | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |  |
| Lys | Ser | Tyr | Ile | Leu | Gln | Lys | His | Thr | Ile | Ser | Lys | Gln | Ser | Ile | Ala |  |
| 705 |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     | 720 |  |
| Ser | Leu | Val | Glu | Gly | Gly | Cys | Leu | Leu | Leu | Pro | Ile | Ile | Asn | Gln | Asp |  |
|     |     |     |     | 725 |     |     |     |     | 730 |     |     |     |     | 735 |     |  |
| Ile | Thr | Ser | Lys | Glu | Arg | Lys | Asp | Lys | Asn | Gln | Phe | Ser | Lys | Asp | Trp |  |
|     |     | 740 |     |     |     |     |     | 745 |     |     |     |     | 750 |     |     |  |
| Lys | Gln | Ile | Phe | Glu | Gly | Ser | Lys | Glu | Phe | Arg | Leu | His | Pro | Glu | Phe |  |
|     | 755 |     |     |     |     |     | 760 |     |     |     |     | 765 |     |     |     |  |
| Ala | Val | Ser | Tyr | Arg | Thr | Pro | Ile | Glu | Gly | Tyr | Pro | Val | Gln | Lys | Arg |  |
|     | 770 |     |     |     |     | 775 |     |     |     |     |     | 780 |     |     |     |  |
| Tyr | Gly | Arg | Leu | Gln | Phe | Val | Cys | Ala | Phe | Asn | Cys | Glu | Ile | Ile | Pro |  |
| 785 |     |     |     |     | 790 |     |     |     |     | 795 |     |     |     |     | 800 |  |
| Gln | Asn | Gly | Glu | Phe | Ile | Asn | Leu | Lys | Lys | Gln | Ile | Glu | Asn | Phe | Asn |  |
|     |     |     |     | 805 |     |     |     |     | 810 |     |     |     |     | 815 |     |  |
| Asp | Glu | Asp | Ala | Gln | Lys | Glu | Ala | Val | Glu | Glu | Phe | Asn | Lys | Lys | Val |  |
|     |     |     | 820 |     |     |     |     | 825 |     |     |     |     | 830 |     |     |  |

|      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |  |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|
| Asn  | His  | Ala  | Leu  | Ser  | Asp  | Lys  | Glu  | Tyr  | Val  | Val  | Ile  | Gly  | Ile  | Asp  | Arg  |  |  |
|      |      | 835  |      |      |      |      | 840  |      |      |      |      | 845  |      |      |      |  |  |
| Gly  | Leu  | Lys  | Gln  | Leu  | Ala  | Thr  | Leu  | Cys  | Val  | Leu  | Asp  | Lys  | Arg  | Gly  | Lys  |  |  |
|      |      | 850  |      |      |      | 855  |      |      |      |      | 860  |      |      |      |      |  |  |
| Ile  | Leu  | Gly  | Asp  | Phe  | Glu  | Ile  | Tyr  | Lys  | Lys  | Glu  | Phe  | Val  | Arg  | Ala  | Glu  |  |  |
| 865  |      |      |      |      | 870  |      |      |      |      | 875  |      |      |      |      | 880  |  |  |
| Lys  | Arg  | Ser  | Glu  | Ser  | His  | Trp  | Glu  | His  | Thr  | Gln  | Ala  | Glu  | Thr  | Arg  | His  |  |  |
|      |      |      |      | 885  |      |      |      |      | 890  |      |      |      |      |      | 895  |  |  |
| Ile  | Leu  | Asp  | Leu  | Ser  | Asn  | Leu  | Arg  | Val  | Glu  | Thr  | Thr  | Ile  | Glu  | Gly  | Lys  |  |  |
|      |      |      | 900  |      |      |      | 905  |      |      |      |      |      | 910  |      |      |  |  |
| Lys  | Val  | Leu  | Val  | Asp  | Gln  | Ser  | Leu  | Thr  | Leu  | Val  | Lys  | Lys  | Asn  | Arg  | Asp  |  |  |
|      |      | 915  |      |      |      |      | 920  |      |      |      |      | 925  |      |      |      |  |  |
| Thr  | Pro  | Asp  | Glu  | Glu  | Ala  | Thr  | Glu  | Glu  | Asn  | Lys  | Gln  | Lys  | Ile  | Lys  | Leu  |  |  |
|      |      | 930  |      |      |      | 935  |      |      |      |      | 940  |      |      |      |      |  |  |
| Lys  | Gln  | Leu  | Ser  | Tyr  | Ile  | Arg  | Lys  | Leu  | Gln  | His  | Lys  | Met  | Gln  | Thr  | Asn  |  |  |
| 945  |      |      |      |      | 950  |      |      |      |      | 955  |      |      |      |      | 960  |  |  |
| Glu  | Gln  | Asp  | Val  | Leu  | Asp  | Leu  | Ile  | Asn  | Asn  | Glu  | Pro  | Ser  | Asp  | Glu  | Glu  |  |  |
|      |      |      |      | 965  |      |      |      |      | 970  |      |      |      |      | 975  |      |  |  |
| Phe  | Lys  | Lys  | Arg  | Ile  | Glu  | Gly  | Leu  | Ile  | Ser  | Ser  | Phe  | Gly  | Glu  | Gly  | Gln  |  |  |
|      |      |      | 980  |      |      |      | 985  |      |      |      |      | 990  |      |      |      |  |  |
| Lys  | Tyr  | Ala  | Asp  | Leu  | Pro  | Ile  | Asn  | Thr  | Met  | Arg  | Glu  | Met  | Ile  | Ser  | Asp  |  |  |
|      |      | 995  |      |      |      |      | 1000 |      |      |      |      | 1005 |      |      |      |  |  |
| Leu  | Gln  | Gly  | Val  | Ile  | Ala  | Arg  | Gly  | Asn  | Asn  | Gln  | Thr  | Glu  | Lys  | Asn  | Lys  |  |  |
|      |      | 1010 |      |      |      | 1015 |      |      |      |      | 1020 |      |      |      |      |  |  |
| Ile  | Ile  | Glu  | Leu  | Asp  | Ala  | Ala  | Asp  | Asn  | Leu  | Lys  | Gln  | Gly  | Ile  | Val  | Ala  |  |  |
| 1025 |      |      |      |      | 1030 |      |      |      |      | 1035 |      |      |      |      | 1040 |  |  |
| Asn  | Met  | Ile  | Gly  | Ile  | Val  | Asn  | Tyr  | Ile  | Phe  | Ala  | Lys  | Tyr  | Ser  | Tyr  | Lys  |  |  |
|      |      |      |      | 1045 |      |      |      |      | 1050 |      |      |      |      | 1055 |      |  |  |
| Ala  | Tyr  | Ile  | Ser  | Leu  | Glu  | Asp  | Leu  | Ser  | Arg  | Ala  | Tyr  | Gly  | Gly  | Ala  | Lys  |  |  |
|      |      |      | 1060 |      |      |      |      | 1065 |      |      |      |      | 1070 |      |      |  |  |
| Ser  | Gly  | Tyr  | Asp  | Gly  | Arg  | Tyr  | Leu  | Pro  | Ser  | Thr  | Ser  | Gln  | Asp  | Glu  | Asp  |  |  |
|      |      | 1075 |      |      |      |      | 1080 |      |      |      |      | 1085 |      |      |      |  |  |
| Val  | Asp  | Phe  | Lys  | Glu  | Gln  | Gln  | Asn  | Gln  | Met  | Leu  | Ala  | Gly  | Leu  | Gly  | Thr  |  |  |
|      | 1090 |      |      |      | 1095 |      |      |      |      |      | 1100 |      |      |      |      |  |  |
| Tyr  | Gln  | Phe  | Phe  | Glu  | Met  | Gln  | Leu  | Leu  | Lys  | Lys  | Leu  | Gln  | Lys  | Ile  | Gln  |  |  |
| 1105 |      |      |      |      | 1110 |      |      |      |      | 1115 |      |      |      |      | 1120 |  |  |
| Ser  | Asp  | Asn  | Thr  | Val  | Leu  | Arg  | Phe  | Val  | Pro  | Ala  | Phe  | Arg  | Ser  | Ala  | Asp  |  |  |
|      |      |      |      | 1125 |      |      |      | 1130 |      |      |      |      |      | 1135 |      |  |  |
| Asn  | Tyr  | Arg  | Asn  | Ile  | Leu  | Arg  | Leu  | Glu  | Glu  | Thr  | Lys  | Tyr  | Lys  | Ser  | Lys  |  |  |
|      |      |      | 1140 |      |      |      |      | 1145 |      |      |      |      | 1150 |      |      |  |  |
| Pro  | Phe  | Gly  | Val  | Val  | His  | Phe  | Ile  | Asp  | Pro  | Lys  | Phe  | Thr  | Ser  | Lys  | Lys  |  |  |
|      |      | 1155 |      |      |      |      | 1160 |      |      |      |      | 1165 |      |      |      |  |  |
| Cys  | Pro  | Val  | Cys  | Ser  | Lys  | Thr  | Asn  | Val  | Tyr  | Arg  | Asp  | Lys  | Asp  | Asp  | Ile  |  |  |
|      | 1170 |      |      |      |      | 1175 |      |      |      |      | 1180 |      |      |      |      |  |  |
| Leu  | Val  | Cys  | Lys  | Glu  | Cys  | Gly  | Phe  | Arg  | Ser  | Asp  | Ser  | Gln  | Leu  | Lys  | Glu  |  |  |
| 1185 |      |      |      |      | 1190 |      |      |      |      | 1195 |      |      |      |      | 1200 |  |  |
| Arg  | Glu  | Asn  | Asn  | Ile  | His  | Tyr  | Ile  | His  | Asn  | Gly  | Asp  | Asp  | Asn  | Gly  | Ala  |  |  |
|      |      |      |      | 1205 |      |      |      |      | 1210 |      |      |      |      | 1215 |      |  |  |
| Tyr  | His  | Ile  | Ala  | Leu  | Lys  | Ser  | Val  | Glu  | Asn  | Leu  | Ile  | Gln  | Met  | Lys  |      |  |  |
|      |      |      | 1220 |      |      |      |      | 1225 |      |      |      |      | 1230 |      |      |  |  |

<210> 4

<211> 3696

<212> DNA

<213> Artificial Sequence

<220>

<223> NT Sequence of BEC67 (Codon optimized for *S. Cerevisiae*)

<400> 4

|                                                                    |      |
|--------------------------------------------------------------------|------|
| atgaagtcct tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg  | 60   |
| aaagaggata agaaaaagtg caagtccac ttggaattgc aagaattcgt tgacatttcc   | 120  |
| tacaagacct tgaagtcac tgctaccatt gctgaatcct tgaacgaaat cgaattggtc   | 180  |
| aaaaagtgcg aaagggtgta ctccgaaatt atcaagttcc atgaagcttg ggggtcaaac  | 240  |
| tactgtagaa ctaaccaaatt tgccgtctac aaggactggg atagacaatt ggctagaaag | 300  |
| gccagattcg atgttgggtga tcaaaactct caactgatca cttgtcatc cttatcttct  | 360  |
| aagcacaacg tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac  | 420  |
| aacattgccg gacaaaagtc tttcctgaag gatttctctc aacaattgaa gcagtacaag  | 480  |
| agagctttgg aaaattctga taaggctcat accaagccaa acctgattaa cttcaacaag  | 540  |
| accttctcca ttttggccaa cttgggttaac gaaattgtca tccattgtc caacggtgct  | 600  |
| atttcttttc caaacatctc caagttggaa gatgggtgaag aatccagaca tttgattgaa | 660  |
| ttcgctctga acgattactc cgatttgggtt gggtctattg gtgaattgaa ggatgctatt | 720  |
| gctaccaatg gtggttatac tccatttgc t aaggttacct tgaaccatta cactgctgaa | 780  |
| caaaagccac acgttttcaa gaacgatatt gatgccaaaga tccgtgagtt gaagttgatt | 840  |
| gagttgggtcg aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag | 900  |
| ttcgacaagt tcaagatcta cgatgataga aacatctccg ttatcattag aaccaatgc   | 960  |
| tttaagtaca agccattcc atttttgggtc aagcacgaat tggctaagta tatcgctgaa  | 1020 |
| gatgaagatg ccgttttgaa ggttttggat gcaattgggtg ctactagatc tccagctcat | 1080 |
| gattacgctc ataatgaaga tgtttttgac ttgaatcact acccaatcaa ggttgctttt  | 1140 |
| gattacgcat gggaacaatt ggctaactcc ttgtacacta ctgttacttt cccaaaagaa  | 1200 |
| cagtgcgaga agtacttgaa ggatgttttt gattgcgaag tctccaaaga accagttttt  | 1260 |
| aagttctacg ccgacctgtt gtacatcaga aagaatttgg ctgttttgga gcacaagaac  | 1320 |
| aacctgccat ctaatcaaga ggaattcatc tgcaagatta acaacacctt cgagaacatc  | 1380 |
| gttctgccat acaagatttc tcaattcgaa acctacaaga aggatattctt ggcctggatt | 1440 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| aacgatggta gaggtcacga aaagtacacc gattctaaaa gagaattggg ttttattaga  | 1500 |
| ggtaggtctga aaggtagaat caaggctcaa aagatgttca gaaaagacaa gtacggtaag | 1560 |
| atcaagtcct actacgaaaa ccatacact aagttgaccg aagagttcaa gaacttggcc   | 1620 |
| atcacctacg gtaaaacctt cgctgaattg agagacaagt tcaaagaaaa gaacaacatc  | 1680 |
| accaagatca ccattttcgg tattatcatc gaagataaga acagggacag atacttgttg  | 1740 |
| gccaacgggt tgcaacacga acaaatcaac catgtctcca ccatcttgaa caagttggat  | 1800 |
| aagtcacccg aattcatcac ctaccaagtt aagtctttga cctctaagac cctgatcaag  | 1860 |
| ctgattaaga atcataccac caagaagggt gcaatttctc catatgctga tttccatact  | 1920 |
| tctaagaccg gctttaacaa aaacgagatc gaaaagaact gggacaacta caagagagaa  | 1980 |
| caagtcttgg ttgaatacgt taaggattgc ttgaccgatt ctaccatggc taagaatcaa  | 2040 |
| aattgggctg aatttgggtg ggatttggag tcttghtaact cctacgaaga tatcgaacac | 2100 |
| gaaatcgatc agaagtctta catcttgcaa aagcatacca tttccaagca atctattgct  | 2160 |
| tctttgggtg aaggtgggtg tttgttgttg ccaattatca accaggacat cacctctaaa  | 2220 |
| gaacgtaagg acaagaatca gttctccaag gattggaagc aaatcttcga aggttccaaa  | 2280 |
| gaattcagat tgcattcaga attcgccgtt tcttacagaa ctccaattga aggttaccba  | 2340 |
| gtccaaaaaa gatacggtag attgcaattc gtttgcgctt ttaactgcga aatcatccca  | 2400 |
| caaatgggtg agttcatcaa cttgaagaag cagatcgaga acttcaacga cgaagatgct  | 2460 |
| caaaaagaag ccgtcgaaga gttcaacaaa aaggttaacc atgccttgtc cgacaaagaa  | 2520 |
| tacgttggtt ttggtatcga cagaggcttg aagcaattag ctactttgtg tgttttggac  | 2580 |
| aagaggggta agattttggg tgactttgaa atctacaaaa aagagttcgt cagagccgaa  | 2640 |
| aagagatctg aatctcattg ggaacatact caagctgaaa ccagacatat cttggacttg  | 2700 |
| tctaacttga gagttgaaac taccattgag ggcaaaaagg tgttgggttga tcaatctttg | 2760 |
| acactgggtc agaagaacag agatactcca gatgaagaag ctaccgaaga aaacaagcag  | 2820 |
| aagattaagt tgaagcagct gtcctacatt agaaagttgc aacacaagat gcagaccaat  | 2880 |
| gaacaagatg tcttggacct gatcaacaac gaaccatctg atgaagaatt caaaaagagg  | 2940 |
| atcgagggct tgatttcttc attcggtgaa ggtcaaaagt acgctgattt gcctattaac  | 3000 |
| accatgaggg aaatgatctc tgacttgcaa ggtgttattg ccagaggaaa caatcagact  | 3060 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| gagaaaaaca agatcatcga attggatgct gccgacaatt tgaaacaagg tatkgttgct   | 3120 |
| aacatgatcg gtatcgtaa ctacattttc gccaaagtact cctacaaggc ctacattttct  | 3180 |
| ttagaagatt tgtccagagc ttacgggtgt gcaaaatctg gttatgatgg tagatatttg   | 3240 |
| ccatccacct ctcaagatga ggatgttgac tttaaagaac agcagaatca aatgttggct   | 3300 |
| ggcttgggta cttaccaatt ttttgaaatg cagctgctga aaaagctgca gaagatccaa   | 3360 |
| tctgataaca ccgttttgag atttgttcca gcttttagat ccgccgataa ctacagaaat   | 3420 |
| atcttgagat tggaagagac taagtacaag tctaagccat tcggtgttgt tcatttcac    | 3480 |
| gatccaaagt tcacatctaa gaagtgtcca gtttgctcta agactaacgt ttacagagat   | 3540 |
| aaggatgaca tcctgggtctg taaagaatgt ggtttttaggt ccgactcaca gttgaaagaa | 3600 |
| agggaaaaca acatccacta catccacaat ggtgatgata atggtgctta ccatattgcc   | 3660 |
| ttgaagtccg tcgaaaactt gattcagatg aagtaa                             | 3696 |

<210> 5  
 <211> 7  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> RuvC I AA Sequence of BEC85, BEC67 and BEC10

<400> 5  
 Ile Gly Ile Asp Arg Gly Leu  
 1 5

<210> 6  
 <211> 7  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> RuvC II AA Sequence of BEC85, BEC67 and BEC10

<400> 6  
 Ile Ser Leu Glu Asp Leu Ser  
 1 5

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

<220>  
<223> RuvC II AA Sequence of BEC85, BEC67 and BEC10

<400> 7  
His Asn Gly Asp Asp Asn Gly  
1 5

<210> 8  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Stem-Loop Consensus Sequence

<220>  
<221> variation  
<222> 1  
<223> /replace="a,c,g,t"

<220>  
<221> variation  
<222> 11  
<223> /replace="a,c,g,t"

<400> 8  
natttctact nttgtagat 19

<210> 9  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> BEC85 Stem-Loop Sequence

<400> 9  
aatttctact gttgtagat 19

<210> 10  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> BEC67 and BEC10 Stem-Loop Sequence

<400> 10  
gatttctact attgtagat 19

<210> 11  
<211> 27  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Nuclear Localization Tag

<400> 11  
atggctccca aaaagaaaag gaaggtg 27

<210> 12  
<211> 582  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Tpi1 Promotor Sequence

<400> 12  
gtttaaagat tacggatatt taacttactt agaataatgc cttttttttg agttataata 60  
atcctacgtt agtgtgagcg ggatttaaac tgtgaggacc ttaatacatt cagacacttc 120  
tgcggtatca ccctacttat tcccttcgag attatatcta ggaacccatc aggttggtgg 180  
aagattaccc gttctaagac ttttcagctt cctctattga tgttacacct ggacaccctt 240  
tttctggcat ccagttttta atcttcagtg gcatgtgaga ttctccgaaa ttaattaaag 300  
caatcacaca atgctctcgg ataccacctc ggttgaaact gacaggtggt ttgttacgca 360  
tgctaatagca aaggagccta tatacctttg gctcggctgc tgtaacaggg aatataaagg 420  
gcagcataat ttaggagttt agtgaacttg caacatttac ttttttcctt tcttacgtaa 480  
atatttttct ttttaattct aaatcaatct ttttcaattt tttgtttgta ttcttttctt 540  
gcttaaactct ataactacaa aaaacacata cataaactaa aa 582

<210> 13  
<211> 191  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Cps1 Terminator

<400> 13

gcgcaatgat tgaatagtca aagatttttt ttttttaatt tttttttttt aatttttttt 60

ttttttcata gaacttttta tttaaataaa tcacgtctat atatgtatca gtataacgta 120

aaaaaaaaaa caccgtcagt taaacaaaac ataaataaaa aaaaaaagaa gtgtcaaadc 180

aagtgtcaaa t 191

<210> 14

<211> 67

<212> DNA

<213> Artificial Sequence

<220>

<223> Em7 Promotor

<400> 14

gtgttgacaa ttaatcatcg gcatagtata tcggcatagt ataatacgac aaggtgagga 60

actaaac 67

<210> 15

<211> 514

<212> DNA

<213> Artificial Sequence

<220>

<223> CEN6 Centromere

<400> 15

ggtccttttc atcacgtgct ataaaaataa ttataattta aattttttta tataaatata 60

taaattaaaa atagaaagta aaaaaagaaa tttaaagaaa aatagttttt gttttccgaa 120

gatgtaaaag actctagggg gatcgccaac aaatactacc ttttatcttg ctcttcctgc 180

tctcaggtat taatgccgaa ttgtttcatc ttgtctgtgt agaagaccac acacgaaaat 240

cctgtgattt tacattttac ttatcggtta tcgaatgtat atctatttaa tctgcttttc 300

ttgtctaata aatatatatg taaagtacgc tttttgttga aattttttta acctttgttt 360

attttttttt cttcattccg taactcttct accttcttta tttactttct aaaatccaaa 420

tacaaaacat aaaaataaat aaacacagag taaattccca aattattcca tcattaaaag 480

atacagggcg cgtgtaagtt acaggcaagc gatc

514

<210> 16

<211> 810

<212> DNA

<213> Artificial Sequence

<220>

<223> kanMX Marker Gene

<400> 16

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| atgggtaagg aaaagactca cgtttcgagg ccgcgattaa attccaacat ggatgctgat  | 60  |
| ttatatgggt ataaatgggc tcgcgataat gtcgggcaat caggtgcgac aatctatcga  | 120 |
| ttgtatggga agcccgatgc gccagagttg tttctgaaac atggcaaagg tagcgttgcc  | 180 |
| aatgatgtta cagatgagat ggtcagacta aactggctga cggaatttat gcctcttccg  | 240 |
| accatcaagc attttatccg tactcctgat gatgcatggg tactcaccac tgcgatcccc  | 300 |
| ggcaaaacag cattccaggt attagaagaa taccctgatt caggtgaaaa tattgttgat  | 360 |
| gcgctggcag tgctcctgcg ccggttgcat tcgattcctg tttgtaattg tccttttaac  | 420 |
| agcgatcgcg tatttcgcct cgctcaggcg caatcacgaa tgaataacgg tttggttgat  | 480 |
| gcgagtgatt ttgatgacga gcgtaatggc tggcctgttg aaacaagtctg gaaagaaatg | 540 |
| cataagcttt tgccattctc accggattca gtcgtcactc atgggtgattt ctcaattgat | 600 |
| aaccttattt ttgacgaggg gaaattaata ggttgatttg atgttgacg agtcggaatc   | 660 |
| gcagaccgat accaggatct tgccatccta tggaactgcc tcggtgagtt ttctccttca  | 720 |
| ttacagaaac ggctttttca aaaatatggg attgataatc ctgatatgaa taaattgcag  | 780 |
| tttcatttga tgctcgatga gtttttctaa                                   | 810 |

<210> 17

<211> 412

<212> DNA

<213> Artificial Sequence

<220>

<223> Tef1 Promotor Sequence

<400> 17

|                                                                   |    |
|-------------------------------------------------------------------|----|
| gcccttagat tagattgcta tgctttcttt ctaatgagca agaagtaaaa aaagttgtaa | 60 |
|-------------------------------------------------------------------|----|

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| tagaacaaga aaaatgaaac tgaaacttga gaaattgaag accgtttatt aacttaaata   | 120 |
| tcaatgggag gtcatcgaaa gagaaaaaaaa tcaaaaaaaaa aaattttcaa gaaaaagaaa | 180 |
| cgtgataaaa attttttattg cttttttcga cgaagaaaaa gaaacgaggc ggtctctttt  | 240 |
| ttctttttcca aaccttttagt acgggtaatt aacgacaccc tagaggaaga aagaggggaa | 300 |
| atttagtatg ctgtgcttgg gtgttttgaa gtggtacggc gatgcgcgga gtccgagaaa   | 360 |
| atctggaaga gtaaaaaagg agtagaaaca ttttgaagct atggtgtgtg gg           | 412 |

<210> 18  
 <211> 281  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> SNR52 RNA Polymerase III Promotor

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| <400> 18                                                           |     |
| ctgcatctgc ggatcctctt tgaaaagata atgtatgatt atgctttcac tcatatttat  | 60  |
| acagaaactt gatgttttct ttcgagtata tacaaggatga ttacatgtac gtttgaagta | 120 |
| caactctaga ttttgtagtg ccctcttggg ctagcggtaa aggtgcgcat tttttcacac  | 180 |
| cctacaatgt tctgttcaaa agattttggt caaacgctgt agaagtgaag gttggtgcgc  | 240 |
| atgtttcggc gttcgaaact tctccgcagt gaaagataaa t                      | 281 |

<210> 19  
 <211> 20  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> SUP4 Terminator Sequence

|                       |    |
|-----------------------|----|
| <400> 19              |    |
| tttttttgtt ttttatgtct | 20 |

<210> 20  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> BEC85, BEC67, BEC10, SuCms1 and SeqID63 Ade2 Spacer Sequence

<400> 20

gtgtaggaac atcaacatgc tcaa

24

<210> 21

<211> 8269

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/BEC85 vector system

<400> 21

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agcttgcaaa ttaaagcctt cgagcgtccc aaaaccttct caagcaaggt tttcagtata  | 60   |
| atgttacatg cgtacacgcg tctgtacaga aaaaaaagaa aaatttgaaa tataaataac  | 120  |
| gttcttaata ctaacataac tataaaaaaa taaataggga cctagacttc aggttgtcta  | 180  |
| actccttcct tttcggtttag agcggatgtg gggggagggc gtgaatgtaa gcgtgacata | 240  |
| actaattaca tgatatcgac aaaggaaaag ggggacggat ctccgaggcc tcggacccgt  | 300  |
| cgggccgcgt cggacgtgtc agtcctgctc ctgcgaattg ttagaaaaac tcatcgagca  | 360  |
| tcaaatgaaa ctgcaattta ttcatatcag gattatcaat accatatttt tgaaaaagcc  | 420  |
| gtttctgtaa tgaaggagaa aactcaccga ggcagttcca taggatggca agatcctggt  | 480  |
| atcggctctgc gattccgact cgtccaacat caatacaacc tattaatttc ccctcgtcaa | 540  |
| aaataagggt atcaagttag aaatcaccat gagtgacgac tgaatccggt gagaatggca  | 600  |
| aaagcttatg catttctttc cagacttggt caacaggcca gccattacgc tcgtcatcaa  | 660  |
| aatcactcgc atcaacaaa ccgttattca ttcgtgattg cgcctgagcg aggcgaaata   | 720  |
| cgcgatcgct gttaaaaagga caattacaaa caggaatcga atgcaaccgg cgcaggaaca | 780  |
| ctgccagcgc atcaacaata ttttcacctg aatcaggata ttcttctaata acctggaatg | 840  |
| ctgttttgcc ggggatcgca gtggtgagta accatgcac atcaggagta cggataaaat   | 900  |
| gcttgatggt cggaagaggc ataaattccg tcagccagtt tagtctgacc atctcatctg  | 960  |
| taacatcatt ggcaacgcta cctttgcat gtttcagaaa caactctggc gcatcgggct   | 1020 |
| tcccatataa tcgatagatt gtcgcacctg attgcccga attatcgca gccatttat     | 1080 |
| acccatataa atcagcatcc atgttggaat ttaatcgcg cctcgaaacg tgagtctttt   | 1140 |

|            |            |             |             |            |            |      |
|------------|------------|-------------|-------------|------------|------------|------|
| ccttaccat  | ggtttagttc | ctcaccttgt  | cgtattatac  | tatgccgata | tactatgccg | 1200 |
| atgattaatt | gtcaacaccg | cccttagatt  | agattgctat  | gctttctttc | taatgagcaa | 1260 |
| gaagtaaaaa | aagttgtaat | agaacaagaa  | aatgaaact   | gaaacttgag | aaattgaaga | 1320 |
| ccgtttatta | acttaaatat | caatgggagg  | tcatcgaaag  | agaaaaaat  | caaaaaaaaa | 1380 |
| aatTTTcaag | aaaaagaaac | gtgataaaaa  | TTTTtattgc  | ctttttcgac | gaagaaaaag | 1440 |
| aaacgaggcg | gtctctTTTT | tcttttccaa  | accttttagta | cgggtaatta | acgacaccct | 1500 |
| agaggaagaa | agaggggaaa | tttagtatgc  | tgtgcttggg  | tgTTTTgaag | tggtacggcg | 1560 |
| atgcgcggag | tccgagaaaa | tctggaagag  | taaaaaagga  | gtagaaacat | tttgaagcta | 1620 |
| tggtgtgtgg | gggatccgca | caaacgaagg  | tctcactgat  | cgcttgcctg | taacttacac | 1680 |
| gcgccctgta | tctTTtaatg | atggaataat  | ttgggaattt  | actctgtgtt | tatttatttt | 1740 |
| tatgTTTTgt | atttggattt | tagaaagtaa  | ataaagaagg  | tagaagagtt | acggaatgaa | 1800 |
| gaaaaaaaa  | taaacaaagg | tttaaaaaat  | ttcaacaaaa  | agcgtacttt | acatatatat | 1860 |
| ttattagaca | agaaaagcag | attaaataga  | tatacattcg  | attaacgata | agtaaaatgt | 1920 |
| aaaatcacag | gattttcgtg | tgtggtcttc  | tacacagaca  | agatgaaaca | attcggcatt | 1980 |
| aatacctgag | agcaggaaga | gcaagataaa  | aggtagtatt  | tgTTggcgat | ccccctagag | 2040 |
| tcttttacat | cttcggaaaa | caaaaactat  | TTTTcttta   | atttcttttt | ttactttcta | 2100 |
| TTTTtaattt | atatatttat | attaaaaaat  | ttaaattata  | attattttta | tagcacgtga | 2160 |
| tgaaaaggac | ccatcgataa | gctggtaccg  | agctcggatc  | ccggtctgca | tctgcggatc | 2220 |
| ctctttgaaa | agataatgta | tgattatgct  | ttcactcata  | tttatacaga | aacttgatgt | 2280 |
| tttctttcga | gtatatacaa | ggtgattaca  | tgtacgtttg  | aagtacaact | ctagattttg | 2340 |
| tagtgccctc | ttgggctagc | ggtaaagggtg | cgcatttttt  | cacaccctac | aatgttctgt | 2400 |
| tcaaaagatt | ttggtcaaac | gctgtagaag  | tgaaagttgg  | tgcgcatggt | tcggcgttcg | 2460 |
| aaacttctcc | gcagtgaaag | ataaatgatc  | gaatttctac  | tgTTgtagat | gtgtaggaac | 2520 |
| atcaacatgc | tcaatttttt | tgTTTTttat  | gtctcctgca  | ggtttaaaga | ttacggatat | 2580 |
| ttaacttact | tagaataatg | ccattttttt  | gagttataat  | aatcctacgt | tagtgtgagc | 2640 |
| gggatttaaa | ctgtgaggac | cttaatacat  | tcagacactt  | ctgcggtatc | accctactta | 2700 |
| ttcccttcga | gattatatct | aggaacccat  | caggTTggtg  | gaagattacc | cgttctaaga | 2760 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| cttttcagct tcctctattg atgttacacc tggacacccc ttttctggca tccagttttt  | 2820 |
| aatcttcagt ggcatgtgag attctccgaa attaattaaa gcaatcacac aatgctctcg  | 2880 |
| gataccacct cggttgaaac tgacaggtgg tttgttacgc atgctaatagc aaaggagcct | 2940 |
| atataccttt ggctcggctg ctgtaacagg gaatataaag ggcagcataa tttaggagtt  | 3000 |
| tagtgaactt gcaacattta ctattttccc ttcttacgta aatatttttc tttttaattc  | 3060 |
| taaatcaatc tttttcaatt tttgtttgt attcttttct tgcttaaatac tataactaca  | 3120 |
| aaaaacacat acataaacta aaaatggctc caaaaaagaa aaggaagggtg atgaagtcct | 3180 |
| tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg aaagaggata  | 3240 |
| agaaaaagtg caagtccac ttggaattgc aagaattcgt tgacatttcc tacaagacct   | 3300 |
| tgaagtcac tgctaccatt gctgaatcct tgaacgaaat cgaattgggtc aaaaagtgcg  | 3360 |
| aaagggtgcta ctccgaaatt atcaagttcc atgaagcttg gggtaaatac tactgtagaa | 3420 |
| ctaaccaaat tgccgtctac aaggactggg atagacaatt ggctagaaag gccagattcg  | 3480 |
| atgttggtga tcaaaactct caactgatca ccttgctatc cttatcttct aagcacaacg  | 3540 |
| tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac aacattgcc   | 3600 |
| gacaaaagtc tttcctgaag gatttctctc aacaattgaa gcagtacaag agagctttgg  | 3660 |
| aaaattctga taagggtcat accaagccaa acctgattaa cttcaacaag accttctcca  | 3720 |
| ttttggccaa cttggttaac gaaattgtca tcccattgtc caacgggtgct atttcttttc | 3780 |
| caaacatctc caagttggaa gatggtgaag aatccagaca tttgattgaa ttcgctctga  | 3840 |
| acgattactc cgatttgggtt ggttctattg gtgaattgaa ggatgctatt gctaccaatg | 3900 |
| gtggttatac tccatttgct aaggttacct tgaaccatta cactgctgaa caaaagccac  | 3960 |
| acgttttcaa gaacgatatt gatgccaaga tccgtgagtt gaagttgatt gagttgggtc  | 4020 |
| aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag ttcgacaagt  | 4080 |
| tcaagatcta cgatgataga aacatctccg ttatcattag aaccaatgc ttttaagtaca  | 4140 |
| agcccattcc atttttgggtc aagcacgaat tggctaagta tatcgctgaa gatgaagatg | 4200 |
| ccgttttgaa ggttttggat gcaattgggtg ctactagatc tccagctcat gattacgctc | 4260 |
| ataatgaaga tgtttttgac ttgaatcact acccaatcaa ggttgctttt gattacgcat  | 4320 |
| gggaacaatt ggctaactcc ttgtacacta ctgttacttt cccaaaagaa cagtgcgaga  | 4380 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agtacttgaa ggatgttttt gattgcgaag tctccaaaga accagttttt aagttctacg  | 4440 |
| ccgacctgtt gtacatcaga aagaatttgg ctgttttgga gcacaagaac aacctgccat  | 4500 |
| ctaatcaaga ggaattcatc tgcaagatta acaacacctt cgagaacatc gttctgccat  | 4560 |
| acaagatttc tcaattcgaa acctacaaga aggatatctt ggcctggatt aacgatggta  | 4620 |
| gaggtcacga aaagtacacc gatgctaaac aacagttggg ttttattaga ggtgggtctga | 4680 |
| aaggtagaat caaggctcaa aagatgttca gaaaagacaa gtacggtaag atcaagtcct  | 4740 |
| actacgaaaa cccatacact aagttgacca acgaattcaa gcaaattctt tctacctacg  | 4800 |
| gtaaaacctt cgctgaattg agagacaagt tcaaagaaaa gaacaacatc accaagatca  | 4860 |
| cccatttcgg tattatcatc gaagataaga acagggacag atacttggtg gccaacggtt  | 4920 |
| tgcaacacga acaaatcaac catgtctcca ccatcttgaa caagttggat aagtcatccg  | 4980 |
| aattcatcac ctaccaagtt aagtctttga cctctaagac cctgatcaag ctgattaaga  | 5040 |
| atcataccac caagaagggt gcaatttctc catatgctga tttccatact tctaagaccg  | 5100 |
| gctttaacaa aaacgagatc gaaaagaact gggacaacta caagagagaa caagtcttgg  | 5160 |
| ttgaatacgt taaggattgc ttgaccgatt ctaccatggc taagaatcaa aattgggctg  | 5220 |
| aatttggttg gaacttcgag aagtgttaact cctacgaaga tatcgaacac gaaatcgatc | 5280 |
| agaagtctta catcttgcaa aagcatacca tttccaagca atctattgct tctttggttg  | 5340 |
| aagggtggtg tttgttggtg ccaattatca accaggacat cacctctaaa gaacgtaagg  | 5400 |
| acaagaatca gttctccaag gattggaagc aaatcttcga aggttccaaa gaattcagat  | 5460 |
| tgcatccaga attcgccgtt tcttacagaa ctccaattga aggttaccca gtccaaaaaa  | 5520 |
| gatacggtag attgcaattc gtttgcgctt ttaactgcga aatcatccca caaatgggtg  | 5580 |
| agttcatcaa cttgaagaag cagatcgaga acttcaacga cgaagatgct caaaaagaag  | 5640 |
| ccgtcgaaga gttcaacaaa aaggttaacc atgccttgct cgacaaagaa tacgttggtta | 5700 |
| ttggtatcga cagaggcttg aagcaattag ctactttgtg tgttttggac aagaggggta  | 5760 |
| agattttggg tgactttgaa atctacaaaa aagagttcgt cagagccgaa aagagatctg  | 5820 |
| aatctcattg ggaacatact caagctgaaa ccagacatat cttggacttg tctaacttga  | 5880 |
| gagttgaaac taccattgag ggcaaaaagg tgttggttga tcaatctttg aactgggtca  | 5940 |
| agaagaacag agatactcca gatgaagaag ctaccgaaga aaacaagcag aagattaagt  | 6000 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| tgaagcagct gtcctacatt agaaagttgc aacacaagat gcagaccaat gaacaagatg  | 6060 |
| tcttggacct gatcaacaac gaaccatctg atgaagaatt caaaaagagg atcgagggct  | 6120 |
| tgatttcttc attcggtgaa ggtcaaaagt acgctgattt gcctattaac accatgaggg  | 6180 |
| aatgatctc tgacttgcaa ggtgttattg ccagaggaaa caatcagact gagaaaaaca   | 6240 |
| agatcatcga attggatgct gccgacaatt tgaaacaagg tatcgttgct aacatgatcg  | 6300 |
| gtatcgtaa ctacattttc gccaaagtact cctacaaggc ctacatttct ttagaagatt  | 6360 |
| tgtccagagc ttacggtggt gcaaaatctg gttatgatgg tagatatattg ccatccacct | 6420 |
| ctcaagatga ggatgttgac tttaaagaac agcagaatca aatgttggct ggcttgggta  | 6480 |
| cttaccaatt ttttgaaatg cagctgctga aaaagctgca gaagatccaa tctgataaca  | 6540 |
| ccgttttgag atttgttcca gcttttagat ccgccgataa ctacagaaat atcttgagat  | 6600 |
| tggaagagac taagtacaag tctaagccat tcggtgttgt tcatttcac gatccaaagt   | 6660 |
| tcacatctaa gaagtgtcca gtttgctcta agactaacgt ttacagagat aaggatgaca  | 6720 |
| tcctggctcg taaagaatgt ggttttaggt ccgactcaca gttgaaagaa agggaaaaca  | 6780 |
| acatccacta catccacaat ggtgatgata atggtgctta ccatattgcc ttgaagtccg  | 6840 |
| tcgaaaactt gattcagatg aagtaagcgg ccgcaatgcc ggcgcaatga ttgaatagtc  | 6900 |
| aaagatTTTT tttttttaat tttttttttt taattttttt tttttttcat agaactTTTT  | 6960 |
| atttaaataa atcacgtcta tatatgtatc agtataacgt aaaaaaaaaa acaccgtcag  | 7020 |
| ttaaacaaaa cataaataaa aaaaaaaga agtgtcaa caagtgtcaa atggccctgc     | 7080 |
| attaatgaat cggccaacgc gcggggagag gcggtttgcg tattgggcgc tcttccgctt  | 7140 |
| cctcgctcac tgactcgctg cgctcggtcg ttcggctgcg gcgagcggta tcagctcact  | 7200 |
| caaaggcggc aatacggtta tccacagaat caggggataa cgcaggaaag aacatgtgag  | 7260 |
| caaaaggcca gcaaaaggcc aggaaccgta aaaaggccgc gttgctggcg tttttccata  | 7320 |
| ggctccgccc ccctgacgag catcacaaaa atcgacgctc aagtcagagg tggcgaaacc  | 7380 |
| cgacaggact ataaagatac caggcgtttc cccctggaag ctccctcgtg cgctctcctg  | 7440 |
| ttccgaccct gccgcttacc ggatacctgt ccgcctttct cccttcggga agcgtggcgc  | 7500 |
| tttctcatag ctacgctgt aggtatctca gttcggtgta ggtcgttcgc tccaagctgg   | 7560 |
| gctgtgtgca cgaaccccc gttcagcccg accgctgcgc cttatccggt aactatcgtc   | 7620 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ttgagtccaa cccggtgaaga cacgacttat cgccactggc agcagccact ggtaacagga | 7680 |
| ttagcagagc gaggtatgta ggcggtgcta cagagttctt gaagtgggtg cctaactacg  | 7740 |
| gctacactag aagaacagta tttggtatct gcgctctgct gaagccagtt accttcggaa  | 7800 |
| aaagagttgg tagctcttga tccggcaaac aaaccaccgc tggtagcggg ggtttttttg  | 7860 |
| tttgcaagca gcagattacg cgcagaaaaa aaggatctca agaagatcct ttgatctttt  | 7920 |
| ctacggggtc tgacgctcag tggaacgaaa actcacgtta agggattttg gtcattgagat | 7980 |
| tatcaaaaag gatcttcacc tagatccttt taaattaaaa atgaagtttt aaatcaatct  | 8040 |
| aaagtatata tgagtaaact tggctctgaca gttaccaatg cttaatcagt gaggcaccta | 8100 |
| tctcagcgat ctgtctatct cgttcattca tagttgcctg actccccgtc gtgtagataa  | 8160 |
| ctacgatacg ggagggctta ccatctggcc ccagtgcctg aatgataccg cgagaccac   | 8220 |
| gctcaccggc tccagattta tcagcaataa accagccagc cggaagggc              | 8269 |

<210> 22

<211> 8269

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/BEC67 vector system

<400> 22

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| agcttgcaaa ttaaagcctt cgagcgtccc aaaaccttct caagcaaggt tttcagtata  | 60  |
| atgttacatg cgtacacgcg tctgtacaga aaaaaagaa aaatttgaaa tataaataac   | 120 |
| gttcttaata ctaacataac tataaaaaaa taaataggga cctagacttc aggttgctta  | 180 |
| actccttcct tttcggtag agcggatgtg gggggagggc gtgaatgtaa gcgtgacata   | 240 |
| actaattaca tgatatcgac aaaggaaaag ggggacggat ctccgaggcc tcggaccgt   | 300 |
| cgggccgcgt cggacgtgtc agtcctgctc ctgcgaattg ttagaaaaac tcattcgagca | 360 |
| tcaaatgaaa ctgcaattta ttcattatcag gattatcaat accatatttt tgaaaaagcc | 420 |
| gtttctgtaa tgaaggagaa aactcaccga ggcagttcca taggatggca agatcctggt  | 480 |
| atcgggtctgc gattccgact cgtccaacat caatacaacc tattaatttc ccctcgtcaa | 540 |
| aaataagggt atcaagtgag aaatcaccat gagtgacgac tgaatccggt gagaatggca  | 600 |
| aaagcttatg catttctttc cagacttggt caacaggcca gccattacgc tcgtcatcaa  | 660 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| aatcactcgc atcaacccaaa ccgttattca ttcgtgattg cgcctgagcg aggcgaaata | 720  |
| cgcgatcgct gttaaaagga caattacaaa caggaatcga atgcaaccgg cgcaggaaca  | 780  |
| ctgccagcgc atcaacaata ttttcacctg aatcaggata ttcttctaata acctggaatg | 840  |
| ctgttttgcc ggggatcgca gtggtgagta accatgcatc atcaggagta cggataaaat  | 900  |
| gcttgatggt cggaagaggc ataaattccg tcagccagtt tagtctgacc atctcatctg  | 960  |
| taacatcatt ggcaacgcta ctttgccat gtttcagaaa caactctggc gcatcgggct   | 1020 |
| tcccatacaa tcgatagatt gtcgcacctg attgcccgc attatcgca gccatttat     | 1080 |
| acccatataa atcagcatcc atgttggaat ttaatcgcg cctcgaaacg tgagtctttt   | 1140 |
| ccttaccat ggtttagttc ctcaccttgt cgtattatac tatgccgata tactatgccg   | 1200 |
| atgattaatt gtcaacaccg cccttagatt agattgctat gctttctttc taatgagcaa  | 1260 |
| gaagtaaaaa aagttgtaat agaacaagaa aaatgaaact gaaacttgag aaattgaaga  | 1320 |
| ccgtttatta acttaaatat caatgggagg tcatcgaaag agaaaaaat caaaaaaaaa   | 1380 |
| aattttcaag aaaaagaaac gtgataaaaa tttttattgc ctttttcgac gaagaaaaag  | 1440 |
| aaacgaggcg gtctcttttt tcttttccaa acctttagta cgggtaatta acgacaccct  | 1500 |
| agaggaagaa agaggggaaa tttagtatgc tgtgcttggg tgttttgaag tggtagcgcg  | 1560 |
| atgcgcggag tccgagaaaa tctggaagag taaaaaagga gtagaaacat tttgaagcta  | 1620 |
| tgggtgtgtg gggatccgca caaacgaagg tctcactgat cgcttgccctg taacttacac | 1680 |
| gcgcctcgta tcttttaatg atggaataat ttgggaattt actctgtgtt tattttattt  | 1740 |
| tatgttttgt atttggattt tagaaagtaa ataaagaagg tagaagagtt acggaatgaa  | 1800 |
| gaaaaaaaaa taaacaaagg tttaaaaaat ttcaacaaaa agcgtacttt acatatatat  | 1860 |
| ttattagaca agaaaagcag attaaataga tatacattcg attaacgata agtaaaatgt  | 1920 |
| aaaatcacag gattttcgtg tgtggtcttc tacacagaca agatgaaaca attcggcatt  | 1980 |
| aatacctgag agcaggaaga gcaagataaa aggtagtatt tgttggcgat cccctagag   | 2040 |
| tcttttacat cttcggaaaa caaaaactat tttttcttta atttcttttt ttactttcta  | 2100 |
| tttttaattt atatatttat attaaaaaat tttaaattata attattttta tagcacgtga | 2160 |
| tgaaaaggac ccatcgataa gctggtaccg agctcggatc ccggtctgca tctgcggatc  | 2220 |
| ctctttgaaa agataatgta tgattatgct ttcactcata ttatacaga aacttgatgt   | 2280 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| tttctttcga gtatatacaa ggtgattaca tgtacgtttg aagtacaact ctagattttg   | 2340 |
| tagtgccctc ttgggctagc ggtaaagggtg cgcatttttt cacaccctac aatgttctgt  | 2400 |
| tcaaaagatt ttgggtcaaac gctgtagaag tgaaagttgg tgcgcatggt tcggcgttcg  | 2460 |
| aaacttctcc gcagtgaag ataaatgatc gaatttctac tgtttagat gtgtaggaac     | 2520 |
| atcaacatgc tcaatttttt tgttttttat gtctcctgca ggtttaaaga ttacggatat   | 2580 |
| ttaacttact tagaataatg ccattttttt gagttataat aatcctacgt tagtgtgagc   | 2640 |
| gggatttaaa ctgtgaggac cttatacat tcagacactt ctgcggtatc accctactta    | 2700 |
| ttcccttcga gattatatct aggaacccat caggttggtg gaagattacc cgttctaaga   | 2760 |
| cttttcagct tcctctattg atgttacacc tggacacccc ttttctggca tccagttttt   | 2820 |
| aatcttcagt ggcatgtgag attctccgaa attaattaaa gcaatcacac aatgctctcg   | 2880 |
| gataccacct cggttgaaac tgacaggtgg tttgttacgc atgctaatac aaaggagcct   | 2940 |
| atataccttt ggctcggctg ctgtaacagg gaatataaag ggcagcataa tttaggagtt   | 3000 |
| tagtgaactt gcaacattta ctattttccc ttcttacgta aatatttttc tttttaattc   | 3060 |
| taaatcaatc tttttcaatt tttgtttgt attcttttct tgcttaaata tataactaca    | 3120 |
| aaaaacacat acataaacta aaaatggctc caaaaagaa aaggaagggtg atgaagtcct   | 3180 |
| tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg aaagaggata   | 3240 |
| agaaaaagtg caagtccac ttggaattgc aagaattcgt tgacatttcc tacaagacct    | 3300 |
| tgaagtcac tgctaccatt gctgaatcct tgaacgaaat cgaattgggtc aaaaagtgcg   | 3360 |
| aaagggtgcta ctccgaaatt atcaagttcc atgaagcttg ggggtcaaata tactgtagaa | 3420 |
| ctaaccacaa tgccgtctac aaggactggt atagacaatt ggctagaaag gccagattcg   | 3480 |
| atgttggtga tcaaaactct caactgatca ccttgatcct cttatcttct aagcacaacg   | 3540 |
| tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac aacattgcca   | 3600 |
| gacaaaagtc tttcctgaag gatttctctc aacaattgaa gcagtacaag agagctttgg   | 3660 |
| aaaattctga taaggctcat accaagccaa acctgattaa cttcaacaag accttctcca   | 3720 |
| ttttggccaa cttgggtaac gaaattgtca tccattgtc caacgggtgct atttcttttc   | 3780 |
| caaacatctc caagttggaa gatgggtgaag aatccagaca tttgattgaa ttcgctctga  | 3840 |
| acgattactc cgatttgggtt ggttctattg gtgaattgaa ggatgctatt gctaccaatg  | 3900 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gtggttatac tccatttgct aaggttacct tgaaccatta cactgctgaa caaaagccac  | 3960 |
| acgttttcaa gaacgatatt gatgccaaga tccgtgagtt gaagttgatt gagttggctg  | 4020 |
| aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag ttcgacaagt  | 4080 |
| tcaagatcta cgatgataga aacatctccg ttatcattag aaccaatgc ttttaagtaca  | 4140 |
| agcccatgcc atttttggtc aagcacgaat tggctaagta tatcgctgaa gatgaagatg  | 4200 |
| ccgttttgaa ggttttggat gcaattgggtg ctactagatc tccagctcat gattacgctc | 4260 |
| ataatgaaga tgtttttgac ttgaatcact acccaatcaa ggttgctttt gattacgcat  | 4320 |
| gggaacaatt ggctaactcc ttgtacacta ctgttacttt cccaaaagaa cagtgcgaga  | 4380 |
| agtacttgaa ggatgttttt gattgcgaag tctccaaaga accagttttt aagttctacg  | 4440 |
| ccgacctgtt gtacatcaga aagaatttgg ctgttttgga gcacaagaac aacctgccat  | 4500 |
| ctaatcaaga ggaattcatc tgcaagatta acaacacctt cgagaacatc gttctgccat  | 4560 |
| acaagatttc tcaattcgaa acctacaaga aggatatctt ggcctggatt aacgatggta  | 4620 |
| gaggtcacga aaagtacacc gattctaaaa gagaattggg ttttattaga ggtggctctga | 4680 |
| aaggtagaat caaggctcaa aagatgttca gaaaagacaa gtacggtaag atcaagtcct  | 4740 |
| actacgaaaa cccatacact aagttgaccg aagagttcaa gaacttgcc atcacctacg   | 4800 |
| gtaaaacctt cgctgaattg agagacaagt tcaaagaaaa gaacaacatc accaagatca  | 4860 |
| cccatttcgg tattatcatc gaagataaga acagggacag atacttgttg gccaacggtt  | 4920 |
| tgcaacacga acaaatcaac catgtctcca ccatcttgaa caagttggat aagtcatccg  | 4980 |
| aattcatcac ctaccaagtt aagtctttga cctctaagac cctgatcaag ctgattaaga  | 5040 |
| atcataccac caagaagggt gcaatttctc catatgctga tttccatact tctaagaccg  | 5100 |
| gctttaacaa aaacgagatc gaaaagaact gggacaacta caagagagaa caagtcttgg  | 5160 |
| ttgaatacgt taaggattgc ttgaccgatt ctaccatggc taagaatcaa aattgggctg  | 5220 |
| aatttggttg ggatttggag tcttgtaact cctacgaaga tatcgaacac gaaatcgatc  | 5280 |
| agaagtctta catcttgcaa aagcatacca tttccaagca atctattgct tctttggttg  | 5340 |
| aaggtggttg tttgttggtg ccaattatca accaggacat cacctctaaa gaacgtaagg  | 5400 |
| acaagaatca gttctccaag gattggaagc aaatcttcga aggttccaaa gaattcagat  | 5460 |
| tgcatccaga attcgccgtt tcttacagaa ctccaattga aggttaccca gtccaaaaaa  | 5520 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gatacggtag attgcaattc gtttgcgctt ttaactgcga aatcatccca caaaatggtg  | 5580 |
| agttcatcaa cttgaagaag cagatcgaga acttcaacga cgaagatgct caaaaagaag  | 5640 |
| ccgtcgaaga gttcaacaaa aaggttaacc atgccttgct cgacaaagaa tacgttggtta | 5700 |
| ttggtatcga cagaggcttg aagcaattag ctactttgtg tgttttggac aagaggggta  | 5760 |
| agattttggg tgactttgaa atctacaaaa aagagttcgt cagagccgaa aagagatctg  | 5820 |
| aatctcattg ggaacatact caagctgaaa ccagacatat cttggacttg tctaacttga  | 5880 |
| gagttgaaac taccattgag ggcaaaaagg tgttggttga tcaatctttg acactggtca  | 5940 |
| agaagaacag agatactcca gatgaagaag ctaccgaaga aaacaagcag aagattaagt  | 6000 |
| tgaagcagct gtcctacatt agaaagttgc aacacaagat gcagaccaat gaacaagatg  | 6060 |
| tcttggaacct gatcaacaac gaaccatctg atgaagaatt caaaaagagg atcgagggct | 6120 |
| tgatttcttc attcggtgaa ggtcaaaaagt acgctgattt gcctattaac accatgaggg | 6180 |
| aaatgatctc tgacttgcaa ggtgttattg ccagaggaaa caatcagact gagaaaaaca  | 6240 |
| agatcatcga attggatgct gccgacaatt tgaaacaagg tatcgttgct aacatgatcg  | 6300 |
| gtatcgtaa ctacattttc gccaaagtact cctacaaggc ctacatttct ttagaagatt  | 6360 |
| tgtccagagc ttacggtggt gcaaaatctg gttatgatgg tagatatttg ccatccacct  | 6420 |
| ctcaagatga ggatgttgac tttaaagaac agcagaatca aatgttggct ggcttgggta  | 6480 |
| cttaccaatt ttttgaaatg cagctgctga aaaagctgca gaagatccaa tctgataaca  | 6540 |
| ccgttttgag atttgttcca gcttttagat ccgccgataa ctacagaaat atcttgagat  | 6600 |
| tggaagagac taagtacaag tctaagccat tcggtgttgt tcatttcatc gatccaaagt  | 6660 |
| tcacatctaa gaagtgtcca gtttgctcta agactaacgt ttacagagat aaggatgaca  | 6720 |
| tcctggtctg taaagaatgt ggttttaggt ccgactcaca gttgaaagaa agggaaaaca  | 6780 |
| acatccacta catccacaat ggtgatgata atggtgctta ccatattgcc ttgaagtccg  | 6840 |
| tcgaaaaactt gattcagatg aagtaagcgg ccgcaatgcc ggcgcaatga ttgaatagtc | 6900 |
| aaagatTTTT tttttttaat tttttttttt taattttttt tttttttcat agaactTTTT  | 6960 |
| atttaaataa atcacgtcta tatatgtatc agtataacgt aaaaaaaaaa acaccgtcag  | 7020 |
| ttaaacaaaa cataaataaa aaaaaaaga agtgtcaa caagtgtcaa atggccctgc     | 7080 |
| attaatgaat cggccaacgc gcggggagag gcggtttgcg tattgggcgc tcttccgctt  | 7140 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| cctcgctcac tgactcgctg cgctcggtcg ttcggctgcg gcgagcggta tcagctcact  | 7200 |
| caaaggcggg aatacgggta tccacagaat caggggataa cgcaggaaag aacatgtgag  | 7260 |
| caaaaggcca gcaaaaggcc aggaaccgta aaaaggccgc gttgctggcg tttttccata  | 7320 |
| ggctccgccc ccctgacgag catcacaaaa atcgacgctc aagtcagagg tggcgaaacc  | 7380 |
| cgacaggact ataaagatac caggcgtttc cccctggaag ctccctcgtg cgctctcctg  | 7440 |
| ttccgaccct gccgcttacc ggatacctgt ccgcctttct cccttcggga agcgtggcgc  | 7500 |
| tttctcatag ctcacgctgt aggtatctca gttcgggtgta ggtcgttcgc tccaagctgg | 7560 |
| gctgtgtgca cgaaccccc gttcagcccg accgctgcgc cttatccggt aactatcgtc   | 7620 |
| ttgagtccaa cccggtaaga cacgacttat cgccactggc agcagccact ggtaacagga  | 7680 |
| ttagcagagc gaggtatgta ggcggtgcta cagagttctt gaagtggtag cctaactacg  | 7740 |
| gctacactag aagaacagta tttggtatct gcgctctgct gaagccagtt accttcggaa  | 7800 |
| aaagagttgg tagctcttga tccggcaaac aaaccaccgc tggtagcggg ggtttttttg  | 7860 |
| tttgcaagca gcagattacg cgcagaaaaa aaggatctca agaagatcct ttgatctttt  | 7920 |
| ctacggggtc tgacgctcag tggaacgaaa actcacgta agggattttg gtcattgagat  | 7980 |
| tatcaaaaag gatcttcacc tagatccttt taaattaaaa atgaagtttt aaatcaatct  | 8040 |
| aaagtatata tgagtaaact tggctctgaca gttaccaatg cttaatcagt gaggcaccta | 8100 |
| tctcagcgat ctgtctattt cgttcattca tagttgcctg actccccgtc gtgtagataa  | 8160 |
| ctacgatacg ggagggtcta ccatctggcc ccagtgcctg aatgataccg cgagaccac   | 8220 |
| gctcaccggc tccagattta tcagcaataa accagccagc cggaagggc              | 8269 |

<210> 23

<211> 838

<212> DNA

<213> Artificial Sequence

<220>

<223> Ade2 HDR-template for BEC85, BEC67, BEC10, SuCms1 and SeqID63

<400> 23

|                                                                   |    |
|-------------------------------------------------------------------|----|
| ttgttgcatg gctacgaacc gggtaatact aagtgattga ctcttgctga ctttttatta | 60 |
|-------------------------------------------------------------------|----|

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| agaactaaat ggacaatatt atggagcatt tcatgtataa attggtgcgt aaaatcgttg | 120 |
|-------------------------------------------------------------------|-----|

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| gatctctctt ctaagtacat cctactataa caatcaagaa aaacaagaaa atcggacaaa  | 180 |
| acaatcaagt atggattcta gaacagttgg tatattagga gggggacaat tgggacgtat  | 240 |
| gattgttgag gcagcaaaca ggctcaacat taagacggta atactagatg ctgaaaattc  | 300 |
| tcctgccaaa caaataagca actccaatga ccacgttaat ggctcctttt ccaatcctct  | 360 |
| tgatatcgaa aaactagctg aaaaatgtga tgtgctaacg attgagaatt cttcaagtaa  | 420 |
| aacatcccaa attaaaaatt tacccttctc cagaaacaat cagattgata caagacaaat  | 480 |
| atattcaaaa agagcattta atcaaaaatg gtatagcagt tacccaaagt gttcctgtgg  | 540 |
| aacaagccag tgagacgtcc ctattgaatg ttggaagaga tttgggtttt ccattcgtct  | 600 |
| tgaagtcgag gactttggca tacgatggaa gaggttaactt cgttgtaaag aataaggaaa | 660 |
| tgattccgga agctttggaa gtactgaagg atcgtccttt gtacgccgaa aaatgggcac  | 720 |
| catttactaa agaattagca gtcattgatt tgagatctgt taacggttta gtgttttctt  | 780 |
| acccaattgt agagactatc cacaaggaca atatttgtga cttatgttat gcgcctgc    | 838 |

<210> 24

<211> 4107

<212> DNA

<213> Artificial Sequence

<220>

<223> Codon Optimized SpCas9 Sequence for *S.cerevisiae*

<400> 24

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| atggacaaga agtactccat cggtttggat attggtacaa attctgttgg ttgggccgtt  | 60  |
| attactgatg agtacaaagt tccatccaag aagttcaagg ttttgggtaa cactgatagg  | 120 |
| cactccatca aaaagaattt gattgggtgcc ttgttgttcg actctggtga aactgctgaa | 180 |
| gtactagat tgaaaagaac cgctagaaga agataacca gaagaaagaa cagaatctgc    | 240 |
| tacttgcaag agatcttctc taacgaaatg gccaaaggttg atgattcatt cttccacaga | 300 |
| ttggaagagt ctttcttggg tgaagaggat aagaaacacg aaagacatcc aatcttcggt  | 360 |
| aacatcgttg atgaagttgc ttaccacgaa aagtacccaa ctatctacca tttgagaaag  | 420 |
| aagttgggtg actctaccga taaggctgat ttgagattga tctatttggc tttggcccac  | 480 |
| atgattaagt tcagaggta tttcttgatc gagggtgatt tgaatccaga taactccgat   | 540 |
| gttgacaagt tgttcatcca attggtccaa acttacaacc agttgttcga agaaaatcca  | 600 |

|                                                                      |      |
|----------------------------------------------------------------------|------|
| atcaatgcct ctggtgttga tgctaaggct attttgtctg ctagactgtc taagtctaga    | 660  |
| aggttggaaa acttgattgc tcaattgccca ggtgaaaaga agaatggttt gttcggtaat   | 720  |
| ttgatcgcct tgtctttggg ttgactcca aatttcaagt ccaacttcga tttggctgaa     | 780  |
| gatgctaagt tgcaattgtc taaggatacc tacgatgatg acttggataa tttgttggcc    | 840  |
| caaatcgggtg atcaatacgc tgatttgttt ttggctgcta agaacttgtc cgatgccatt   | 900  |
| ttgttgtccg atatcttgag agttaacacc gaaattacta aggctccatt gtctgcctct    | 960  |
| atgatcaaaa gatacgatga acaccaccaa gacttgactt tgttgaaagc tttggtcaga    | 1020 |
| caacagttgc cagaaaagta caaagaaatc ttcttcgacc agtccaaaaa tggttacgct    | 1080 |
| ggttatattg atggtggtgc ttctcaagaa gagttctaca agttcattaa gcccatcttg    | 1140 |
| gaaaagatgg atggtactga agaactgttg gtcaagttga acagagaaga tttgttgaga    | 1200 |
| aagcagagaa ctttcgataa cggttctatt ccacatcaaa tccacttggg tgaattgcat    | 1260 |
| gctattttga gaaggcaaga ggatttctac ccattcttga aggataacag agaaaagatc    | 1320 |
| gagaagatcc tgaccttcag aattccatat tatgttggtc cattggccag aggtaattct    | 1380 |
| agatttgctt ggatgactag gaagtccgaa gaaactatta ctccatggaa cttcgaagag    | 1440 |
| gttgttgata agggtgcttc tgctcaatcc ttcatgaaa gaatgactaa cttcgacaag     | 1500 |
| aacctgccaa acgaaaagggt tttgccaaaa cactcttgc tgtacgaata cttcaccgtc    | 1560 |
| tacaacgaat tgactaagggt taagtacgtc accgaaggta tgagaaaacc agcttttttg   | 1620 |
| tctggtgaac aaaagaaggc tatcgtcgat ttgttgttca agactaacag aaaggttacc    | 1680 |
| gtcaagcaat tgaaagagga ctacttcaag aaaatcgagt gcttcgattc cgttgaaatt    | 1740 |
| tccggtgttg aagatagatt caacgcttcc ttaggtactt accatgacct gttgaaaatc    | 1800 |
| atcaaggaca aggatttctt ggacaacgaa gaaaacgagg atatcttgga ggatatcgtt    | 1860 |
| ttgactttga ccttgttcga ggataggga atgatcgaag aaaggttgaa aacctacgct     | 1920 |
| cacttgtttg atgataagggt catgaagcag ttgaagagaa gaaggatatac tggttgggggt | 1980 |
| agattgtcta ggaaattgat taacggatatc agggacaagc aatccggtaa gactattttg   | 2040 |
| gactttttga agtctgatgg cttcgccaat agaaacttca tgcaattgat ccacgatgac    | 2100 |
| agcttgacct tcaaagaaga tattcaaaag gcccaagttt ccggtcaagg tgattcttta    | 2160 |
| catgaacata ttgctaactt ggctggttcc ccagctatta agaaaggat tttacaaacc     | 2220 |

|             |            |            |             |             |             |      |
|-------------|------------|------------|-------------|-------------|-------------|------|
| gttaaggtgg  | tcgacgaatt | ggtaaaagtt | atgggtagac  | ataagccaga  | gaacatcgtt  | 2280 |
| attgaaatgg  | ctagagaaaa | tcagactacc | caaaagggtc  | aaaagaactc  | cagagaaagg  | 2340 |
| atgaagagaa  | ttgaagaggg | tatcaaagaa | ttgggctccc  | agattttgaa  | agaacaccca  | 2400 |
| gttgaaaaca  | cccaattgca | gaacgaaaag | ctgtacttgt  | actacttgca  | gaatggtaga  | 2460 |
| gatatgtacg  | tcgaccaaga | attggatatc | aacagattgt  | ccgattacga  | tgtcgatcat  | 2520 |
| atcgttccac  | agtctttttt | gaaggatgac | tccatcgata  | acaaggctctt | gactagatcc  | 2580 |
| gataagaaca  | gaggtaagtc | tgataacggt | ccatctgaag  | aggtcgtcaa  | gaagatgaag  | 2640 |
| aattattgga  | gacagttgct | gaacgccaa  | ttgattactc  | aaagaaagtt  | cgacaatttg  | 2700 |
| accaaggctg  | aaagaggtgg | tttgtctgaa | ttggacaaag  | caggtttcat  | taagaggcaa  | 2760 |
| ttggttgaaa  | ctaggcaa   | at         | acac        | gttgcccaa   | ttttggattc  | 2820 |
| accaagtacg  | acgaaaacga | taagttgatc | agggaagtta  | aggtcatcac  | gttgaagtct  | 2880 |
| aagttggttt  | ccgatttcag | aaaggacttc | caattctaca  | aggtcaggga  | aatcaacaac  | 2940 |
| taccatcatg  | ctcatgatgc | ttacttgaat | gctgttggtg  | gtactgcctt  | gattaagaag  | 3000 |
| tatccaaagt  | tggaatccga | gttcgtttac | ggtgattaca  | aggtttacga  | cgtcagaaag  | 3060 |
| atgattgcca  | agtccgaaca | agaaattggg | aaggctactg  | ccaagtactt  | tttctactcc  | 3120 |
| aacatcatga  | atttcttcaa | gaccgaaatc | actttggcca  | acggtgaaat  | tagaaaaagg  | 3180 |
| ccattgattg  | agactaacgg | tgagactggg | gaaatagttt  | gggataaggg  | tagagatttc  | 3240 |
| gctaccgtta  | gaaaagtttt | gtccatgcca | caagttaaca  | tcgtcaaaaa  | gaccgaagtt  | 3300 |
| caaactgggtg | gtttctccaa | agaatccatc | ttgccaaaaa  | gaaactccga  | caaattgatc  | 3360 |
| gccagaaaga  | aagattggga | cccaaaaaag | tatggcggtt  | ttgattctcc  | aactgttgct  | 3420 |
| tactctgttt  | tggttggtgc | caaagtcgaa | aagggtgaag  | gtaagaagtt  | gaagtcagtc  | 3480 |
| aaagagttgt  | tgggtatcac | gatcatggaa | aggatcatctt | tcgaaaagaa  | tcctatcgac  | 3540 |
| tttttggaag  | ccaagggtta | caaagaagtc | aaaaaggacc  | tgattatcaa  | gctgccaaag  | 3600 |
| tactctttgt  | tcgaattgga | aaacggtcgt | aagagaatgt  | tggcttctgc  | tgggtgaacta | 3660 |
| caaaaaggta  | atgaattggc | tctgccctct | aagtacgtta  | acttcttgta  | cttggttctt  | 3720 |
| cactacgaaa  | agttgaaagg | ttctccagaa | gataacgagc  | aaaagcagtt  | gtttgtggaa  | 3780 |
| caacataagc  | actacttgga | cgaaatcatc | gaacagatct  | ctgaattctc  | caagagggtt  | 3840 |

|                                                                   |      |
|-------------------------------------------------------------------|------|
| atTTTggctg atgccaattt ggataaggTc ttgtctgctt acaacaagca cagagataag | 3900 |
| ccaattagag aacaagccga aaacatcatt cacctgttca ctttgactaa tttgggtgct | 3960 |
| ccagctgctt ttaagtactt cgatacaacc atcgacagaa agagatacac ctctacaaa  | 4020 |
| gaagttttgg acgctacctt gatccatcaa tctattactg gtctgtacga aaccagaatc | 4080 |
| gacttgtctc aattaggtgg tgattaa                                     | 4107 |

<210> 25  
 <211> 20  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> SpCas9 Ade2 Spacer Sequence

|                       |    |
|-----------------------|----|
| <400> 25              |    |
| attgggacgt atgattgttg | 20 |

<210> 26  
 <211> 76  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> SpCas9 sgRNA Sequence

|                                                                   |    |
|-------------------------------------------------------------------|----|
| <400> 26                                                          |    |
| gttttagagc tagaaatagc aagttaaaat aaggctagtc cgttatcaac ttgaaaaagt | 60 |
| ggcaccgagt cgggtgc                                                | 76 |

<210> 27  
 <211> 8667  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> CRISPR/SpCas9 vector system

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| <400> 27                                                          |     |
| agcttgcaaa ttaaagcctt cgagcgtccc aaaaccttct caagcaaggt tttcagtata | 60  |
| atgttacatg cgtacacgcg tctgtacaga aaaaaagaa aaatttgaaa tataaataac  | 120 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| gttcttaata ctaacataac tataaaaaaa taaataggga cctagacttc aggttgtcta   | 180  |
| actccttcct ttctcggttag agcggatgtg gggggagggc gtgaatgtaa gcgtgacata  | 240  |
| actaattaca tgatatcgac aaaggaaaag ggggacggat ctccgaggcc tcggacccgt   | 300  |
| cgggccgcgt cggacgtgtc agtcctgctc ctcgcaattg ttagaaaaac tcatcgagca   | 360  |
| tcaaatgaaa ctgcaattta ttcatatcag gattatcaat accatatttt tgaaaaagcc   | 420  |
| gtttctgtaa tgaaggagaa aactcaccga ggcagttcca taggatggca agatcctggg   | 480  |
| atcggctctgc gattccgact cgtccaacat caatacaacc tattaatttc ccctcgtcaa  | 540  |
| aaataagggt atcaagtgag aaatcaccat gagtgacgac tgaatccggt gagaatggca   | 600  |
| aaagcttatg catttctttc cagacttggt caacaggcca gccattacgc tcgtcatcaa   | 660  |
| aatcactcgc atcaacaaaa ccgttattca ttcgtgattg cgcctgagcg aggcgaaata   | 720  |
| cgcgatcgcgt gttaaaaagga caattacaaa caggaatcga atgcaaccgg cgcaggaaca | 780  |
| ctgccagcgc atcaacaata ttttcacctg aatcaggata ttcttctaata acctggaatg  | 840  |
| ctgttttgcc ggggatcgca gtggtgagta accatgcatc atcaggagta cggataaaat   | 900  |
| gcttgatggg cggaagaggc ataaattccg tcagccagtt tagtctgacc atctcatctg   | 960  |
| taacatcatt ggcaacgcta cctttgccat gtttcagaaa caactctggc gcatcgggct   | 1020 |
| tcccatataa tcgatagatt gtcgcacctg attgcccgc attatcgca gccatttat      | 1080 |
| acccatataa atcagcatcc atgttggaat ttaatcgcg cctcgaaacg tgagtctttt    | 1140 |
| ccttaccat ggtttagttc ctcaccttgt cgtattatac tatgccgata tactatgccg    | 1200 |
| atgattaatt gtcaacaccg cccttagatt agattgctat gctttctttc taatgagcaa   | 1260 |
| gaagtaaaaa aagttgtaat agaacaagaa aaatgaaact gaaacttgag aaattgaaga   | 1320 |
| ccgtttatta acttaaatat caatgggagg tcatcgaaag agaaaaaat caaaaaaaaa    | 1380 |
| aattttcaag aaaaagaaac gtgataaaaa tttttattgc ctttttcgac gaagaaaaag   | 1440 |
| aaacgaggcg gtctcttttt tcttttccaa acctttagta cgggtaatta acgacaccct   | 1500 |
| agaggaagaa agaggggaaa tttagtatgc tgtgcttggg tgttttgaag tgggtacggcg  | 1560 |
| atgcgcggag tccgagaaaa tctggaagag taaaaaagga gtagaaacat tttgaagcta   | 1620 |
| tggtgtgtgg gggatccgca caaacgaagg tctcactgat cgcttgcctg taacttacac   | 1680 |
| gcgcctcgta tcttttaatg atggaataat ttgggaattt actctgtgtt tatttatattt  | 1740 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| tatgttttgt atttggattt tagaaaagtaa ataaagaagg tagaagagtt acggaatgaa  | 1800 |
| gaaaaaaaaa taaacaaagg tttaaaaaat ttcaacaaaa agcgtacttt acatatatat   | 1860 |
| ttatttagaca agaaaagcag attaaataga tatacattcg attaacgata agtaaaatgt  | 1920 |
| aaaatcacag gattttcgtg tgtgggtcttc tacacagaca agatgaaaca attcggcatt  | 1980 |
| aatacctgag agcaggaaga gcaagataaa aggtagtatt tgttggcgat ccccctagag   | 2040 |
| tctttttacat cttcggaana caaaaaactat tttttcttta atttcttttt ttactttcta | 2100 |
| tttttaattt atatatattat attaaaaaat tttaaattata attattttta tagcacgtga | 2160 |
| tgaaaaggac ccatcgataa gctgggtaccg agctcggatc ccgggtctgca tctgcggatc | 2220 |
| ctctttgaaa agataatgta tgattatgct ttcactcata tttatacaga aacttgatgt   | 2280 |
| tttctttcga gtatatacaa ggtgattaca tgtacgtttg aagtacaact ctagattttg   | 2340 |
| tagtgccctc ttgggctagc ggtaaagggtg cgcatttttt cacaccctac aatgttctgt  | 2400 |
| tcaaaagatt ttgggtcaaac gctgtagaag tgaaagtggg tgcgcatggt tcggcgttcg  | 2460 |
| aaacttctcc gcagtгааag ataaatgac cgcagacgag ctcggaagct caaacgtctc    | 2520 |
| atttttttgt tttttatgtc tcctgcaggt tttaaagatta cggatattta acttacttag  | 2580 |
| aataatgcca tttttttgag ttataataat cctacgttag tgtgagcggg atttaaactg   | 2640 |
| tgaggacctt aatacattca gacacttctg cggtatcacc ctacttattc ctttcgagat   | 2700 |
| tatatctagg aacccatcag gttgggtggaa gattacccgt tctaagactt ttcagcttcc  | 2760 |
| tctattgatg ttacacctgg acaccccttt tctggcatcc agtttttaat cttcagtggc   | 2820 |
| atgtgagatt ctccgaaatt aattaaagca atcacacaat tctctcggat accacctcgg   | 2880 |
| ttgaaactga cagggtggtt gttacgcatg ctaatgcaaa ggagcctata tacctttggc   | 2940 |
| tcggctgctg taacagggaa tataaagggc agcataattt aggagttag tgaacttgca    | 3000 |
| acatttacta ttttcccttc ttacgtaaat atttttcttt ttaattctaa atcaatcttt   | 3060 |
| ttcaattttt tgtttgtatt cttttcttgc ttaaatctat aactacaaaa aacacatata   | 3120 |
| taaactaaaa atgggtccca aaaagaaaag gaaggtgatg gacaagaagt actccatcgg   | 3180 |
| tttgatatt ggtacaaatt ctgttggttg ggccgttatt actgatgagt acaaagttcc    | 3240 |
| atccaagaag ttcaaggttt tgggtaacac tgataggcac tccatcaaaa agaatttgat   | 3300 |
| tggtgccttg ttgttcgact ctggtgaaac tgctgaagct actagattga aaagaaccgc   | 3360 |

|             |             |             |            |            |             |      |
|-------------|-------------|-------------|------------|------------|-------------|------|
| tagaagaaga  | tacaccagaa  | gaaagaacag  | aatctgctac | ttgcaagaga | tcttctctaa  | 3420 |
| cgaaatggcc  | aaggttgatg  | attcattctt  | ccacagattg | gaagagtcct | tcttggttga  | 3480 |
| agaggataag  | aaacacgaaa  | gacatccaat  | cttcggtaac | atcgttgatg | aagttgctta  | 3540 |
| ccacgaaaag  | taccaacta   | tctaccattt  | gagaaagaag | ttggttgact | ctaccgataa  | 3600 |
| ggctgatttg  | agattgatct  | atttggcttt  | ggcccacatg | attaagttca | gaggtcattt  | 3660 |
| cttgatcgag  | ggtgatttga  | atccagataa  | ctccgatgtt | gacaagttgt | tcaccaatt   | 3720 |
| ggtcctaaact | tacaaccagt  | tgttcgaaga  | aaatccaatc | aatgcctctg | gtgttgatgc  | 3780 |
| taaggctatt  | ttgtctgcta  | gactgtctaa  | gtctagaagg | ttggaaaact | tgattgctca  | 3840 |
| attgccaggt  | gaaaagaaga  | atggtttggt  | cgtaatttg  | atgccttgt  | ctttgggttt  | 3900 |
| gactccaaat  | ttcaagtcca  | acttcgattt  | ggctgaagat | gctaagttgc | aattgtctaa  | 3960 |
| ggatacctac  | gatgatgact  | tggtataattt | gttggcccaa | atcggtgatc | aatacgctga  | 4020 |
| tttgtttttg  | gctgctaaga  | acttgtccga  | tgccattttg | ttgtccgata | tcttgagagt  | 4080 |
| taacaccgaa  | attactaagg  | ctccattgtc  | tgctctatg  | atcaaaagat | acgatgaaca  | 4140 |
| ccaccaagac  | ttgactttgt  | tgaaagcttt  | ggtcagacaa | cagttgccag | aaaagtacaa  | 4200 |
| agaaatcttc  | ttcgaccagt  | ccaaaaatgg  | ttacgctggg | tatattgatg | gtgggtgcttc | 4260 |
| tcaagaagag  | ttctacaagt  | tcattaagcc  | catcttgga  | aagatggatg | gtactgaaga  | 4320 |
| actgttggtc  | aagttgaaca  | gagaagattt  | gttgagaaa  | cagagaacct | tcgataacgg  | 4380 |
| ttctattcca  | catcaaattc  | acttgggtga  | attgcatgct | atcttgagaa | ggcaagagga  | 4440 |
| tttctacca   | ttcttgaagg  | ataacagaga  | aaagatcgag | aagatcctga | ccttcagaat  | 4500 |
| tccatattat  | gttgggtccat | tggtccagagg | taattctaga | tttgcttgga | tgactaggaa  | 4560 |
| gtccgaagaa  | actattactc  | catggaactt  | cgaagagggt | gttgataagg | gtgcttctgc  | 4620 |
| tcaatccttc  | attgaaagaa  | tgactaactt  | cgacaagaac | ctgccaacg  | aaaagggttt  | 4680 |
| gccaaaacac  | tctttgctgt  | acgaatactt  | caccgtctac | aacgaattga | ctaagggttaa | 4740 |
| gtacgtcacc  | gaaggatga   | gaaaaccagc  | ttttttgtct | ggtgaacaaa | agaaggctat  | 4800 |
| cgtcgatttg  | ttgttcaaga  | ctaacagaaa  | ggttaccgtc | aagcaattga | aagaggacta  | 4860 |
| cttcaagaaa  | atcgagtgtc  | tcgattccgt  | tgaaatttcc | ggtgttgaag | atagattcaa  | 4920 |
| cgcttcctta  | ggtacttacc  | atgacctgtt  | gaaaatcatc | aaggacaagg | atcttcttga  | 4980 |

|                                                                       |      |
|-----------------------------------------------------------------------|------|
| caacgaagaa aacgaggata tcttggagga tatcgttttg actttgacct tgttcgagga     | 5040 |
| tagggaaatg atcgaagaaa ggttgaaaac ctacgctcac ttgtttgatg ataaggatcat    | 5100 |
| gaagcagttg aagagaagaa ggtatactgg ttggggtaga ttgtctagga aattgattaa     | 5160 |
| cggtatcagg gacaagcaat ccggtgaagac tattttggac tttttgaagt ctgatggctt    | 5220 |
| cgccaataga aacttcatgc aattgatcca cgatgacagc ttgaccttca aagaagatat     | 5280 |
| tcaaaaaggcc caagtttccg gtcaagggtga ttctttacat gaacatattg ctaacttggc   | 5340 |
| tggttcccca gctattaaga aagggtat tttt acaaaccgtt aagggtggcgc acgaattggc | 5400 |
| aaaagttatg ggtagacata agccagagaa catcggttatt gaaatggcta gagaaaatca    | 5460 |
| gactacccaa aagggtcaaaa agaactccag agaaaggatg aagagaattg aagagggtat    | 5520 |
| caaagaattg ggctcccaga ttttgaaaga acaccagtt gaaaacaccc aattgcagaa      | 5580 |
| cgaaaagctg tacttgtact acttgcagaa tggtagagat atgtacgtcg accaagaatt     | 5640 |
| ggatatcaac agattgtccg attacgatgt cgatcatatc gttccacagt cttttttgaa     | 5700 |
| ggatgactcc atcgataaca aggtcttgac tagatccgat aagaacagag gtaagtctga     | 5760 |
| taacgttcca tctgaagagg tcgtcaagaa gatgaagaat tattggagac agttgctgaa     | 5820 |
| cgccaagttg attactcaaa gaaagttcga caatttgacc aaggctgaaa gaggtggttt     | 5880 |
| gtctgaattg gacaaagcag gtttcattaa gaggcaattg gttgaaacta ggcaaatcac     | 5940 |
| caaacacgtt gcccaaattt tggattccag aatgaatacc aagtacgacg aaaacgataa     | 6000 |
| gttgatcagg gaagttaagg tcatcacgtt gaagtctaag ttggtttccg atttcagaaa     | 6060 |
| ggacttccaa ttctacaagg tcagggaat caacaactac catcatgctc atgatgctta      | 6120 |
| cttgaatgct gttgttggtg ctgccttgat taagaagtat ccaaagttgg aatccgagtt     | 6180 |
| cgtttacggt gattacaagg tttacgacgt cagaaagatg attgccaagt ccgaacaaga     | 6240 |
| aattggtaag gctactgcca agtacttttt ctactccaac atcatgaatt tcttcaagac     | 6300 |
| cgaaatcact ttggccaacg gtgaaattag aaaaaggcca ttgattgaga ctaacgggtga    | 6360 |
| gactgggtgaa atagtttggg ataagggtag agatttcgct accgttagaa aagttttgtc    | 6420 |
| catgccacaa gttaacatcg tcaaaaagac cgaagttcaa actggtggtt tctccaaaga     | 6480 |
| atccatcttg ccaaaaagaa actccgacaa attgatcgcc agaaagaaag attgggaccc     | 6540 |
| aaaaaagtat ggcggttttg attctccaac tgttgcttac tctgttttgg ttgttgccaa     | 6600 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agtcgaaaag ggtaagagta agaagttgaa gtcagtcaaa gagttgttgg gtatcacgat  | 6660 |
| catggaaagg tcatctttcg aaaagaatcc tatcgacttt ttggaagcca agggttacaa  | 6720 |
| agaagtcaaa aaggacctga ttatcaagct gccaaagtac tctttgttcg aattggaaaa  | 6780 |
| cggtcgtaag agaatgttgg cttctgctgg tgaactacaa aaaggtaatg aattggctct  | 6840 |
| gccctctaag tacgttaact tcttgacttt ggcttctcac tacgaaaagt tgaaaggttc  | 6900 |
| tccagaagat aacgagcaaa agcagttggt tgtggaacaa cataagcact acttgacga   | 6960 |
| aatcatcgaa cagatctctg aattctccaa gagggttatt ttggctgatg ccaatttgga  | 7020 |
| taaggctcttg tctgcttaca acaagcacag agataagcca attagagaac aagccgaaaa | 7080 |
| catcattcac ctgttcactt tgactaattt ggggtgctca gctgctttta agtacttcga  | 7140 |
| tacaaccatc gacagaaaga gatacacctc taccaaagaa gttttggacg ctaccttgat  | 7200 |
| ccatcaatct attactggtc tgtacgaaac cagaatcgac ttgtctcaat taggtgggtga | 7260 |
| ttaagcggcc gcaatgccgg cgcaatgatt gaatagtcaa agatTTTTTT tttttaattt  | 7320 |
| TTTTTTTTTTa atTTTTTTTT tttttcatag aactTTTTat ttaaataaat cacgtctata | 7380 |
| tatgtatcag tataacgtaa aaaaaaaaaac accgtcagtt aaacaaaaca taaataaaaa | 7440 |
| aaaaaagaag tgtcaaatca agtgtcaaat ggccctgcat taatgaatcg gccaacgcgc  | 7500 |
| ggggagaggc ggtttgcgta ttgggcgctc ttccgcttcc tcgctcactg actcgctgcg  | 7560 |
| ctcggctcgtt cggctgcggc gagcggatc agctcactca aaggcggtaa tacggttatc  | 7620 |
| cacagaatca ggggataacg caggaaagaa catgtgagca aaaggccagc aaaaggccag  | 7680 |
| gaaccgtaaa aaggccgcgt tgctggcgtt tttccatagg ctccgcccc ctgacgagca   | 7740 |
| tcacaaaaat cgacgctcaa gtcagagggtg gcgaaacccg acaggactat aaagatacca | 7800 |
| ggcgtttccc cctggaagct ccctcgtgcg ctctcctggt ccgaccctgc cgcttaccgg  | 7860 |
| atacctgtcc gcctttctcc cttcgggaag cgtggcgctt tctcatagct cacgctgtag  | 7920 |
| gtatctcagt tcggtgtagg tcgttcgctc caagctgggc tgtgtgcacg aacccccgt   | 7980 |
| tcagcccgcg cgctgcgcct tatccggtaa ctatcgtctt gagtccaacc cggtgaagaca | 8040 |
| cgacttatcg ccaactggcag cagccactgg taacaggatt agcagagcga ggtatgtagg | 8100 |
| cggtgctaca gagttcttga agtggtggcc taactacggc tacactagaa gaacagtatt  | 8160 |
| tggtatctgc gctctgctga agccagttac cttcggaaaa agagttggta gctcttgatc  | 8220 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| cggcaaacaa accaccgctg gtagcggtagg tttttttggt tgcaagcagc agattacgcg  | 8280 |
| cagaaaaaaaa ggatctcaag aagatccttt gatcttttct acgggggtctg acgctcagtg | 8340 |
| gaacgaaaac tcacgttaag ggattttggt catgagatta tcaaaaagga tcttcaccta   | 8400 |
| gatcctttta aattaaaaat gaagttttaa atcaatctaa agtatatatg agtaaacttg   | 8460 |
| gtctgacagt taccaatgct taatcagtga ggcacctatc tcagcgatct gtctatttcg   | 8520 |
| ttcatccata gttgcctgac tccccgtcgt gtagataact acgatacggg agggccttacc  | 8580 |
| atctggcccc agtgctgcaa tgataccgcg agaccacgc tcaccggctc cagatttatc    | 8640 |
| agcaataaac cagccagccg gaagggc                                       | 8667 |

<210> 28  
 <211> 832  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Ade2 HDR-template for SpCas9

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| <400> 28                                                          |     |
| tctttacaac gaagttacct cttccatcgt atgccaaagt cctcgacttc aagacgaatg | 60  |
| gaaaacccaa atctcttcca acattcaata gggacgtctc actggcttgt tccacaggaa | 120 |
| cactttgggt aactgctata ccatttttga ttaaagtctc tttttgaata tatttgtctt | 180 |
| gtatcaatct gattgtttct ggagaagggt aaatttttaa tttgggatgt tttacttgaa | 240 |
| gattcttttag tgtaggaaca tcaacatgct caatctcaat cgtagcaca tcacattttt | 300 |
| cagctagttt ttcgatatca agaggattgg aaaaggagcc attaacgtgg tcattggagt | 360 |
| tgcttatttg tttggcagga gaattttcag catctagtat taccgtctta atgttgagcc | 420 |
| tgtttgctgt cccctccta atataccaac tgttctagaa tccatacttg attgttttgt  | 480 |
| ccgattttct tgtttttctt gattgttata gtaggatgta cttagaagag agatccaacg | 540 |
| attttacgca ccaatttata catgaaatgc tccataatat tgtccattta gttcttaata | 600 |
| aaaggtcagc aagagtcaat cacttagtat taccgggttc gtagccatgc aacaagagtc | 660 |
| attgtgcagc atagctgtaa taatcaatca tgacgtaaga aatgtatcat aattaaaagt | 720 |
| tgtaaagat gtcagtgtta tgttggtgtt aaaaaattct cggcttctca ctaatattta  | 780 |
| atatctctta aattttatct gtctttgatt cttttaagaa aagttatgta tt         | 832 |

<210> 29  
 <211> 1231  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> AA Sequence of BEC10

<400> 29  
 Met Lys Ser Phe Glu Asn Ser Cys Gln Ile Ser Lys Thr Leu Arg Phe  
 1 5 10 15  
 Gly Ala Thr Leu Lys Glu Asp Lys Lys Lys Cys Lys Ser His Leu Glu  
 20 25 30  
 Leu Gln Glu Phe Val Asp Ile Ser Tyr Lys Thr Leu Lys Ser Ser Ala  
 35 40 45  
 Thr Ile Ala Glu Ser Leu Asn Glu Ile Glu Leu Val Lys Lys Cys Glu  
 50 55 60  
 Arg Cys Tyr Ser Glu Ile Ile Lys Phe His Glu Ala Trp Gly Gln Ile  
 65 70 75 80  
 Tyr Cys Arg Thr Asn Gln Ile Ala Val Tyr Lys Asp Trp Tyr Arg Gln  
 85 90 95  
 Leu Ala Arg Lys Ala Arg Phe Asp Val Gly Asp Gln Asn Ser Gln Leu  
 100 105 110  
 Ile Thr Leu Ser Ser Leu Ser Ser Lys His Asn Val Tyr Gln Gly Leu  
 115 120 125  
 Lys Arg Ser Gln His Ile Thr Asn Tyr Trp Lys Asp Asn Ile Ala Arg  
 130 135 140  
 Gln Lys Ser Phe Leu Lys Asp Phe Ser Gln Gln Leu Lys Gln Tyr Lys  
 145 150 155 160  
 Arg Ala Leu Glu Asn Ser Asp Lys Ala His Thr Lys Pro Asn Leu Ile  
 165 170 175  
 Asn Phe Asn Lys Thr Phe Ser Ile Leu Ala Asn Leu Val Asn Glu Ile  
 180 185 190  
 Val Ile Pro Leu Ser Asn Gly Ala Ile Ser Phe Pro Asn Ile Ser Lys  
 195 200 205  
 Leu Glu Asp Gly Glu Glu Ser Arg His Leu Ile Glu Phe Ala Leu Asn  
 210 215 220  
 Asp Tyr Ser Asp Leu Val Gly Ser Ile Gly Glu Leu Lys Asp Ala Ile  
 225 230 235 240  
 Ala Thr Asn Gly Gly Tyr Thr Pro Phe Ala Lys Val Thr Leu Asn His  
 245 250 255  
 Tyr Thr Ala Glu Gln Lys Pro His Val Phe Lys Asn Asp Ile Asp Ala  
 260 265 270  
 Lys Ile Arg Glu Leu Lys Leu Ile Glu Leu Val Glu Lys Leu Lys Asn  
 275 280 285  
 Lys Thr Ser Lys Gln Ile Glu Glu Tyr Phe Ser Lys Phe Asp Lys Phe  
 290 295 300  
 Lys Ile Tyr Asp Asp Arg Asn Ile Ser Val Ile Ile Arg Thr Gln Cys  
 305 310 315 320  
 Phe Lys Tyr Lys Pro Ile Pro Phe Leu Val Lys His Glu Leu Ala Lys  
 325 330 335

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Ile | Ala | Glu | Asp | Glu | Asp | Ala | Val | Leu | Lys | Val | Leu | Asp | Ala | Ile |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Gly | Ala | Thr | Arg | Ser | Pro | Ala | His | Asp | Tyr | Ala | His | Asn | Glu | Asp | Val |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Phe | Asp | Leu | Asn | His | Tyr | Pro | Ile | Lys | Val | Ala | Phe | Asp | Tyr | Ala | Trp |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Glu | Gln | Leu | Ala | Asn | Gly | Val | Tyr | Thr | Thr | Val | Thr | Phe | Pro | Lys | Glu |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Gln | Cys | Glu | Lys | Tyr | Leu | Lys | Asp | Val | Phe | Asp | Cys | Glu | Val | Ser | Lys |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Glu | Pro | Val | Phe | Lys | Phe | Tyr | Ala | Asp | Leu | Leu | Tyr | Ile | Arg | Lys | Asn |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Leu | Ala | Val | Leu | Glu | His | Lys | Asn | Asn | Leu | Pro | Ser | Asn | Gln | Glu | Glu |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
| Phe | Ile | Cys | Lys | Ile | Asn | Asn | Thr | Phe | Glu | Asn | Ile | Val | Leu | Pro | Tyr |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |
| Lys | Ile | Lys | Glu | Phe | Glu | Thr | Tyr | Lys | Lys | Asp | Ile | Leu | Ala | Trp | Ile |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Asn | Asp | Gly | Arg | Gly | His | Glu | Lys | Tyr | Thr | Asp | Ala | Lys | Gln | Gln | Leu |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Gly | Phe | Ile | Arg | Gly | Gly | Leu | Lys | Gly | Arg | Ile | Lys | Ala | Gln | Lys | Met |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     | 510 |     |     |     |
| Phe | Arg | Lys | Asp | Lys | Tyr | Gly | Lys | Ile | Lys | Ser | Tyr | Tyr | Glu | Asn | Pro |
|     |     | 515 |     |     |     | 520 |     |     |     |     | 525 |     |     |     |     |
| Tyr | Thr | Lys | Leu | Thr | Asn | Glu | Phe | Lys | Gln | Ile | Ser | Ser | Thr | Tyr | Gly |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Lys | Thr | Phe | Ala | Glu | Leu | Arg | Asp | Lys | Phe | Lys | Glu | Lys | Asn | Asn | Ile |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Thr | Lys | Ile | Thr | His | Phe | Gly | Ile | Ile | Ile | Glu | Asp | Asn | Asn | Lys | Asp |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Arg | Tyr | Leu | Leu | Ala | Asn | Gly | Leu | Gln | His | Glu | Gln | Ile | Asn | His | Val |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |
| Glu | Ala | Ile | Leu | Gly | Lys | Leu | Asn | Thr | Ser | Ser | Glu | Phe | Ile | Thr | Tyr |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |
| Gln | Val | Lys | Ser | Leu | Thr | Ser | Lys | Thr | Leu | Ile | Lys | Leu | Ile | Lys | Asn |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |
| His | Thr | Thr | Lys | Lys | Gly | Ala | Ile | Ser | Pro | Tyr | Ala | Asp | Phe | His | Thr |
| 625 |     |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |
| Ser | Lys | Ile | His | Val | Asp | Trp | Thr | Lys | Ile | Lys | Lys | Glu | Trp | Asp | Asn |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |
| Tyr | Lys | Arg | Glu | Gln | Val | Leu | Leu | Gln | Tyr | Val | Lys | Asp | Cys | Leu | Thr |
|     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |
| Asp | Ser | Thr | Met | Ala | Lys | Asn | Gln | Asn | Trp | Ala | Glu | Phe | Gly | Trp | Asn |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |
| Phe | Glu | Lys |     |     |     |     |     |     |     |     |     |     |     |     |     |

|      |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Ala  | Val | Ser  | Tyr  | Arg  | Thr  | Pro  | Ile  | Lys  | Asp  | Tyr  | Pro  | Lys  | Asp  | Lys  | Arg  |
| 770  |     |      |      |      |      | 775  |      |      |      |      | 780  |      |      |      |      |
| Tyr  | Gly | Arg  | Leu  | Gln  | Phe  | Val  | Cys  | Ala  | Phe  | Asn  | Cys  | Glu  | Ile  | Ile  | Pro  |
| 785  |     |      |      |      | 790  |      |      |      |      | 795  |      |      |      |      | 800  |
| Gln  | Asn | Gly  | Glu  | Phe  | Ile  | Asn  | Leu  | Lys  | Lys  | Gln  | Ile  | Glu  | Asn  | Phe  | Asn  |
|      |     |      |      | 805  |      |      |      |      | 810  |      |      |      |      | 815  |      |
| Asp  | Glu | Asp  | Ala  | Gln  | Lys  | Glu  | Ala  | Val  | Glu  | Glu  | Phe  | Asn  | Lys  | Lys  | Val  |
|      |     |      | 820  |      |      |      |      | 825  |      |      |      |      | 830  |      |      |
| Asn  | His | Ala  | Leu  | Leu  | Gly  | Lys  | Glu  | Tyr  | Val  | Val  | Ile  | Gly  | Ile  | Asp  | Arg  |
|      |     | 835  |      |      |      |      | 840  |      |      |      |      | 845  |      |      |      |
| Gly  | Leu | Lys  | Gln  | Leu  | Ala  | Thr  | Leu  | Cys  | Val  | Leu  | Asp  | Lys  | Arg  | Gly  | Lys  |
| 850  |     |      |      |      |      | 855  |      |      |      |      | 860  |      |      |      |      |
| Ile  | Leu | Gly  | Asp  | Phe  | Glu  | Ile  | Tyr  | Lys  | Lys  | Glu  | Phe  | Val  | Arg  | Ala  | Glu  |
| 865  |     |      |      |      | 870  |      |      |      |      | 875  |      |      |      |      | 880  |
| Lys  | Arg | Ser  | Lys  | Asn  | Tyr  | Trp  | Lys  | His  | Thr  | Leu  | Ala  | Glu  | Thr  | Arg  | His  |
|      |     |      |      | 885  |      |      |      |      | 890  |      |      |      |      | 895  |      |
| Ile  | Leu | Asp  | Leu  | Ser  | Asn  | Leu  | Arg  | Val  | Glu  | Thr  | Thr  | Ile  | Glu  | Asp  | Asn  |
|      |     | 900  |      |      |      |      | 905  |      |      |      |      |      | 910  |      |      |
| Lys  | Val | Leu  | Val  | Asp  | Gln  | Ser  | Leu  | Thr  | Leu  | Val  | Lys  | Lys  | Asn  | Arg  | Asp  |
|      |     | 915  |      |      |      |      | 920  |      |      |      |      |      | 925  |      |      |
| Thr  | Pro | Asp  | Glu  | Glu  | Ala  | Thr  | Glu  | Glu  | Asn  | Lys  | Gln  | Lys  | Ile  | Lys  | Leu  |
| 930  |     |      |      |      |      | 935  |      |      |      |      | 940  |      |      |      |      |
| Lys  | Gln | Leu  | Ser  | Tyr  | Ile  | Arg  | Lys  | Leu  | Gln  | His  | Lys  | Met  | Gln  | Thr  | Asn  |
| 945  |     |      |      |      | 950  |      |      |      |      | 955  |      |      |      |      | 960  |
| Glu  | Gln | Asp  | Val  | Leu  | Asp  | Leu  | Ile  | Asn  | Asn  | Glu  | Pro  | Ser  | Asp  | Glu  | Glu  |
|      |     |      |      | 965  |      |      |      |      | 970  |      |      |      |      | 975  |      |
| Phe  | Lys | Lys  | Arg  | Ile  | Glu  | Gly  | Leu  | Ile  | Ser  | Ser  | Phe  | Gly  | Glu  | Gly  | Gln  |
|      |     |      | 980  |      |      |      |      | 985  |      |      |      |      | 990  |      |      |
| Lys  | Tyr | Ala  | Asp  | Leu  | Pro  | Ile  | Asn  | Thr  | Met  | Arg  | Glu  | Met  | Ile  | Ser  | Asp  |
|      |     | 995  |      |      |      |      | 1000 |      |      |      |      | 1005 |      |      |      |
| Leu  | Gln | Gly  | Val  | Ile  | Ala  | Arg  | Gly  | Asn  | Asn  | Gln  | Thr  | Glu  | Lys  | Asn  | Lys  |
|      |     | 1010 |      |      |      | 1015 |      |      |      |      | 1020 |      |      |      |      |
| Ile  | Ile | Glu  | Leu  | Asp  | Ala  | Ala  | Asp  | Asn  | Leu  | Lys  | Gln  | Gly  | Ile  | Val  | Ala  |
| 1025 |     |      |      | 1030 |      |      |      |      |      | 1035 |      |      |      |      | 1040 |
| Asn  | Met | Ile  | Gly  | Ile  | Val  | Asn  | Tyr  | Ile  | Phe  | Ala  | Lys  | Tyr  | Ser  | Tyr  | Lys  |
|      |     |      | 1045 |      |      |      |      |      | 1050 |      |      |      |      | 1055 |      |
| Ala  | Tyr | Ile  | Ser  | Leu  | Glu  | Asp  | Leu  | Ser  | Arg  | Ala  | Tyr  | Gly  | Gly  | Ala  | Lys  |
|      |     |      | 1060 |      |      |      |      | 1065 |      |      |      |      | 1070 |      |      |
| Ser  | Gly | Tyr  | Asp  | Gly  | Arg  | Tyr  | Leu  | Pro  | Ser  | Thr  | Ser  | Gln  | Asp  | Glu  | Asp  |
|      |     | 1075 |      |      |      |      | 1080 |      |      |      |      | 1085 |      |      |      |
| Val  | Asp | Phe  | Lys  | Glu  | Gln  | Gln  | Asn  | Gln  | Met  | Leu  | Ala  | Gly  | Leu  | Gly  | Thr  |
|      |     | 1090 |      |      |      | 1095 |      |      |      |      | 1100 |      |      |      |      |
| Tyr  | Gln | Phe  | Phe  | Glu  | Met  | Gln  | Leu  | Leu  | Lys  | Lys  | Leu  | Gln  | Lys  | Ile  | Gln  |
| 1105 |     |      |      |      | 1110 |      |      |      |      | 1115 |      |      |      |      | 1120 |
| Ser  | Asp | Asn  | Thr  | Val  | Leu  | Arg  | Phe  | Val  | Pro  | Ala  | Phe  | Arg  | Ser  | Ala  | Asp  |
|      |     |      |      | 1125 |      |      |      |      | 1130 |      |      |      |      | 1135 |      |
| Asn  | Tyr | Arg  | Asn  | Ile  | Ile  | Lys  | Leu  | Glu  | Glu  | Thr  | Lys  | Tyr  | Lys  | Ser  | Lys  |
|      |     |      | 1140 |      |      |      |      | 1145 |      |      |      |      | 1150 |      |      |
| Pro  | Phe | Gly  | Val  | Val  | His  | Phe  | Ile  | Asp  | Pro  | Lys  | Phe  | Thr  | Ser  | Lys  | Lys  |
|      |     | 1155 |      |      |      |      | 1160 |      |      |      |      | 1165 |      |      |      |
| Cys  | Pro | Val  | Cys  | Ser  | Lys  | Thr  | Asn  | Val  | Tyr  | Arg  | Asp  | Lys  | Asp  | Asp  | Ile  |
|      |     | 1170 |      |      |      | 1175 |      |      |      |      | 1180 |      |      |      |      |
| Leu  | Val | Cys  | Lys  | Glu  | Cys  | Gly  | Phe  | Arg  | Ser  | Asp  | Ser  | Gln  | Leu  | Lys  | Glu  |
| 1185 |     |      |      |      | 1190 |      |      |      |      | 1195 |      |      |      |      | 1200 |

|     |     |     |      |     |      |     |     |      |      |     |     |     |      |      |     |
|-----|-----|-----|------|-----|------|-----|-----|------|------|-----|-----|-----|------|------|-----|
| Arg | Glu | Asn | Asn  | Ile | His  | Tyr | Ile | His  | Asn  | Gly | Asp | Asp | Asn  | Gly  | Ala |
|     |     |     |      |     | 1205 |     |     |      | 1210 |     |     |     |      | 1215 |     |
| Tyr | His | Ile | Ala  | Leu | Lys  | Ser | Val | Glu  | Asn  | Leu | Ile | Gln | Met  | Lys  |     |
|     |     |     | 1220 |     |      |     |     | 1225 |      |     |     |     | 1230 |      |     |

<210> 30  
 <211> 3696  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> NT Sequence of BEC10 (Codon optimized for *S. Cerevisiae*)

<400> 30  
 atgaagtcct tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg 60  
 aaagaggata agaaaaagtg caagtccac ttggaattgc aagaattcgt tgacatttcc 120  
 tacaagacct tgaagtcac tgctaccatt gctgaatcct tgaacgaaat cgaattggtc 180  
 aaaaagtgcg aaaggtgcta ctccgaaatt atcaagttcc atgaagcttg ggggtcaaadc 240  
 tactgtagaa ctaaccaaatt tgccgtctac aaggactggg atagacaatt ggctagaaag 300  
 gccagattcg atgttggtga tcaaaactct caactgatca cttgtgcatc cttatcttct 360  
 aagcacaacg tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac 420  
 aacattgccg gacaaaagtc tttcctgaag gatttctctc aacaattgaa gcagtacaag 480  
 agagctttgg aaaattctga taaggctcat accaagccaa acctgattaa cttcaacaag 540  
 accttctcca ttttgccaa cttgggttaac gaaattgtca tccattgtc caacggtgct 600  
 atttcttttc caaacatctc caagttggaa gatggtgaag aatccagaca tttgattgaa 660  
 ttcgctctga acgattactc cgatttgggt gggtctattg gtgaattgaa ggatgctatt 720  
 gctaccaatg gtggttatac tccatttgct aagggtacct tgaaccatta cactgctgaa 780  
 caaaagccac acgttttcaa gaacgatatt gatgccaaga tccgtgagtt gaagttgatt 840  
 gagttgggtc aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag 900  
 ttcgacaagt tcaagatcta cgatgataga aacatctccg ttatcattag aaccaatgc 960  
 ttttaagtaca agccccattcc atttttgggtc aagcacgaat tggctaagta tatcgctgaa 1020  
 gatgaagatg ccgttttgaa ggttttggat gcaattgggt ctactagatc tccagctcat 1080  
 gattacgctc ataatagaaga tgtttttgac ttgaatcact acccaatcaa ggttgctttt 1140  
 gattacgcat gggaacaatt ggctaacggg gtctacacta ctgttacttt cccaaaagaa 1200

|                                                                    |      |
|--------------------------------------------------------------------|------|
| cagtgcgaga agtacttgaa ggatgttttt gattgcgaag tctccaaaga accagttttt  | 1260 |
| aagttctacg ccgacctggt gtacatcaga aagaatttgg ctgttttgga gcacaagaac  | 1320 |
| aacctgccat ctaatcaaga ggaattcatc tgcaagatta acaacacctt cgagaacatc  | 1380 |
| gttctgccat acaagattaa agagttcgaa acctacaaga aggatatctt ggcctggatt  | 1440 |
| aacgatggta gaggtcacga aaagtacacc gatgctaaac aacagttggg ttttattaga  | 1500 |
| ggtaggtctga aaggtagaat caaggctcaa aagatgttca gaaaagacaa gtacggtaag | 1560 |
| atcaagtcct actacgaaaa cccatacact aagttgacca acgaattcaa gcaaattctt  | 1620 |
| tctacctacg gtaaaacctt cgctgaattg agagacaagt tcaaagaaaa gaacaacatc  | 1680 |
| accaagatca cccatttcgg tattatcatc gaagataaca acaaagacag atacttggtg  | 1740 |
| gccaacgggt tgcaacacga acaaatcaac catgtcgaag ccattttggg taagttgaac  | 1800 |
| acctcatccg aattcatcac ctaccaagtt aagtctttga cctctaagac cctgatcaag  | 1860 |
| ctgattaaga atcataccac caagaagggt gcaatttctc catatgctga tttccatact  | 1920 |
| tctaagatcc atgttgattg gaccaagatc aagaaagaat gggacaacta caagagagaa  | 1980 |
| caagtcttgt tgcaatacgt taaggattgc ttgaccgatt ctaccatggc taagaatcaa  | 2040 |
| aattgggctg aatttggttg gaacttcgag aagtgttaact cctacgaaga tatcgaacac | 2100 |
| gaaatcgatc agaagtctta catcttgcaa aagcatacca tttccaagca atctattgct  | 2160 |
| tctttgggtg aagggtggtg tttgttggtg ccaattatca accaggacat cacctctcaa  | 2220 |
| ggtcgtaagg acaagaatca gttctccaag gattggaagc aaatcttcga aggttccaaa  | 2280 |
| gaattcagat tgcattccaga attcgccgtt tcttacagaa ctccaattaa ggactacca  | 2340 |
| aaggataaaa gatacggtag attgcaattc gtttgcgctt ttaactgcga aatcatccca  | 2400 |
| caaatgggtg agttcatcaa cttgaagaag cagatcgaga acttcaacga cgaagatgct  | 2460 |
| caaaaagaag ccgtcgaaga gttcaacaaa aaggttaacc atgccttggt gggtaaagaa  | 2520 |
| tacgttgta ttggtatcga cagaggcttg aagcaattag ctactttgtg tgttttggtg   | 2580 |
| aagaggggta agattttggg tgactttgaa atctacaaaa aagagttcgt cagagccgaa  | 2640 |
| aagagatcta agaattactg gaagcacacc ttggctgaaa ccagacatat cttggacttg  | 2700 |
| tctaacttga gagttgaaac taccattgag gataataagg tgttggttga tcaatctttg  | 2760 |
| acactgggtca agaagaacag agatactcca gatgaagaag ctaccgaaga aaacaagcag | 2820 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| aagattaagt tgaagcagct gtcctacatt agaaagttgc aacacaagat gcagaccaat   | 2880 |
| gaacaagatg tcttggacct gatcaacaac gaaccatctg atgaagaatt caaaaagagg   | 2940 |
| atcgagggct tgatttcttc attcggtgaa ggtcaaaagt acgctgattt gcctattaac   | 3000 |
| accatgaggg aaatgatctc tgacttgcaa ggtgttattg ccagaggaaa caatcagact   | 3060 |
| gagaaaaaca agatcatcga attggatgct gccgacaatt tgaacaagg tatcgttgct    | 3120 |
| aacatgatcg gtatcgtaa ctacatttcc gccaaagtact cctacaaggc ctacatttct   | 3180 |
| ttagaagatt tgtccagagc ttacgggtggt gcaaaatctg gttatgatgg tagatatttg  | 3240 |
| ccatccacct ctcaagatga ggatgttgac tttaaagaac agcagaatca aatgttggct   | 3300 |
| ggcttgggta cttaccaatt ttttgaaatg cagctgctga aaaagctgca gaagatccaa   | 3360 |
| tctgataaca ccgttttgag atttgttcca gcttttagat ccgccgataa ctacagaaat   | 3420 |
| atcatcaagt tggaagagac taagtacaag tctaagccat tcggtgttgt tcatttcac    | 3480 |
| gatccaaaagt tcacatctaa gaagtgtcca gtttgctcta agactaacgt ttacagagat  | 3540 |
| aaggatgaca tcctgggtctg taaagaatgt ggtttttaggt ccgactcaca gttgaaagaa | 3600 |
| agggaaaaca acatccacta catccacaat ggtgatgata atgggtgctta ccatattgcc  | 3660 |
| ttgaagtccg tcgaaaactt gattcagatg aagtaa                             | 3696 |

<210> 31

<211> 8269

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/BEC10 vector system

<400> 31

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| agcttgcaaa ttaaagcctt cgagcgtccc aaaaccttct caagcaaggt tttcagtata  | 60  |
| atgttacatg cgtacacgcg tctgtacaga aaaaaaagaa aaatttgaaa tataaataac  | 120 |
| gttcttaata ctaacataac tataaaaaaa taaataggga cctagacttc aggttgtcta  | 180 |
| actccttcct tttcggtttag agcggatgtg gggggagggc gtgaatgtaa gcgtgacata | 240 |
| actaattaca tgatatcgac aaaggaaaag ggggacggat ctccgaggcc tcggaccgt   | 300 |
| cgggccgcgt cggacgtgtc agtcctgctc ctcgcaattg ttagaaaaac tcatcgagca  | 360 |

|             |             |            |            |             |             |      |
|-------------|-------------|------------|------------|-------------|-------------|------|
| tcaaataaaa  | ctgcaattta  | ttcatatcag | gattatcaat | accatatttt  | tgaaaaagcc  | 420  |
| gtttctgtaa  | tgaaggagaa  | aactcaccga | ggcagttcca | taggatggca  | agatcctggt  | 480  |
| atcgggtctgc | gattccgact  | cgtccaacat | caatacaacc | tattaatttc  | ccctcgtcaa  | 540  |
| aaataagggtt | atcaagttag  | aaatcaccat | gagtgcgcgc | tgaatccggt  | gagaatggca  | 600  |
| aaagcttatg  | catttctttc  | cagacttggt | caacaggcca | gccattacgc  | tcgtcatcaa  | 660  |
| aatcactcgc  | atcaacaaaa  | ccgttattca | ttcgtgattg | cgcctgagcg  | aggcgaaata  | 720  |
| cgcgatcgc   | gttaaaaagga | caattacaaa | caggaatcga | atgcaaccgg  | cgcaggaaca  | 780  |
| ctgccagcgc  | atcaacaata  | ttttcacctg | aatcaggata | ttcttctaata | acctggaatg  | 840  |
| ctgttttgcc  | ggggatcgca  | gtggtgagta | accatgcac  | atcaggagta  | cggataaaat  | 900  |
| gcttgatggt  | cggaagaggc  | ataaattccg | tcagccagtt | tagtctgacc  | atctcatctg  | 960  |
| taacatcatt  | ggcaacgcta  | cttttgccat | gtttcagaaa | caactctggc  | gcatcgggct  | 1020 |
| tcccatataa  | tcgatagatt  | gtcgcacctg | attgcccgc  | attatcgca   | gcccatttat  | 1080 |
| acccatataa  | atcagcatcc  | atggtggaat | ttaatcgcg  | cctcgaaacg  | tgagtctttt  | 1140 |
| ccttaccat   | ggtttagttc  | ctcacctgt  | cgtattatac | tatgccgata  | tactatgccg  | 1200 |
| atgattaatt  | gtcaacaccg  | cccttagatt | agattgctat | gctttctttc  | taatgagcaa  | 1260 |
| gaagtaaaaa  | aagttgtaat  | agaacaagaa | aaatgaaact | gaaacttgag  | aaattgaaga  | 1320 |
| ccgtttatta  | acttaaatat  | caatgggagg | tcacgaaag  | agaaaaaaat  | caaaaaaaaaa | 1380 |
| aattttcaag  | aaaaagaaac  | gtgataaaaa | tttttattgc | ctttttcgac  | gaagaaaaag  | 1440 |
| aaacgaggcg  | gtctcttttt  | tcttttccaa | accttagta  | cgggtaatta  | acgacaccct  | 1500 |
| agaggaagaa  | agaggggaaa  | tttagtatgc | tgtgcttggg | tgttttgaag  | tggtacggcg  | 1560 |
| atgcgcggag  | tccgagaaaa  | tctggaagag | taaaaaagga | gtagaaacat  | tttgaagcta  | 1620 |
| tggtgtgtgg  | gggatccgca  | caaacgaagg | tctcactgat | cgcttgccctg | taacttacac  | 1680 |
| gcgcctcgta  | tcttttaattg | atggaataat | ttgggaattt | actctgtgtt  | tatttatattt | 1740 |
| tatgttttgt  | atttggtattt | tagaaagtaa | ataaagaagg | tagaagagtt  | acggaatgaa  | 1800 |
| gaaaaaaaaa  | taaacaaagg  | tttaaaaaat | ttcaacaaaa | agcgtacttt  | acatatatat  | 1860 |
| ttattagaca  | agaaaagcag  | attaaataga | tatacattcg | attaacgata  | agtaaaatgt  | 1920 |
| aaaatcacag  | gattttcgtg  | tgtggtcttc | tacacagaca | agatgaaaca  | attcggcatt  | 1980 |

|                                                                      |      |
|----------------------------------------------------------------------|------|
| aatacctgag agcaggaaga gcaagataaa aggtagtatt tgttggcgat ccccctagag    | 2040 |
| tctttttacat cttcggaaaa caaaaactat tttttcttta atttcttttt ttacttttcta  | 2100 |
| tttttaattt atatatattat attaaaaaat tttaaattata attatttttta tagcacgtga | 2160 |
| tgaaaaggac ccatcgataa gctggtagcg agctcggatc ccggtctgca tctgcggatc    | 2220 |
| ctctttgaaa agataatgta tgattatgct ttcactcata tttatacaga aacttgatgt    | 2280 |
| tttctttcga gtatatacaa ggtgattaca tgtacgtttg aagtacaact ctagattttg    | 2340 |
| tagtgccctc ttgggctagc ggtaaagggtg cgcatttttt cacaccctac aatgttctgt   | 2400 |
| tcaaaaagatt ttggtcaaac gctgtagaag tgaaagtggg tgcgcatgtt tcggcgttcg   | 2460 |
| aaacttctcc gcagtgaaag ataaatgatc gaatttctac tgttgtagat gtgtaggaac    | 2520 |
| atcaacatgc tcaatttttt tgttttttat gtctcctgca ggttttaaaga ttacggatat   | 2580 |
| ttaacttact tagaataatg ccattttttt gagttataat aatcctacgt tagtgtgagc    | 2640 |
| gggattttaa ctgtgaggac cttaatacat tcagacactt ctgcggtatc accctactta    | 2700 |
| ttcccttcga gattatatct aggaacccat caggttgggtg gaagattacc cgttctaaga   | 2760 |
| cttttcagct tcctctattg atgttacacc tggacacccc ttttctggca tccagttttt    | 2820 |
| aatcttcagt ggcatgtgag attctccgaa attaattaaa gcaatcacac aatgctctcg    | 2880 |
| gataccacct cggttgaaac tgacagggtg tttgttacgc atgctaatagc aaaggagcct   | 2940 |
| atataccttt ggctcggctg ctgtaacagg gaatataaag ggcagcataa tttaggagtt    | 3000 |
| tagtgaactt gcaacattta ctattttccc ttcttacgta aatatttttc tttttaattc    | 3060 |
| taaatcaatc tttttcaatt ttttgtttgt attcttttct tgcttaaadc tataactaca    | 3120 |
| aaaaacacat acataaacta aaaatggctc ccaaaaagaa aaggaagggtg atgaagtcct   | 3180 |
| tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg aaagaggata    | 3240 |
| agaaaaagtg caagtccac ttggaattgc aagaattcgt tgacatttcc tacaagacct     | 3300 |
| tgaagtcac tgctaccatt gctgaatcct tgaacgaaat cgaattgggtc aaaaagtgcg    | 3360 |
| aaagggtgcta ctccgaaatt atcaagttcc atgaagcttg ggggtcaaadc tactgtagaa  | 3420 |
| ctaaccaaat tgccgtctac aaggactggt atagacaatt ggctagaaag gccagattcg    | 3480 |
| atgttggtga tcaaaactct caactgatca ccttgtcatc cttatcttct aagcacaacg    | 3540 |
| tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac aacattgcc     | 3600 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| gacaaaagtc tttcctgaag gatttctctc aacaattgaa gcagtacaag agagctttgg   | 3660 |
| aaaattctga taaggctcat accaagccaa acctgattaa cttcaacaag accttctcca   | 3720 |
| ttttggccaa cttggttaac gaaattgtca tcccattgtc caacggtgct atttcttttc   | 3780 |
| caaacatctc caagttggaa gatgggtgaag aatccagaca tttgattgaa ttcgctctga  | 3840 |
| acgattactc cgatttgggtt ggttctattg gtgaattgaa ggatgctatt gctaccaatg  | 3900 |
| gtggttatac tccatttgct aaggttacct tgaaccatta cactgctgaa caaaagccac   | 3960 |
| acgttttcaa gaacgatatt gatgccaaga tccgtgagtt gaagttgatt gagttggctg   | 4020 |
| aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag ttcgacaagt   | 4080 |
| tcaagatcta cgatgataga aacatctccg ttatcattag aaccaatgc tttaagtaca    | 4140 |
| agccccattcc atttttgggtc aagcacgaat tggctaagta tatcgctgaa gatgaagatg | 4200 |
| ccgttttgaa ggttttggat gcaattgggtg ctactagatc tccagctcat gattacgctc  | 4260 |
| ataatgaaga tgtttttgac ttgaatcact acccaatcaa ggttgctttt gattacgcat   | 4320 |
| gggaacaatt ggctaacgggt gtctacacta ctgttacttt cccaaaagaa cagtgcgaga  | 4380 |
| agtacttgaa ggatgttttt gattgcgaag tctccaaaga accagttttt aagttctacg   | 4440 |
| ccgacctgtt gtacatcaga aagaatttgg ctgttttgga gcacaagaac aacctgccat   | 4500 |
| ctaatcaaga ggaattcatc tgcaagatta acaacacctt cgagaacatc gttctgccat   | 4560 |
| acaagattaa agagttcgaa acctacaaga aggatatctt ggcctggatt aacgatggta   | 4620 |
| gaggtcacga aaagtacacc gatgctaaac aacagttggg ttttattaga ggtgggtctga  | 4680 |
| aaggtagaat caaggctcaa aagatgttca gaaaagacaa gtacggtaag atcaagtcct   | 4740 |
| actacgaaaa cccatacact aagttgacca acgaattcaa gcaaattctt tctacctacg   | 4800 |
| gtaaaaacctt cgctgaattg agagacaagt tcaaagaaaa gaacaacatc accaagatca  | 4860 |
| cccatttcgg tattatcatc gaagataaca acaaagacag atacttggtg gccaacgggt   | 4920 |
| tgcaacacga acaaatcaac catgtcgaag ccattttggg taagttgaac acctcatccg   | 4980 |
| aattcatcac ctaccaagtt aagtctttga cctctaagac cctgatcaag ctgattaaga   | 5040 |
| atcataccac caagaagggt gcaatttctc catatgctga tttccatact tctaagatcc   | 5100 |
| atgttgattg gaccaagatc aagaaagaat gggacaacta caagagagaa caagtcttgt   | 5160 |
| tgcaatacgt taaggattgc ttgaccgatt ctaccatggc taagaatcaa aattgggctg   | 5220 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| aatttggttg gaacttcgag aagtgtact cctacgaaga tatcgaacac gaaatcgatc    | 5280 |
| agaagtctta catcttgcaa aagcatacca tttccaagca atctattgct tctttggttg   | 5340 |
| aaggtaggttg tttgttggtg ccaattatca accaggacat cacctctcaa ggtcgttaagg | 5400 |
| acaagaatca gttctccaag gattggaagc aaatcttcga aggttccaaa gaattcagat   | 5460 |
| tgcattccaga attcgccgtt tcttacagaa ctccaattaa ggactacca aaggataaaa   | 5520 |
| gatacggttag attgcaattc gtttgcgctt ttaactgcga aatcatccca caaatggtg   | 5580 |
| agttcatcaa cttgaagaag cagatcgaga acttcaacga cgaagatgct caaaaagaag   | 5640 |
| ccgtcgaaga gttcaacaaa aaggttaacc atgccttggt gggtaaagaa tacgttggtta  | 5700 |
| ttggtatcga cagaggcttg aagcaattag ctactttgtg tgttttggac aagaggggta   | 5760 |
| agattttggg tgactttgaa atctacaaaa aagagttcgt cagagccgaa aagagatcta   | 5820 |
| agaattactg gaagcacacc ttggctgaaa ccagacatat cttggacttg tctaacttga   | 5880 |
| gagttgaaac taccattgag gataataagg tgttggttga tcaatctttg aactgggtca   | 5940 |
| agaagaacag agatactcca gatgaagaag ctaccgaaga aaacaagcag aagattaagt   | 6000 |
| tgaagcagct gtcctacatt agaaagttgc aacacaagat gcagaccaat gaacaagatg   | 6060 |
| tcttggaact gatcaacaac gaaccatctg atgaagaatt caaaaagagg atcgagggct   | 6120 |
| tgatttcttc attcggtgaa ggtcaaaaagt acgctgattt gcctattaac accatgaggg  | 6180 |
| aaatgatctc tgacttgcaa ggtgttattg ccagaggaaa caatcagact gagaaaaaca   | 6240 |
| agatcatcga attggatgct gccgacaatt tgaaacaagg tatcgttgct aacatgatcg   | 6300 |
| gtatcgtaa ctacattttc gccaaagtact cctacaaggc ctacatttct ttagaagatt   | 6360 |
| tgtccagagc ttacggtggt gcaaaatctg gttatgatgg tagatatttg ccatccacct   | 6420 |
| ctcaagatga ggatgttgac tttaaagaac agcagaatca aatgttggct ggcttgggta   | 6480 |
| cttaccaatt tttgaaatg cagctgctga aaaagctgca gaagatccaa tctgataaca    | 6540 |
| ccgttttgag atttggtcca gcttttagat ccgccgataa ctacagaaat atcatcaagt   | 6600 |
| tggaagagac taagtacaag tctaagccat tcggtgttgt tcatttcacg gatccaaagt   | 6660 |
| tcacatctaa gaagtgtcca gtttgctcta agactaacgt ttacagagat aaggatgaca   | 6720 |
| tcctgggtctg taaagaatgt ggttttaggt ccgactcaca gttgaaagaa agggaaaaca  | 6780 |
| acatccacta catccacaat ggtgatgata atggtgctta ccatattgcc ttgaagtccg   | 6840 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| tcgaaaactt gattcagatg aagtaagcgg ccgcaatgcc ggcgcaatga ttgaatagtc  | 6900 |
| aaagatTTTT tttttttaat tttttttttt taattttttt tttttttcat agaactTTTT  | 6960 |
| atttaaataa atcacgtcta tatatgtatc agtataacgt aaaaaaaaaa acaccgtcag  | 7020 |
| ttaaacaaaa cataaataaa aaaaaaaaga agtgtcaa caagtgtcaa atggccctgc    | 7080 |
| attaatgaat cggccaacgc gcggggagag gcggtttgcg tattgggcgc tcttccgctt  | 7140 |
| cctcgctcac tgactcgctg cgctcggtcg ttcggctgcg gcgagcggta tcagctcact  | 7200 |
| caaaggcggg aatacgggta tccacagaat caggggataa cgcaggaaag aacatgtgag  | 7260 |
| caaaaggcca gcaaaaggcc aggaaccgta aaaaggccgc gttgctggcg tttttccata  | 7320 |
| ggctccgccc ccctgacgag catcacaaaa atcgacgctc aagtcagagg tggcgaaacc  | 7380 |
| cgacaggact ataaagatac caggcgtttc cccctggaag ctccctcgtg cgctctcctg  | 7440 |
| ttccgaccct gccgcttacc ggatacctgt ccgcctttct cccttcggga agcgtggcgc  | 7500 |
| tttctcatag ctcacgctgt aggtatctca gttcggtgta ggtcgttcgc tccaagctgg  | 7560 |
| gctgtgtgca cgaaccccc gttcagcccg accgctgcgc cttatccggt aactatcgtc   | 7620 |
| ttgagtccaa cccggtaaga cacgacttat cgccactggc agcagccact ggtaacagga  | 7680 |
| ttagcagagc gaggtatgta ggcggtgcta cagagtcttt gaagtgggtg cctaactacg  | 7740 |
| gctacactag aagaacagta tttggtatct gcgctctgct gaagccagtt accttcggaa  | 7800 |
| aaagagttgg tagctcttga tccggcaaac aaaccaccgc tggtagcggg ggTTTTTTTT  | 7860 |
| tttgcaagca gcagattacg cgcagaaaaa aaggatctca agaagatcct ttgatctttt  | 7920 |
| ctacgggggtc tgacgctcag tggaacgaaa actcacgta agggattttg gtcatgagat  | 7980 |
| tatcaaaaag gatcttcacc tagatccttt taaattaaaa atgaagtttt aaatcaatct  | 8040 |
| aaagtatata tgagtaaact tgggtctgaca gttaccaatg cttaatcagt gaggcaccta | 8100 |
| tctcagcgat ctgtctatTT cgttcatcca tagttgcctg actccccgtc gtgtagataa  | 8160 |
| ctacgatacg ggagggctta ccatctggcc ccagtgcctg aatgataccg cgagaccac   | 8220 |
| gctcaccggc tccagattta tcagcaataa accagccagc cggaagggc              | 8269 |

<210> 32

<211> 8272

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/SuCms1 vector system

<400> 32

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agcttgcaaa ttaaagcctt cgagcgtccc aaaaccttct caagcaaggt tttcagtata  | 60   |
| atgttacatg cgtacacgcg tctgtacaga aaaaaaagaa aaatttgaaa tataaataac  | 120  |
| gttcttaata ctaacataac tataaaaaaa taaataggga cctagacttc aggttgtcta  | 180  |
| actccttcct tttcggttag agcggatgtg gggggagggc gtgaatgtaa gcgtgacata  | 240  |
| actaattaca tgatatcgac aaaggaaaag ggggacggat ctccgaggcc tcggaccctg  | 300  |
| cgggccgcgt cggacgtgtc agtcctgctc ctcgcaattg ttagaaaaac tcatcgagca  | 360  |
| tcaaataaaa ctgcaattta ttcatatcag gattatcaat accatatattt tgaaaaagcc | 420  |
| gtttctgtaa tgaaggagaa aactcaccga ggacagttcca taggatggca agatcctggg | 480  |
| atcgggtctgc gattccgact cgtccaacat caatacaacc tattaatttc ccctcgtcaa | 540  |
| aaataagggt atcaagtgag aaatcaccat gagtgacgac tgaatccggg gagaatggca  | 600  |
| aaagcttatg catttctttc cagacttggt caacaggcca gccattacgc tcgtcatcaa  | 660  |
| aatcactcgc atcaacaaaa ccgttattca ttcgtgattg cgcctgagcg aggcgaaata  | 720  |
| cgcgatcgtc gttaaaaagga caattacaaa caggaatcga atgcaaccgg cgcaggaaca | 780  |
| ctgccagcgc atcaacaata ttttcacctg aatcaggata ttcttctaata acctggaatg | 840  |
| ctgttttgcc ggggatcgca gtgggtgagta accatgcatc atcaggagta cggataaaat | 900  |
| gcttgatggg cggaagaggc ataaattccg tcagccagtt tagtctgacc atctcatctg  | 960  |
| taacatcatt ggcaacgcta cctttgccat gtttcagaaa caactctggc gcatcgggct  | 1020 |
| tcccatacaa tcgatagatt gtcgcacctg attgcccgc attatcgca gccatttat     | 1080 |
| acccatataa atcagcatcc atgttggaat ttaatcgcg cctcgaaacg tgagtctttt   | 1140 |
| ccttaccat ggtttagttc ctcacctgt cgtattatac tatgccgata tactatgccg    | 1200 |
| atgattaatt gtcaacaccg cccttagatt agattgctat gctttctttc taatgagcaa  | 1260 |
| gaagtaaaaa aagttgtaat agaacaagaa aaatgaaact gaaacttgag aaattgaaga  | 1320 |
| ccgtttatta acttaaatat caatgggagg tcatcgaaa agaaaaaaat caaaaaaaaa   | 1380 |
| aattttcaag aaaaagaaac gtgataaaaa tttttattgc ctttttcgac gaagaaaaag  | 1440 |
| aaacgaggcg gtctcttttt tcttttccaa accttagta cgggtaatta acgacaccct   | 1500 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agaggaagaa agaggggaaa tttagtatgc tgtgcttggg tgttttgaag tgggtacggcg | 1560 |
| atgcgcggag tccgagaaaa tctggaagag taaaaaagga gtagaaacat tttgaagcta  | 1620 |
| tgggtgtgtgg gggatccgca caaacgaagg tctcactgat cgcttgcctg taacttacac | 1680 |
| gcgcctcgta tcttttaatg atggaataat ttgggaattt actctgtgtt tattttatttt | 1740 |
| tatgttttgt atttggattt tagaaagtaa ataaagaagg tagaagagtt acggaatgaa  | 1800 |
| gaaaaaaaaa taaacaaagg tttaaaaaat ttcaacaaaa agcgtacttt acatatatat  | 1860 |
| ttattagaca agaaaagcag attaaataga tatacattcg attaacgata agtaaaatgt  | 1920 |
| aaaatcacag gattttcgtg tgtggtcttc tacacagaca agatgaaaca attcggcatt  | 1980 |
| aatacctgag agcaggaaga gcaagataaa aggtagtatt tgttggcgat ccccctagag  | 2040 |
| tcttttacat cttcggaaaa caaaaactat ttttcttta atttcttttt ttactttcta   | 2100 |
| tttttaattt atatatttat attaaaaaat tttaaattata attattttta tagcacgtga | 2160 |
| tgaaaaggac ccatcgataa gctggtaccg agctcggatc ccggtctgca tctgcggatc  | 2220 |
| ctctttgaaa agataatgta tgattatgct ttcactcata tttatacaga aacttgatgt  | 2280 |
| tttctttcga gtatatacaa ggtgattaca tgtacgtttg aagtacaact ctagattttg  | 2340 |
| tagtgccctc ttgggctagc ggtaaagggtg cgcatttttt cacaccctac aatgttctgt | 2400 |
| tcaaaaagatt ttggtcaaac gctgtagaag tgaaagtggg tgcgcatggt tcggcgttcg | 2460 |
| aaacttctcc gcagtgaag ataaatgac gaatttctac tgttgtagat gtgtaggaac    | 2520 |
| atcaacatgc tcaatttttt tgttttttat gtctcctgca ggtttaaaga ttacggatat  | 2580 |
| ttaacttact tagaataatg ccattttttt gagttataat aatcctacgt tagtgtgagc  | 2640 |
| gggatttaaa ctgtgaggac cttaatacat tcagacactt ctgcggtatc accctactta  | 2700 |
| ttcccttcga gattatatct aggaacccat caggttggtg gaagattacc cgttctaaga  | 2760 |
| cttttcagct tcctctattg atgttacacc tggacacccc ttttctggca tccagttttt  | 2820 |
| aatcttcagt ggcatgtgag attctccgaa attaattaaa gcaatcacac aattctctcg  | 2880 |
| gataccacct cggttgaaac tgacaggtgg tttgttacgc atgctaatagc aaaggagcct | 2940 |
| atataccttt ggctcggctg ctgtaacagg gaatataaag ggcagcataa tttaggagtt  | 3000 |
| tagtgaactt gcaacattta ctattttccc ttcttacgta aatatttttc tttttaattc  | 3060 |
| taaatcaatc tttttcaatt ttttgtttgt attcttttct tgcttaaatac tataactaca | 3120 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| aaaaacacat acataaacta aaaatggctc caaaaaagaa aaggaagggtg atgttgcatg  | 3180 |
| ccttcaccaa tcaataccaa ttgtctaaga ctttgagatt cggtgccact ttgaaagaag   | 3240 |
| atgagaaaaa gtgcaagtcc cacgaagaat tgaagggttt cgttgatatc tcctacgaga   | 3300 |
| acatgaagtc ctctgctact attgctgaat ccttgaacga aaacgagttg gtcaaaaagt   | 3360 |
| gtgaaagggtg ctactctgaa atcgtcaagt ttcataatgc ctgggagaag atctactaca  | 3420 |
| gaactgatca aattgccgtc tacaaggact tctacagaca gttgtctaga aaggctagat   | 3480 |
| ttgatgctgg taagcaaaac tccaattga ttactttggc ttctttgtgc ggtatgtacc    | 3540 |
| aagggtgctaa attgtccaga tatatcacca attactggaa ggacaacatc accagacaaa  | 3600 |
| agtctttctt gaaggatttc tccaacaat tgcatacagta cactagagct ttggaaaagt   | 3660 |
| ctgataaggc tcataccaag ccaaacttga tcaacttcaa caagaccttc atggttttgg   | 3720 |
| ccaacttggg taacgaaatc gttatcccat tgtccaacgg tgctatttct ttcccaaaca   | 3780 |
| tctctaagtt ggaagatggg gaagaatccc acttgattga attcgctttg aacgactact   | 3840 |
| ctcagttgtc tgaattgatc ggtgaattga aagatgctat tgctaccaat ggtgggttaca  | 3900 |
| ctccatttgc taaggttacc ttgaatcatt acaccgctga acaaaagcca cacgttttca   | 3960 |
| agaatgatat cgatgccaag atccgtgagt tgaaattgat aggtttgggtc gaaaccttga  | 4020 |
| agggcaaadc ctctgaacaa atcgaagagt actttagcaa cctggataag ttctctacct   | 4080 |
| acaacgacag aaatcaatcc gttatcgta gaaccaatg cttcaagtat aagcccattc     | 4140 |
| catttttggg caagcaccaa ttggcaaagt acatctctga acctaattggg tgggatgaag  | 4200 |
| atgctgttgc aaaagttttg gatgcagttg gtgctattag atctccagct catgattacg   | 4260 |
| ctaacaatca agaaggtttt gacttgaatc actaccaat caaggttgct tttgattacg    | 4320 |
| catgggaaca attggctaac tccttgtaac ctactgttac tttcccacaa gaaatgtgcg   | 4380 |
| agaagtactt gaattctatc tacggttgcg aagtctcaa agaaccagtt ttttaagttct   | 4440 |
| acgccgacct gttgtacatc agaaagaatt tggctgtttt ggagcacaag aacaacctgc   | 4500 |
| catctaataca agagggaattc atctgcaaga ttaacaacac cttcgagaac atcgttctgc | 4560 |
| catacaagat ttctcaattc gaaacctaca agaaggatat cttggcctgg attaacgatg   | 4620 |
| gtcatgatca caaaaagtac accgatgcta aacaacagtt gggttttatt agagggtgtc   | 4680 |
| tgaaaggtag aatcaaggct gaagaagttt ccaaaaaaga caagtacggg aagatcaagt   | 4740 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| cctactacga aaacccatac actaagttga ccaacgaatt caagcaaadc tcttctacct  | 4800 |
| acggtaaaac cttcgctgaa ttgagagaca agttcaaaga aaagaacgag atcaccaaga  | 4860 |
| tcacccattt cgggtattatc atcgaagata agaacaggga cagatacttg ttggcctcag | 4920 |
| aattgaaaca cgaacaaadc aaccatgtct ccaccatctt gaacaagttg gataagtcac  | 4980 |
| ccgaattcat cacctacca gtttaagtcct tgacctctaa gacctgatc aagctgatta   | 5040 |
| agaatcatac caccaagaag ggtgcaattt ctccatatgc tgatttccat acttctaaga  | 5100 |
| ccggctttta caaaaacgag atcgaaaaga actgggacaa ctacaagaga gaacaagtct  | 5160 |
| tggttgaata cgtaaggat tgcttgaccg attctaccat ggctaagaat caaaattggg   | 5220 |
| ctgaatttgg ttggaacttc gagaagtga actcctacga agatatcga cacgaaatcg    | 5280 |
| atcagaagtc ttacttggtg caatccgaca ccatttccaa gcaatctatt gcttctttgg  | 5340 |
| ttgaagggtg ttgtttgttg ttgccaatta tcaaccagga catcacctct aaagaacgta  | 5400 |
| aggacaagaa tcagttctcc aaggattgga accatatctt cgaagggtcc aaagaattca  | 5460 |
| gattgcatcc agaattcgcc gtttcttaca gaactccaat tgaagggtac ccagtccaaa  | 5520 |
| aaagatacgg tagattgcaa ttcgtttgcg cttttaacgc tcatatcggt ccacaaaatg  | 5580 |
| gtgagttcat caacttgaag aagcagatcg agaacttcaa cgacgaagat gttcaaaaga  | 5640 |
| gaaacgttac cgagttcaac aaaaagggtta accatgcctt gtccgacaaa gaatacgttg | 5700 |
| ttattgggtat cgacagaggc ttgaagcaat tagctacttt gtgtgttttg gacaagaggg | 5760 |
| gtaagatttt ggggtgacttt gaaatctaca aaaaagagtt cgtcagagcc gaaaagagat | 5820 |
| ctgaatctca ttgggaacat actcaagctg aaaccagaca tatcttggac ttgtctaact  | 5880 |
| tgagagttga aactaccatt gagggcaaaa aggtgttggt tgatcaatct ttgacactgg  | 5940 |
| tcaagaagaa cagagatact ccagatgaag aagctaccga agaaaacaag cagaagatta  | 6000 |
| agttgaagca gctgtcctac attagaaagt tgcaacacaa gatgcagacc aatgaacaag  | 6060 |
| atgtcttgga cctgatcaac aacgaacct ctgatgaaga attcaaaaag aggatcgagg   | 6120 |
| gcttgatttc ttcattcggg gaagggtcaaa agtacgctga tttgcctatt aacacctga  | 6180 |
| gggaaatgat ctctgacttg caagggtgta ttgccagagg aaacaatcag actgagaaaa  | 6240 |
| acaagatcat cgaattggat gctgccgaca atttgaaaca aggtatcggt gctaacatga  | 6300 |
| tcggtatcgt taactacatt ttcgccaagt actcctacaa ggcctacatt tctttagaag  | 6360 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| atttgtccag agcttacggt ggtgcaaaat ctggttatga tggtagatat ttgccatcca  | 6420 |
| cctctcaaga tgaggatggt gacttttaaag aacagcagaa tcaaatgttg gctggcttgg | 6480 |
| gtacttacca attttttgaa atgcagctgc tgaaaaagct gcagaagatc caatctgata  | 6540 |
| acaccgtttt gagatttggt ccagctttta gatccgccga taactacaga aatatcttga  | 6600 |
| gattggaaga gactaagtac aagtctaagc cattcggtgt tgttcatttc atcgatccaa  | 6660 |
| agttcacatc taagaagtgt ccagtttgct ctaagactaa cgtttacaga gataaggatg  | 6720 |
| acatcctggt ctgtaaagaa tgtgggtttta ggtccgactc acagttgaaa gaaagggaaa | 6780 |
| acaacatcca ctacatccac aatggtgatg ataatggtgc ttaccatatt gccttgaagt  | 6840 |
| ccgtcgaaaa cttgattcag atgaagtaag cggccgcaat gccggcgcaa tgattgaata  | 6900 |
| gtcaaagatt tttttttttt aatttttttt ttttaatttt tttttttttt catagaactt  | 6960 |
| tttatttaaa taaatcacgt ctatatatgt atcagtataa cgtaaaaaaa aaaacaccgt  | 7020 |
| cagttaaaca aaacataaat aaaaaaaaaa agaagtgtca aatcaagtgt caaatggccc  | 7080 |
| tgcattaatg aatcggccaa cgcgcgggga gaggcggttt gcgtattggg cgctcttccg  | 7140 |
| cttcctcgct cactgactcg ctgcgctcgg tcgttcggct gcggcgagcg gtatcagctc  | 7200 |
| actcaaaggc ggtaatacgg ttatccacag aatcagggga taacgcagga aagaacatgt  | 7260 |
| gagcaaaagg ccagcaaaag gccaggaacc gtaaaaaggc cgcgttgctg gcgtttttcc  | 7320 |
| ataggctccg cccccctgac gagcatcaca aaaatcgacg ctcaagtcag aggtggcgaa  | 7380 |
| acccgacagg actataaaga taccaggcgt ttccccctgg aagctccctc gtgcgctctc  | 7440 |
| ctgttccgac cctgccgctt accggatacc tgtccgcctt tctcccttcg ggaagcgtgg  | 7500 |
| cgcttttctca tagctcacgc tgtaggtatc tcagttcggg ttaggtcggt cgctccaagc | 7560 |
| tgggctgtgt gcacgaaccc cccgttcagc ccgaccgctg cgccttatcc ggtaactatc  | 7620 |
| gtcttgagtc caaccggta agacacgact tatcgccact ggcagcagcc actggtaaca   | 7680 |
| ggattagcag agcgaggtat gtaggcggtg ctacagagtt cttgaagtgg tggcctaact  | 7740 |
| acggctacac tagaagaaca gtatttggtt tctgcgctct gctgaagcca gttaccttcg  | 7800 |
| gaaaaagagt tggtagctct tgatccggca aacaaaccac cgctggtagc ggtgggtttt  | 7860 |
| ttgtttgcaa gcagcagatt acgcgcagaa aaaaaggatc tcaagaagat cctttgatct  | 7920 |
| tttctacggg gtctgacgct cagtggaacg aaaactcacg ttaagggatt ttggtcatga  | 7980 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gattatcaaa aaggatcttc acctagatcc ttttaaatta aaaatgaagt tttaaataca  | 8040 |
| tctaaagtat atatgagtaa acttgggtctg acagttacca atgcttaatc agtgaggcac | 8100 |
| ctatctcagc gatctgtcta tttcgttcat ccatagttgc ctgactcccc gtcgtgtaga  | 8160 |
| taactacgat acgggagggc ttaccatctg gccccagtgc tgcaatgata ccgcgagacc  | 8220 |
| cacgctcacc ggctccagat ttatcagcaa taaaccagcc agccggaagg gc          | 8272 |

<210> 33

<211> 8404

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/SeqID63 vector system

<400> 33

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| agcttgcaaa ttaaaacctt cgagcgtccc aaaaccttct caagcaaggt tttcagtata  | 60  |
| atgttacatg cgtacacgcg tctgtacaga aaaaaaagaa aaatttgaaa tataaataac  | 120 |
| gttcttaata ctaacataac tataaaaaaa taaataggga cctagacttc aggttgtcta  | 180 |
| actccttcct tttcggttag agcggatgtg gggggagggc gtgaatgtaa gcgtgacata  | 240 |
| actaattaca tgatatcgac aaaggaaaag ggggacggat ctccgaggcc tcggacccgt  | 300 |
| cgggccgcgt cggacgtgtc agtcctgctc ctcgcaattg ttagaaaaac tcatcgagca  | 360 |
| tcaaatgaaa ctgcaattta ttcatatcag gattatcaat accatatttt tgaaaaagcc  | 420 |
| gtttctgtaa tgaaggagaa aactcaccga ggcagttcca taggatggca agatcctggt  | 480 |
| atcgggtctgc gattccgact cgtccaacat caatacaacc tattaatttc ccctcgtcaa | 540 |
| aaataagggt atcaagtgag aaatcaccat gagtgacgac tgaatccggt gagaatggca  | 600 |
| aaagcttatg catttctttc cagacttggt caacaggcca gccattacgc tcgtcatcaa  | 660 |
| aatcactcgc atcaacaaa ccgttattca ttcgtgattg cgcctgagcg aggcgaaata   | 720 |
| cgcgatcgct gttaaaagga caattacaaa caggaatcga atgcaaccgg cgcaggaaca  | 780 |
| ctgccagcgc atcaacaata ttttcacctg aatcaggata ttcttctaata acctggaatg | 840 |
| ctgttttgcc ggggatcgca gtggtgagta accatgcatc atcaggagta cggataaaat  | 900 |
| gcttgatggt cggaagaggc ataaattccg tcagccagtt tagtctgacc atctcatctg  | 960 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| taacatcatt ggcaacgcta cctttgccat gtttcagaaa caactctggc gcatcgggct   | 1020 |
| tcccatacaa tcgatagatt gtcgcacctg attgcccgcac attatcgcga gcccatthtat | 1080 |
| acccatataa atcagcatcc atgttggaat ttaatcgcgg cctcgaaacg tgagtctttt   | 1140 |
| ccttaccat ggtttagttc ctcaccttgt cgtattatac tatgccgata tactatgccg    | 1200 |
| atgattaatt gtcaacaccg cccttagatt agattgctat gctttctttc taatgagcaa   | 1260 |
| gaagtaaaaa aagttgtaat agaacaagaa aaatgaaact gaaacttgag aaattgaaga   | 1320 |
| ccgtttatta acttaaatat caatgggagg tcatcgaaag agaaaaaat caaaaaaaaa    | 1380 |
| aatthtcaag aaaaagaaac gtgataaaaa thtttattgc cthtttcgac gaagaaaaag   | 1440 |
| aaacgaggcg gtctctthtt tctthttcaa acctthtagta cgggtaatta acgacaccct  | 1500 |
| agaggaagaa agaggggaaa tttagtatgc tgtgcttggg tgthttgaag tggtagggcg   | 1560 |
| atgcgcggag tccgagaaaa tctggaagag taaaaaagga gtagaaacat thtgaagcta   | 1620 |
| tgggtgtgtg gggatccgca caaacgaagg tctcactgat cgcttgccctg taacttacac  | 1680 |
| gcgcctcgta tctthttaatg atggaataat ttgggaattt actctgtgtt taththttt   | 1740 |
| tatgtthttgt atthggattt tagaaagtaa ataaagaagg tagaagagtt acggaatgaa  | 1800 |
| gaaaaaaaaa taaacaaagg thtaaaaaat thcaacaaaa agcgtactth acatathatat  | 1860 |
| thattagaca agaaaagcag attaaataga tathacttcg attaacgata agtaaaatgt   | 1920 |
| aaaatcacag gaththtcgtg tgtgggtctt tacacagaca agatgaaaca atthggcatt  | 1980 |
| aatactgag agcaggaaga gcaagataaa aggtagtatt tgthggcgat ccccttagag    | 2040 |
| tctthttacat cthtcgaaaa caaaaactat thttthctth atthctthtt thactthtcta | 2100 |
| ththtaattt ataththtt atttaaaaa thtaattata atthththta tagcacgtga     | 2160 |
| tgaaaaggac ccatcgataa gctggtaccg agctcggatc ccggtctgca tctgcggatc   | 2220 |
| ctctthgaaa agataatgta tgattatgct thcactcata thtatacaga aacttgatgt   | 2280 |
| thtctthtga gtatatacaa ggtgattaca tgtacgtthg aagtacaact ctagaththt   | 2340 |
| tagtgccctc thgggctagc ggtaaaggth cgcatththt cacaccctac aatgttctgt   | 2400 |
| tcaaaagatt thgggtcaaac gctgtagaag tgaaagthgg tgcgcatgtt tcggcgthtcg | 2460 |
| aaactthtcc gcagtgaag ataaatgatc gaaththtct tgthttagat gtgtaggaac    | 2520 |
| atcaacatgc tcaaththtt tgthththtt gtctcctgca ggtthtaaga thacggatat   | 2580 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| ttaacttact tagaataatg ccattttttt gagttataat aatcctacgt tagtgtgagc   | 2640 |
| gggatttaaa ctgtgaggac cttaatacat tcagacactt ctgcggtatc accctactta   | 2700 |
| ttcccttcga gattatatct aggaacccat caggttggtg gaagattacc cgttctaaga   | 2760 |
| cttttcagct tcctctattg atgttacacc tggacacccc ttttctggca tccagttttt   | 2820 |
| aatcttcagt ggcatgtgag attctccgaa attaattaaa gcaatcacac aattctctcg   | 2880 |
| gataccacct cggttgaaac tgacagggtg tttgttacgc atgctaatagc aaaggagcct  | 2940 |
| atataccttt ggctcggctg ctgtaacagg gaatataaag ggcagcataa tttaggagtt   | 3000 |
| tagtgaactt gcaacattta ctattttccc ttcttacgta aatatttttc tttttaattc   | 3060 |
| taaatcaatc tttttcaatt tttgtttgt attcttttct tgcttaaatac tataactaca   | 3120 |
| aaaaacacat acataaacta aaaatggctc caaaaaagaa aaggaagggtg atgaagtcct  | 3180 |
| tcgaaaactc ctgccaaatt tctaagactt tgagattcgg tgccactttg aaagaggata   | 3240 |
| agaaaaagtg caagtcccac gaagaattgc aagaattcgt tgacatttcc tacaagacca   | 3300 |
| tgaagtcatac tgctaccatt gctgaatcct tgaacgaaat cgaattgggtc aaaaagtgcg | 3360 |
| aaagggtgcta ctccgaaatt atcaagttcc atgaagcttg ggtcaaatc tactgtagaa   | 3420 |
| ctgatcaaat tgccgtctac aaggacttct atagacaatt ggctagaaag gccagattcg   | 3480 |
| atgttggtga tcaaaactct caactgatca cttgtcatc cttatcttct aagcacaacg    | 3540 |
| tttaccaggg tttgaagaga tctcaacata ttaccaacta ctggaaggac aacattgcc    | 3600 |
| gacaaaagtc tttcctgaag gatttctctc aacaattgca ccagtacaag agagctttgg   | 3660 |
| aaaattctga taaggctcat accaagccaa acctgattaa cttcaacaag accttctcca   | 3720 |
| ttttggccaa cttggttaac gaaattgtca tcccattgtc caacgggtgct atttcttttc  | 3780 |
| caaacatctc caagttggaa gatggtgaag aatccagaca tttgattgaa ttcgctctga   | 3840 |
| acgattactc cgatttggtt ggttctattg gtgaattgaa ggatgctatt gctaccaatg   | 3900 |
| gtggttatac tccatttgct aaggttacct tgaaccatta cactgctgaa caaaagccac   | 3960 |
| acgttttcaa gaacgatatt gatgccaaga tccgtgagtt gaagttgatt gagttggctg   | 4020 |
| aaaagttgaa gaacaagacg tccaagcaaa tcgaagagta cttttccaag ttcgacaagt   | 4080 |
| tcaagatcta cgatgataga aaccagtccg ttatcattag aaccaatgc ttttaagtaca   | 4140 |
| agcccattcc atttttggtc aagcacgaat tggctaagta tatcgctgaa gatgaagatg   | 4200 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ccgttttgaa gggttttgat gcaattgggt ctactagatc tccagctcat gattacgctc  | 4260 |
| ataacgaaga tggttttcgac ttgaaacact acccaatcaa gggtgctttt gattacgcat | 4320 |
| gggaacaatt ggcaaatggg gtttacacta ctgtctcatt ccctgaagaa aagtgcagag  | 4380 |
| aatacttgaa tgctatctac gggtgcgaag ttaccaaaga accagttttt aagttctacg  | 4440 |
| ccgacctgtt gtacatcaga aagaatttgg ctgttttgga gcacaagaac aacttgccat  | 4500 |
| ctaattccaga agaattcatc tgcaagattg agaacacttt cgagaagatc gttctgccct | 4560 |
| acaagatcaa agaattcgaa acttacaaga aggccatctt gacctggatt aacgatggta  | 4620 |
| gaggtcacga aaagtacacc gattctaaaa gagaattggg tttgatcaga ggtggtttga  | 4680 |
| aaggtagaat tggtgcccaa aagatgttcc gtaaaaacaa gaaaggtagg ttgatcccct  | 4740 |
| actacgaaaa tccatacact aagttgacta acgagttcaa gaacatctcc tcctcttacg  | 4800 |
| gtaaaacttt cgctgaattg aggataagt tcaaagagaa gtctgagatt accaagatca   | 4860 |
| cccatttcgg tatcatcatc gaagataaca acaaggacag atacttggtt gctaattggct | 4920 |
| tgcaacatga taacaccgat caatctaaca cccaagttga agccattttg ggtaaattga  | 4980 |
| acacctcttt ggaattcact acctaccaag ttaagtcctt gacctccaag attctgatca  | 5040 |
| agttgattaa gaaccatacc acctctcaa atgctaaatc tccatacgct gatttccata   | 5100 |
| cctctaagat tcatgttgat tggacgaaga tcaagaaaga atgggatacc tacaagtcca  | 5160 |
| accactcttt gttgcaatat gttaaggact gtttgaccaa ctctaccatg gctaagaatc  | 5220 |
| aaaattgggc tgaattcggg tgggacttag aatcttgtaa ttcctacgaa gccatcgaac  | 5280 |
| acgagattga tcaaaagtcc tacatcttgc aaaagcacac catttctaag gcctccatta  | 5340 |
| agtctttggg tgaaaacggg tgtctgttgt tgccaatcgt caatcaagat attacctctc  | 5400 |
| aaggtcgtaa ggacaagaat caattttcta aggactggaa gcaaattctt caggactcta  | 5460 |
| aagagtacag attgcatcct gaatttgccg tttcttacag aacccaatc aaagattatc   | 5520 |
| caaaggataa gaggtacggc agattgcaat tcatttgtgc tttcaactgc gaaatcatcc  | 5580 |
| cacaaaatgg tgagttcatc aacctgaaga agcagatcga aaacttcaac gacgaagata  | 5640 |
| tcacaaaagaa caatgtcgcc gaattcaaca acaaagttaa cgaagctttg ctgggcaaag | 5700 |
| aatacgttgt tatttggtatc gatagaggct tgaaacagtt ggctactttg tgtgttttaa | 5760 |
| acaagagggg taagatcttg ggtgacttcg agatctacaa gaaagagttt gttagaaccg  | 5820 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agaacaggtc taagaattac tggaacata ctttggccga aaccagacat atcctggatt   | 5880 |
| tgtctaattt gagagttgaa accaccgttg aggataacaa agttttggtc gatcaatcct  | 5940 |
| tgacgttggt caagaagaat agagatactc cagacgaaaa agccaccgaa gagaatagac  | 6000 |
| aaaagatcaa gctgaagcag ctgtcctaca ttagaaagtt gcaatacgct atgcagacca  | 6060 |
| acgaacaagc tgtttttagat ctgttgaagg ataactccga cgatgaggaa ttcaaaaaaa | 6120 |
| gagttgaagg cgtcatttcc ccatttggtg aaggtcaaga atatgctgat ttgcctattg  | 6180 |
| ataccatgag agccatgatt caagacttgc aaggtgttat tgctaagggt aacaagcaaa  | 6240 |
| ccgagaagaa caaaatcatt gaattggatg ctgccgactc tttgaaacaa ggtgtttag   | 6300 |
| ctaatatgat cggcgttggt aacttcatct tggccaaatt caattacgag gcctacgttt  | 6360 |
| ctttggagga tttgtcaaga gttacaatg ttgctaagtc tggttatgac ggtagatact   | 6420 |
| taccatccac ttctcaagat ccagatatgg acttcaaaga acaacagaat caaatgctag  | 6480 |
| ctggtttggg tacttaccag ttcttcgaaa ttcagctggt gaagaagttg cagaagatcc  | 6540 |
| aatccaacaa cactgttttg agatttgtcc cagcttttag atccgctgat aactacagaa  | 6600 |
| acatcatcaa actgaacccc aagtacgaca acactgaata tgttcataag ccattcggta  | 6660 |
| tcgttcactt cattgatcct aaggatacct cttctaagtg tccagtttgt ggtaagactg  | 6720 |
| gtaaaaagaa cgttgacaga aacgagaaga aaaacaacat cttgttgtgt aaggcttgcg  | 6780 |
| gttttagaac agtctgggaa ttgaaacaac cagagaacat caaatctgag ggttactgtt  | 6840 |
| tttccgagga cgaaattcaa aagaccatta agaacaatca aaaacagatg gaaatcaaga  | 6900 |
| agctgtccga taagaacatc cattacatcc ataacggtga tgataatggt gcttaccata  | 6960 |
| ttgccttgaa gtctgtcgag aatttgaagc acaaagaata agcggccgca atgccggcgc  | 7020 |
| aatgattgaa tagtcaaaga tttttttttt ttaatttttt ttttttaatt tttttttttt  | 7080 |
| ttcatagaac tttttattta aataaatcac gtctatatat gtatcagtat aacgtaaaaa  | 7140 |
| aaaaaacacc gtcagttaaa caaacataa ataaaaaaaa aaagaagtgt caaatcaagt   | 7200 |
| gtcaaatggc cctgcattaa tgaatcggcc aacgcgcggg gagaggcggg ttgcgtattg  | 7260 |
| ggcgctcttc cgcttcctcg ctactgact cgctgcgctc ggctgttcgg ctgcggcgag   | 7320 |
| cggtatcagc tctactcaaag gcggtaatac ggttatccac agaatcaggg gataacgcag | 7380 |
| gaaagaacat gtgagcaaaa ggccagcaaa aggccaggaa ccgtaaaaag gccgcgttgc  | 7440 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| tggcggttttt ccataggctc cgccccctg acgagcatca caaaaatcga cgctcaagtc  | 7500 |
| agagggtggcg aaacccgaca ggactataaa gataccaggc gtttccccct ggaagctccc | 7560 |
| tcgtgcgctc tcctgttccg accctgccgc ttaccggata cctgtccgcc tttctccctt  | 7620 |
| cgggaagcgt ggcgctttct catagctcac gctgtaggta tctcagttcg gtgtaggtcg  | 7680 |
| ttcgctccaa gctgggctgt gtgcacgaac cccccgttca gcccgaccgc tgcgccttat  | 7740 |
| ccggtaacta tcgtcttgag tccaacccgg taagacacga cttatcgcca ctggcagcag  | 7800 |
| ccactggtaa caggattagc agagcgaggc atgtaggcgg tgctacagag ttcttgaagt  | 7860 |
| ggtggcctaa ctacggctac actagaagaa cagtatttgg tatctgcgct ctgctgaagc  | 7920 |
| cagttacctt cggaaaaaga gttggtagct cttgatccgg caaacaacc accgctggta   | 7980 |
| gcggtgggtt ttttgtttgc aagcagcaga ttacgcgcag aaaaaaagga tctcaagaag  | 8040 |
| atcctttgat cttttctacg gggctctgacg ctcaaggtaa cgaaaactca cgtaaggga  | 8100 |
| ttttggtcat gagattatca aaaaggatct tcacctagat ctttttaaataaaaaatgaa   | 8160 |
| gttttaaatac aatctaaagt atatatgagt aaacttggtc tgacagttac caatgcttaa | 8220 |
| tcagtgaggc acctatctca gcgatctgtc tatttcgttc atccatagtt gcctgactcc  | 8280 |
| ccgtcgtgta gataactacg atacgggagg gcttaccatc tggccccagt gctgcaatga  | 8340 |
| taccgcgaga cccacgctca ccggctccag atttatcagc aataaaccag ccagccggaa  | 8400 |
| gggc                                                               | 8404 |

<210> 34  
 <211> 10407  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> CRISPR/BEC10\_Coli vector system

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| <400> 34                                                          |     |
| ccatgcttat ctccatgcgg tagggtgccg cacggttgcg gcacatgcg caatcagctg  | 60  |
| caacttttcg gcagcgcgac aacaattatg cgttgcgtaa aagtggcagt caattacaga | 120 |
| ttttctttaa cctacgcaat gagctattgc ggggggtgcc gcaatgagct gttgcgtacc | 180 |
| cccccttttt aagttgttga tttttaagtc tttcgcattt cgccctatat ctagttcttt | 240 |
| ggtgccccaa gaagggcacc cctgcggggt tccccacgc cttcggcgcg gctccccctc  | 300 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| cggcaaaaag tggccccctcc ggggcttggt gatcgactgc gcggccttcg gccttgccca | 360  |
| aggtggcgct gcccccttgg aacccccgca ctcgccgccg tgaggctcgg ggggcaggcg  | 420  |
| ggcgggcttc gccttcgact gccccactc gcataggctt gggtcgttcc aggcgcgtca   | 480  |
| aggccaagcc gctgcgcggt cgctgcgcga gccttgaccc gccttcactc tgggtgtccaa | 540  |
| ccggcaagcg aagcgcgcag gccgcaggcc ggaggctttt cccagagaa aattaaanaa   | 600  |
| attgatgggg caaggccgca ggccgcgcag ttggagccgg tgggtatgtg gtcgaaggct  | 660  |
| gggtagccgg tgggcaatcc ctgtggtcaa gctcgtgggc aggcgcagcc tgtccatcag  | 720  |
| cttgtccagc aggggtgtcc acgggccgag cgaagcgagc cagccggtgg ccgctcgcgg  | 780  |
| ccatcgtcca catatccacg ggctggcaag ggagcgcagc gaccgcgcag ggcgaagccc  | 840  |
| ggagagcaag cccgtagggc gccgcagccg ccgtagggcg tcacgacttt gcgaagcaaa  | 900  |
| gtctagttag tatactcaag cattgagtgg cccgccggag gcaccgcctt gcgctgcccc  | 960  |
| cgtcgagccg gttggacacc aaaagggagg ggcaggcatg gcggcatacg cgatcatgcg  | 1020 |
| atgcaagaag ctggcgaaaa tgggcaacgt ggcgccagct ctcaagcacg cctaccgcga  | 1080 |
| gcgcgagacg cccaacgctg acgccagcag gacgccagag aacgagcact gggcgggccag | 1140 |
| cagcaccgat gaagcgatgg gccgactgcg cgagttgctg ccagagaagc ggcgcaagga  | 1200 |
| cgctgtgttg gcggtcgagt acgtcatgac ggccagcccc gaatgggtgga agtcggccag | 1260 |
| ccaagaacag caggcggcgt tcttcgagaa ggcgcacaa tggctggcgg acaagtacgg   | 1320 |
| ggcggatcgc atcgtgacgg ccagcatcca ccgtgacgaa accagcccgc acatgaccgc  | 1380 |
| gttcgtggtg ccgctgacgc aggacggcag gctgtcggcc aaggagttca tcggcaacaa  | 1440 |
| agcgcagatg acccgcgacc agaccacgtt tgcggccgct gtggccgata tagggctgca  | 1500 |
| acggggcatc gagggcagca aggcacgtca cacgcgcatt caggcgttct acgaggccct  | 1560 |
| ggagcggcca ccagtgggac acgtcacatc cagcccgaag gcggtcgagc cacgcgccta  | 1620 |
| tgcaccgcag ggattggccg aaaagctggg aatctcaaag cgcgttgaga cgccggaagc  | 1680 |
| cgtggccgac cggctgacaa aagcggttcg gcaggggtat gagcctgccc tacaggccgc  | 1740 |
| cgcaggagcg cgtgagatgc gcaagaaggc cgatcaagcc caagagacgg cccgagacct  | 1800 |
| tcgggagcgc ctgaagcccg ttctggacgc cctggggccg ttgaatcggg atatgcaggc  | 1860 |
| caaggccgcc gcgatcatca aggccgtggg cgaaaagctg ctgacggaac agcgggaagt  | 1920 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ccagcgccag aaacaggccc agcgccagca ggaacgcggg cgcgcacatt tccccgaaaa  | 1980 |
| gtgccacctg aaccccagag tcccgtcag aagaactcgt caagaaggcg atagaaggcg   | 2040 |
| atgcgtgctg aatcgggagc ggcgataccg taaagcacga ggaagcggtc agcccattcg  | 2100 |
| ccgccaagct cttcagcaat atcacgggta gccaacgcta tgtcctgata gcggtccgcc  | 2160 |
| acacccagcc ggccacagtc gatgaatcca gaaaagcggc cattttccac catgatattc  | 2220 |
| ggcaagcagg catcgccatg ggtcacgacg agatcctcgc cgtcgggcat ccgcgcttg   | 2280 |
| agcctggcga acagttcggc tggcgcgagc ccctgatgct cttcgtccag atcatcctga  | 2340 |
| tcgacaagac cggcttccat ccgagtacgt gtcgctcga tgcgatgttt cgcttggtgg   | 2400 |
| tcgaatgggc aggtagccgg atcaagcgta tgcagccgcc gcattgcatc agccatgatg  | 2460 |
| gatactttct cggcaggagc aaggtgagat gacaggagat cctgccccgg cacttcgccc  | 2520 |
| aatagcagcc agtccccttc cgcttcagtg acaacgtcga gcacagctgc gcaaggaacg  | 2580 |
| cccgtcgtgg ccagccacga tagccgcgct gcctcgtctt ggagttcatt cagggcaccg  | 2640 |
| gacaggtcgg tcttgacaaa aagaaccggg cgccccctgcg ctgacagccg gaacacggcg | 2700 |
| gcatcagagc agccgattgt ctgttggtcc cagtcatagc cgaatagcct ctccacccaa  | 2760 |
| gcggccggag aacctgcgtg caatccatct tgttcaatca tgcgaaacga tcctcatcct  | 2820 |
| gtctcttgat cagatcttga tcccctgcgc catcagatcc ttggcggcaa gaaagccatc  | 2880 |
| cagtttactt tgcagggctt cccaacctta ccagagggcg cccagctgg caattccggt   | 2940 |
| tcgcttgctg tccataaaac cgcccagtct agctatcgcc atgtaagccc actgcaagct  | 3000 |
| acctgctttc tctttgcgct tgcgttttcc cttgtccaga tagcccagta gctgacattc  | 3060 |
| atccggggtc agcaccgttt ctgcggactg gctttctacg tgttccgctt cctttagcag  | 3120 |
| cccttgcgcc ctgagtgtt gcggcagcgt gaagctagca taaaacgaaa ggcccagtct   | 3180 |
| ttcgactgag cttttcgttt tatttgatgc ctggcagttc cctactctcg catggggaga  | 3240 |
| ccccacacta ccatcggcgc tacggcgttt cacttctgag ttcggcatgg ggtcaggtgg  | 3300 |
| gaccaccgcg ctactgccgc caggcaaaaa aaaaagtccc ggttgagtac atcgcaggat  | 3360 |
| ctacaacagt agaaattcga cctcattcta ttagactctc gtttggattg caactggtct  | 3420 |
| attttcctct tttgtttgat agaaaatcat aaaaggattt gcagactacg ggcctaaaga  | 3480 |
| actaaaaaat ctatctgttt cttttcattc tctgtatttt ttatagtttc tgttgcattg  | 3540 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| gctgcataat gtgcctgtca aatggacgaa gcagggattc tgcaaaccct atgctactcc   | 3600 |
| gtcaagccgt caattgtctg attcgttacc aattatgaca acttgacggc tacatcattc   | 3660 |
| actttttctt cacaaccggc acggaactcg ctcgggctgg ccccggtgca ttttttaa     | 3720 |
| acccgcgaga aatagagttg atcgtcaaaa ccaacattgc gaccgacggg ggcgataggc   | 3780 |
| atccgggtgg tgctcaaaag cagcttcgcc tggctgatac gttggtcctc gcgccagctt   | 3840 |
| aagacgctaa tccctaactg ctggcggaaa agatgtgaca gacgcgacgg cgacaagcaa   | 3900 |
| acatgctgtg cgacgctggc gatatacaaaa ttgctgtctg ccaggtgatac gctgatgtac | 3960 |
| tgacaagcct cgcgtacccg attatccatc ggtggatgga gcgactcgtt aatcgcttcc   | 4020 |
| atgcgccgca gtaacaattg ctcaagcaga tttatcgcca gcagctccga atagcgccct   | 4080 |
| tccccttgcc cggcgtaaat gatttgccca aacaggctgc tgaaatgcgg ctggtgcgct   | 4140 |
| tcacccgggc gaaagaaccc cgtattggca aatattgacg gccagttaag ccattcatgc   | 4200 |
| cagtaggcgc gcggacgaaa gtaaaccac tggtgatacc attcgcgagc ctccggatga    | 4260 |
| cgaccgtagt gatgaatctc tcctggcggg aacagcaaaa tatcaccggc tcggcaaaca   | 4320 |
| aattctcgtc cctgattttt caccaccccc tgaccgcgaa tggtgagatt gagaatataa   | 4380 |
| cctttcattc ccagcggctg gtcgataaaa aaatcgagat aaccgttggc ctcaatcggc   | 4440 |
| gttaaaccgc ccaccagatg ggcattaaac gagtatcccg gcagcagggg atcattttgc   | 4500 |
| gcttcagcca tacttttcat actcccgcca ttcagagaag aaaccaattg tccatattgc   | 4560 |
| atcagacatt gccgtcactg cgtcttttac tggctcttct cgctaaccac accggtaac    | 4620 |
| ccgcttatta aaagcattct gtaacaaagc gggaccaaag ccatgacaaa aacgcgtaac   | 4680 |
| aaaagtgtct ataatcacgg cagaaaagtc cacattgatt atttgcacgg cgtcacactt   | 4740 |
| tgctatgcc tagcattttt atccataaga ttagcggatc ctacctgacg ctttttatcg    | 4800 |
| caactctcta ctgtttctcc ataccgttt tttggtaccg ggccccccct cgagtttatt    | 4860 |
| ttaggaggca aaaatgaaaa gctttgaaaa cagctgccag attagcaaaa ccctgcgttt   | 4920 |
| tggtgcaacc ctgaaagagg ataaaaagaa atgtaaaagc cacctggaac tgcaagaatt   | 4980 |
| tgtggatatt agctacaaga ccctgaaaag cagcgcaacc attgcagaaa gcctgaatga   | 5040 |
| aattgagctg gtgaaaaaat gcgaacgctg ctatagcgaa atcatcaaat ttcataagc    | 5100 |
| ctggggctcag atttattgtc gtaccaatca gattgccgtg taaaagatt ggtatcgtca   | 5160 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| gctggcacgt aaagcacgtt ttgatgttgg tgatcagaat agccagctga ttaccctgag   | 5220 |
| cagcctgagt agcaaacata atgtttatca gggctctgaaa cgcagccagc atattaccaa  | 5280 |
| ttattggaaa gataacattg cccgtcagaa aagcttcttg aaagatttta gccagcagct   | 5340 |
| gaaacagtat aaacgtgcac tggaaaatag cgataaagca cataccaaac cgaacctgat   | 5400 |
| caacttcaat aaaaccttta gcattctggc caacctggtg aacgaaattg ttattccgct   | 5460 |
| gagcaatggg gcaattagct ttccgaatat cagcaaactg gaagatgggtg aagaaagccg  | 5520 |
| tcacttgatt gaatttgccc tgaatgatta tagcgatctg gttggtagca ttggcgaact   | 5580 |
| gaaagatgca attgccacca atgggtggta taccctgttt gcaaaaagta ccctgaacca   | 5640 |
| ttataccgca gaacagaaac cgcatgtgtt caaaaatgat atcgatgcca aaatccgtga   | 5700 |
| gctgaaactg attgaactgg ttgagaaact gaaaaacaaa accagcaagc agatcgaaga   | 5760 |
| gtacttcagc aaattcgaca agttcaaaat ctatgatgat cgcaacatca gcgtgattat   | 5820 |
| tcgtacccag tgctttaaat acaaaccgat tccgtttctg gtgaaacatg aactggccaa   | 5880 |
| atatatcgcc gaagatgaag atgcagttct gaaagtcttg gatgccattg gtgcgacccg   | 5940 |
| tagtccggca catgattatg cacataatga agatgtgttc gatctgaacc actatccgat   | 6000 |
| taaagtggca ttgattatg cctgggaaca gctggcaaat ggtgtgtata ccaccgtgac    | 6060 |
| ctttccgaaa gaacagtgtg aaaaatatct gaaggatgtg ttgattgcg aggttagcaa    | 6120 |
| agaaccgggtg tttaaatctt atgccgatct gctgtatatc cgcaaaaatc tggccgttct  | 6180 |
| ggaacataaa aacaatctgc cgagcaacca agaagagttc atttgcaaaa tcaacaacac   | 6240 |
| cttcgaaaac atcgtgctgc cgtataaaat caaagagttc gaaacctaca aaaaagacat   | 6300 |
| cctggcctgg attaatgatg gtcgtggtca tgagaaatat accgatgcaa aacagcagct   | 6360 |
| gggttttatt cgtgggtggtc tgaaagggtcg tattaaagcc cagaaaatgt tccgcaaaga | 6420 |
| taagtacggg aagatcaaaa gctattatga gaaccctgat accaaactga ccaacgaatt   | 6480 |
| taagcagatc agcagcacct atggcaaaac ctttgccgaa ctgcgtgata agtttaaaga   | 6540 |
| gaagaacaac atcaccaaaa tcaccactt tggcatcatc atcgaggata ataacaaga     | 6600 |
| tcgttatctg ctggccaatg gtctgcagca tgagcagatt aatcatgttg aagcaattct   | 6660 |
| gggcaaaactg aataccagca gcgaatttat cacctatcag gttaaaagcc tgaccagtaa  | 6720 |
| aaccctgatt aagctgatta aaaaccatac caccaaaaag ggtgcgatta gcccgatatgc  | 6780 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agattttcat accagcaaaa ttcattgtgga ctggacgaaa atcaaaaaag agtgggataa | 6840 |
| ctataagcgc gaacagggttc tgctgcagta tgtaaagat tgtctgaccg atagcaccat  | 6900 |
| ggccaaaaat cagaattggg cagaatttgg ctggaacttt gaaaaatgca acagctatga  | 6960 |
| agatatcgag cacgagattg accagaaaaag ttatatcctg cagaaacaca ccatctccaa | 7020 |
| acagagcatt gcaagcctgg ttgaagggtg ttgtctgctg ctgccgatta ttaaccagga  | 7080 |
| tattacctca cagggtcgca aagacaaaaa ccagtttagt aaagattgga agcagatctt  | 7140 |
| tgaaggcagc aaagaatttc gtctgcatcc ggaatttgca gttagctatc gtaccccgat  | 7200 |
| caaagattat ccgaaagata aacgttatgg tcgcctgcag tttgtttgtg cttttaactg  | 7260 |
| tgaaatcatt ccgcagaatg gcgaattcat caatctgaaa aagcagattg agaacttcaa  | 7320 |
| cgatgaggat gcacagaaaag aagccgttga agaattcaac aaaaaagtga atcatgccct | 7380 |
| gctgggcaaa gaatatgttg tgattggtat tgatcgtggc ctgaaacaac tggcaaccct  | 7440 |
| gtgtgttctg gataaacgtg gtaaaatcct gggcgatttt gagatctaca agaaagaatt  | 7500 |
| cgttcgtgcc gaaaaacgca gcaaaaacta ttggaaacac aactggcag aaaccgtca    | 7560 |
| tattctggat ctgagcaatc tgcgtgttga aaccacaatc gaagataaca aagtgcgtgt  | 7620 |
| tgatcagagt ctgaccctgg ttaaaaagaa tcgtgataca ccggatgaag aagccaccga  | 7680 |
| agaaaaataaa cagaagatca aactgaagca gctgagctat attcgtaaac tgcagcataa | 7740 |
| aatgcagacc aatgaacagg atgttctgga cctgattaat aacgaaccga gcgacgaaga  | 7800 |
| atttaagaaa cgtattgaag gtctgattag cagctttggt gaaggtcaga aatatgcgga  | 7860 |
| tctgcctatt aataccatgc gcgaaatgat tagtgatctg cagggtgtta ttgccgtgg   | 7920 |
| taataatcag acagagaaaa acaagatcat cgaactggat gcagccgata atctgaaaca  | 7980 |
| gggtattggt gcaaactatg ttggcatcgt gaactacatc ttgccaat acagctacaa    | 8040 |
| agcctataatc agcctggaag atctgagccg tgcatatggt ggtgcaaaaa gcggttatga | 8100 |
| tggaagctat ctgccgtcaa ccagccagga cgaagatgtg gattttaaag aacagcagaa  | 8160 |
| tcagatgctg gcaggctctg gtacatatca gttttttgaa atgcagctgc tgaagaagct  | 8220 |
| gcagaaaatt cagagcgata atacgtttct gcgctttgtt ccggcatttc gtagcgaga   | 8280 |
| taactatcgc aatattatca agctggaaga aaccaaatac aaaagcaaac cgtttggcgt  | 8340 |
| ggtgcacttt attgatccga aatttacgag caaaaaatgt ccggtttgca gcaaaaccaa  | 8400 |

|                                                                    |       |
|--------------------------------------------------------------------|-------|
| tgtgtatcgt gataaagatg acattctggt gtgtaaagaa tgcggttttc gtagtgatag  | 8460  |
| tcagctgaaa gaacgcgaaa acaacatcca ctatattcat aatggtgatg acaacggtgc  | 8520  |
| ctatcatatt gcactgaaaa gcgtggaaaa tctgatccag atgaaataat ggtctagagg  | 8580  |
| tcgaaattca aattgtgagc ggataacaat ttgaattttc tgtatgaggt tttgctaaac  | 8640  |
| aactttcaac agtttcagtg gaggagaat agaaaggaac aactaaagga attgcgaata   | 8700  |
| ataatttttt cacgttgaaa atctccaaaa aaaaaggctc caaaaggagc ctttaattgt  | 8760  |
| atcggtttat cagcttgctt tcgaggtgaa ttttgaccct ctagcgaaaa tgcaagagca  | 8820  |
| aagacgaaaa catgccacac atgaggaata ccgattctct cattaacata ttcaggccag  | 8880  |
| ttatctgggc ttaaaagcag aagtccaacc cagataacga tcatatacat ggttctctcc  | 8940  |
| agaggttcat tactgaacac tcgtccgaga ataacgagtg gatcccctcc aattcgccct  | 9000  |
| atagtgagtc gtattacgcg cgctcactgg ccgtcgtttt acaacgtcgt gactgggaaa  | 9060  |
| accctggcgt tacccaactt aatcgccctg cagcacatcc ccctttcgcc agctggcgta  | 9120  |
| atagcgaaga ggcccgacc gatcgccctt cccaacagtt gcgcagcctg aatggcgaat   | 9180  |
| ggaaattgta agcgtaata ttttgtaaa attcgcgtta aatttttggt aaatcagctc    | 9240  |
| attttttaac caataggccg actgcgatga gtggcagggc ggggcgtaat ttttttaagg  | 9300  |
| cagttattgg tgcccttaaa cgctgggtgc tacgcctgaa taagtataa taagcggatg   | 9360  |
| aatggcagaa attcgaaagc aaattcgacc cggtcgtcgg ttcagggcag ggtcgttaaa  | 9420  |
| tagccgctta tgtctattgc tggtttaccg gtttattgac taccggaagc agtgtgaccg  | 9480  |
| tgtgcttctc aaatgcctga ggccagtttg ctgaggctct ccccgtaggag gtaataattg | 9540  |
| acgatatgat catttattct gcctcccaga gcctgataaa aacggtgaat ccgttagcga  | 9600  |
| ggtgccgccg gcttccattc aggtcgaggt ggcccggtc catgcaccgc gacgcaacgc   | 9660  |
| ggggaggcag acaaggtata gggcggcgag gcggctacag ccgatagtct ggaacagcgc  | 9720  |
| acttacgggt tgctgcgcaa cccaagtgt accggcgcgg cagcgtgacc cgtgtcggcg   | 9780  |
| gctccaacgg ctgccatcg tccagaaaac acggctcatc gggcatcggc aggcgtgct    | 9840  |
| gcccgcgccg ttcccatcc tccgtttcgg tcaaggctgg caggcttggt tccatgcccg   | 9900  |
| gaatgccggg ctggctgggc ggctcctcgc cggggccggg cggtagtgtg tgctcgcccg  | 9960  |
| gatacagggt cgggatgcgg cgcaggtcgc catgccccaa cagcgattcg tcctggtcgt  | 10020 |

|                                                                    |       |
|--------------------------------------------------------------------|-------|
| cgtgatcaac caccacggcg gcactgaaca ccgacaggcg caactggtcg cggggctggc  | 10080 |
| cccacgccac gcggtcattg accacgtagg ccgacacggt gccggggccg ttgagcttca  | 10140 |
| cgacggagat ccagcgctcg gccaccaagt ccttgactgc gtattggacc gtccgcaaag  | 10200 |
| aacgtccgat gagcttggaa agtgtctttt ggctgaccac cacggcgttc tgggtggccca | 10260 |
| tctgcgccac gaggtgatgc agcagcattg ccgccgtggg tttcctcgca ataagcccgg  | 10320 |
| cccacgcctc atgcgctttg cgttccgttt gcacccagtg accgggcttg ttcttggctt  | 10380 |
| gaatgccgat ttctctggac tgcgtgg                                      | 10407 |

<210> 35

<211> 10410

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/SuCms1\_Coli vector system

<400> 35

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| ccatgcttat ctccatgcgg tagggtgccg cacggttgcg gcacatgcg caatcagctg   | 60  |
| caacttttcg gcagcgcgac aacaattatg cgttgcgtaa aagtggcagt caattacaga  | 120 |
| ttttctttaa cctacgcaat gagctattgc ggggggtgcc gcaatgagct gttgcgtacc  | 180 |
| cccccttttt aagttgttga tttttaagtc tttcgcattt cgccctatat ctagttcttt  | 240 |
| ggtgcccaaa gaagggcacc cctgcggggg tccccacgc cttcggcgcg gctccccctc   | 300 |
| cggcaaaaag tggcccctcc ggggcttggt gatcgactgc gcggccttcg gccttgccca  | 360 |
| aggtggcgct gcccccttgg aacccccgca ctgcgcgcg tgaggctcgg ggggcaggcg   | 420 |
| ggcgggcttc gccttcgact gccccactc gcataggctt gggtcgttcc aggcgcgtca   | 480 |
| aggccaagcc gctgcgcggt cgctgcgcga gccttgaccc gccttccact tgggtgtccaa | 540 |
| ccggcaagcg aagcgcgcag gccgcaggcc ggaggctttt cccagagaa aattaaanaa   | 600 |
| attgatgggg caaggccgca ggccgcgcag ttggagccgg tgggtatgtg gtcgaaggct  | 660 |
| gggtagccgg tgggcaatcc ctgtgggtcaa gctcgtgggc aggcgcagcc tgtccatcag | 720 |
| cttgtccagc agggttgtcc acgggcccag cgaagcgagc cagccggtgg ccgctcgcgg  | 780 |
| ccatcgtcca catatccacg ggctggcaag ggagcgcagc gaccgcgcag ggcgaagccc  | 840 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ggagagcaag cccgtagggc gccgcagccg ccgtaggcgg tcacgacttt gcgaagcaaa  | 900  |
| gtctagttag tatactcaag cattgagtgg cccgccggag gcaccgcctt gcgctgcccc  | 960  |
| cgtcgagccg gttggacacc aaaagggagg ggcaggcatg gcggcatacg cgatcatgcg  | 1020 |
| atgcaagaag ctggcgaaaa tgggcaacgt ggcgggcagt ctcaagcacg cctaccgcga  | 1080 |
| gcgcgagacg cccaacgctg acgccagcag gacgccagag aacgagcact gggcgggccag | 1140 |
| cagcaccgat gaagcgatgg gccgactgcg cgagttgctg ccagagaagc ggcgcaagga  | 1200 |
| cgctgtgttg gcggtcgagt acgtcatgac ggccagcccc gaatggtgga agtcggccag  | 1260 |
| ccaagaacag caggcggcgt tcttcgagaa ggcgcacaa tggctggcgg acaagtacgg   | 1320 |
| ggcggatcgc atcgtgacgg ccagcatcca ccgtgacgaa accagcccg acatgaccgc   | 1380 |
| gttcgtggtg ccgctgacgc aggacggcag gctgtcggcc aaggagttca tcggcaacaa  | 1440 |
| agcgcagatg acccgcgacc agaccacgtt tgcggccgct gtggccgatc tagggctgca  | 1500 |
| acggggcatc gagggcagca aggcacgtca cacgcgcatt caggcgttct acgaggccct  | 1560 |
| ggagcggcca ccagtgggccc acgtcaccat cagcccga gcggtcgagc cacgcgccta   | 1620 |
| tgcaccgcag ggattggccc aaaagctggg aatctcaaag cgcgttgaga cgccggaagc  | 1680 |
| cgtggccgac cggctgacaa aagcggttcg gcaggggtat gagcctgccc tacaggccgc  | 1740 |
| cgcaggagcg cgtgagatgc gcaagaaggc cgatcaagcc caagagacgg cccgagacct  | 1800 |
| tcgggagcgc ctgaagcccc ttctggacgc cctggggccc ttgaatcggg atatgcaggc  | 1860 |
| caaggccgcc gcgatcatca aggccgtggg cgaaaagctg ctgacggaac agcgggaagt  | 1920 |
| ccagcgccag aaacaggccc agcgccagca ggaacgcggg cgcgcacatt tccccgaaaa  | 1980 |
| gtgccacctg aaccccagag tcccgtcag aagaactcgt caagaaggcg atagaaggcg   | 2040 |
| atgcgctgcg aatcgggagc ggcgataccg taaagcacga ggaagcggtc agcccattcg  | 2100 |
| ccgccaagct cttcagcaat atcacgggta gccaacgcta tgtcctgata gcggtccgcc  | 2160 |
| acacccagcc ggccacagtc gatgaatcca gaaaagcggc cattttccac catgatattc  | 2220 |
| ggcaagcagg catcgccatg ggtcacgacg agatcctcgc cgtcgggcat ccgcgccttg  | 2280 |
| agcctggcga acagttcggc tggcgcgagc ccctgatgct cttcgtccag atcatcctga  | 2340 |
| tcgacaagac cggcttccat ccgagtacgt gctcgctcga tgcgatgttt cgcttggtgg  | 2400 |
| tcgaatgggc aggtagccgg atcaagcgta tgcagccgcc gcattgcatc agccatgatg  | 2460 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gatacttttct cggcaggagc aaggtgagat gacaggagat cctgccccgg cacttcgccc | 2520 |
| aatagcagcc agtcccttcc cgcttcagtgc acaacgtcga gcacagctgc gcaaggaacg | 2580 |
| cccgtcgtgg ccagccacga tagccgcgct gcctcgtctt ggagttcatt cagggcaccg  | 2640 |
| gacaggtcgg tcttgacaaa aagaaccggg cgccccctgcg ctgacagccg gaacacggcg | 2700 |
| gcatcagagc agccgattgt ctgttggtgc cagtcatagc cgaatagcct ctccacccaa  | 2760 |
| gcggccggag aacctgcgtg caatccatct tgttcaatca tgcgaaacga tcctcatcct  | 2820 |
| gtctcttgat cagatcttga tcccctgcgc catcagatcc ttggcggcaa gaaagccatc  | 2880 |
| cagtttactt tgcaggggctt cccaacctta ccagagggcg cccagctgg caattccggt  | 2940 |
| tcgcttgctg tccataaaac cgcccagtct agctatcgcc atgtaagccc actgcaagct  | 3000 |
| acctgctttc tctttgcgct tgcgttttcc cttgtccaga tagcccagta gctgacattc  | 3060 |
| atccggggtc agcaccgttt ctgcggactg gctttctacg tgttccgctt cctttagcag  | 3120 |
| cccttgcgcc ctgagtgtt gcggcagcgt gaagctagca taaaacgaaa ggcccagtct   | 3180 |
| ttcgactgag cctttcgttt tatttgatgc ctggcagttc cctactctcg catggggaga  | 3240 |
| ccccacacta ccatcggcgc tacggcgttt cacttctgag ttcggcatgg ggtcaggtgg  | 3300 |
| gaccaccgcg ctactgccgc caggcaaaaa aaaaagtccc ggttgagtac atcgcaggat  | 3360 |
| ctacaacagt agaaattcga cctcattcta ttagactctc gtttggttg caactggtct   | 3420 |
| attttcctct tttgtttgat agaaaatcat aaaaggattt gcagactacg ggcctaaaga  | 3480 |
| actaaaaaat ctatctgttt cttttcattc tctgtatttt ttatagtttc tgttgcatgg  | 3540 |
| gctgcataat gtgcctgtca aatggacgaa gcagggattc tgcaaaccct atgctactcc  | 3600 |
| gtcaagccgt caattgtctg attcgttacc aattatgaca acttgacggc tacatcattc  | 3660 |
| actttttctt cacaaccggc acggaactcg ctcgggctgg ccccggtgca ttttttaa    | 3720 |
| acccgcgaga aatagagttg atcgtcaaaa ccaacattgc gaccgacggt ggcgataggc  | 3780 |
| atccgggtgg tgctcaaaaag cagcttcgcc tggctgatac gttggtcctc gcgccagctt | 3840 |
| aagacgctaa tccctaactg ctggcggaaa agatgtgaca gacgcgacgg cgacaagcaa  | 3900 |
| acatgctgtg cgacgctggc gatatcaaaa ttgctgtctg ccaggtgatc gctgatgtac  | 3960 |
| tgacaagcct cgcgtacccg attatccatc ggtggatgga gcgactcgtt aatcgcttcc  | 4020 |
| atgcgccgca gtaacaattg ctcaagcaga tttatcgcca gcagctccga atagcgccct  | 4080 |

|             |            |            |             |            |             |      |
|-------------|------------|------------|-------------|------------|-------------|------|
| tcccccttgcc | cggcgttaat | gatttgccca | aacaggtcgc  | tgaaatgcgg | ctggtgcgct  | 4140 |
| tcatccgggc  | gaaagaaccc | cgtattggca | aatattgacg  | gccagttaag | ccattcatgc  | 4200 |
| cagtaggcgc  | gcggacgaaa | gtaaaccac  | tggtgatacc  | attcgcgagc | ctccggatga  | 4260 |
| cgaccgtagt  | gatgaatctc | tcctggcggg | aacagcaaaa  | tatcacccgg | tcggcaaaca  | 4320 |
| aattctcgtc  | cctgattttt | caccaccccc | tgaccgcgaa  | tggtgagatt | gagaatataa  | 4380 |
| cctttcattc  | ccagcggtcg | gtcgataaaa | aaatcgagat  | aaccgttggc | ctcaatcggc  | 4440 |
| gttaaaccgc  | ccaccagatg | ggcattaaac | gagtatcccg  | gcagcagggg | atcattttgc  | 4500 |
| gcttcagcca  | tacttttcat | actcccgcga | ttcagagaag  | aaaccaattg | tccatattgc  | 4560 |
| atcagacatt  | gccgtcactg | cgtcttttac | tggtcttctt  | cgctaaccac | accggttaacc | 4620 |
| ccgcttatta  | aaagcattct | gtaacaaagc | gggaccaaag  | ccatgacaaa | aacgcgtaac  | 4680 |
| aaaagtgtct  | ataatcacgg | cagaaaagtc | cacattgatt  | atttgcacgg | cgtcacactt  | 4740 |
| tgctatgcca  | tagcattttt | atccataaga | ttagcggatc  | ctacctgacg | ctttttatcg  | 4800 |
| caactctcta  | ctgtttctcc | atacccgttt | tttgggtaccg | ggccccccct | cgagttttatt | 4860 |
| ttaggaggca  | aaaatgctgc | atgcatttac | caatcagtat  | cagctgagca | aaaccctgcg  | 4920 |
| ttttggtgca  | accctgaaag | aagatgagaa | aaaatgcaaa  | agccacgagg | aactgaaagg  | 4980 |
| ctttgttgat  | attagctatg | aaaacatgaa | aagcagcgca  | accattgcag | aaagcctgaa  | 5040 |
| tgaaaatgag  | ctggtgaaaa | aatgtgaacg | ctgctatagc  | gagatcgtga | aattccataa  | 5100 |
| tgccctgggag | aaaatctatt | atcgcaccga | tcagattgcc  | gtgtataaag | atttttatcg  | 5160 |
| tcagctgagt  | cgcaaagcac | gttttgatgc | aggtaaacag  | aatagccagc | tgattaccct  | 5220 |
| ggcaagcctg  | tgtggtatgt | atcagggtgc | aaaactgagc  | cgttatatta | ccaattactg  | 5280 |
| gaaggataac  | atcacccgtc | agaagagttt | tctgaaagat  | tttagccagc | agctgcatca  | 5340 |
| gtatacccg   | gactggaaa  | aaagcgataa | agcacatacc  | aaaccgaacc | tgatcaactt  | 5400 |
| caataaaacc  | tttatgggtc | tgGCCaatct | ggtgaacgaa  | attgttattc | cgctgagcaa  | 5460 |
| tggtgcaatt  | agctttccga | atatcagcaa | actggaagat  | ggtgaagaaa | gccatctgat  | 5520 |
| tgaatttgcc  | ctgaacgatt | attcacagct | gagcgaactg  | attggcgagc | tgaaagatgc  | 5580 |
| aattgccacc  | aatggtggtt | atacccggtt | tgcaaaagtt  | accctgaatc | attataccgc  | 5640 |
| agaacagaaa  | ccgcacgtgt | ttaaaaacga | tatcgaatgc  | aaaatccgcg | aactgaaact  | 5700 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gatcggctctg gttgaaacac tgaaaggtaa aagcagtga cagatcgaag aatatttcag  | 5760 |
| caacctggat aaattcagca cctataatga tcgtaaccag agcgttattg ttcgtaccca  | 5820 |
| gtgctttaaa taaaaaccga ttccgtttct ggtgaaacat caactggcca aatatatcag  | 5880 |
| cgaaccgaat ggttgggatg aagatgcagt tgcgaaagtt ctggatgccg ttggtgccat  | 5940 |
| tcgtagtccg gcacatgatt atgcaaataa ccaagaaggc tttgatctga accactatcc  | 6000 |
| gattaaagtg gcctttgatt atgcgtggga acagctggca aatagcctgt ataccaccgt  | 6060 |
| tacctttccg caagaaatgt gcgaaaaata tctgaacagc atctatgggt gcgaagttag  | 6120 |
| caaagaaccg gtgttttaaat tctatgccga tctgctgtat atccgcaaaa atctggcagt | 6180 |
| tctggaacac aaaaataacc tgccgagcaa tcaagaagag ttcattctga aaatcaacaa  | 6240 |
| cacctttgaa aacattgtgc tgccgtataa aatcagccag ttcgaaacct acaaaaaaga  | 6300 |
| tattctggcc tggattaacg atggccatga tcataaaaag tataccgatg caaaacagca  | 6360 |
| gctggggtttt attcgtggtg gtctgaaagg tcgtattaaa gcagaagaag ttagccagaa | 6420 |
| agacaagtac ggtaaaatca aaagctatta tgagaacccg tacaccaaac tgaccaacga  | 6480 |
| atttaagcag attagcagca catatggcaa aacctttgca gaactgcgcg acaaattcaa  | 6540 |
| agaaaaaac gagatcacca aaatcaccca ctttggcatt atcatcgaag ataaaaaccg   | 6600 |
| tgatcggtat ctgctggcaa gtgagctgaa acatgagcag attaatactg ttagcaccat  | 6660 |
| cctgaacaaa ctggataaaa gctcagaatt cattacctat caggtgaaaa gcctgaccag  | 6720 |
| taaaaccctg attaaactga tcaaaaacca taccacaaa aagggtgcga ttagcccgta   | 6780 |
| tgcagatttt cataccagca aaaccggctt caacaaaaat gagatcgaga aaaactggga  | 6840 |
| caactataaa cgtgaacagg tcctggttga gtatgttaaa gattgtctga ccgatagcac  | 6900 |
| catggccaaa aatcagaatt gggcagaatt tggctggaac ttgaaaagt gtaacagcta   | 6960 |
| tgaagatatt gagcacgaga ttgatcagaa aagctatctg ctgcagagcg ataccattag  | 7020 |
| caaacagagc attgcaagcc tggttgaagg tggttgtctg ctgctgccga ttattaacca  | 7080 |
| ggatattacc agtaaagagc gcaaagacaa aaaccagttc agcaaagatt ggaaccatat  | 7140 |
| ctttgaaggc agcaaagaat ttcgtctgca tccggaattt gcagttagct atcgtacccc  | 7200 |
| gattgaagggt tatccgggtc agaaacgtta tggctgtctg cagtttggtt gtgcatttaa | 7260 |
| tgcccatatt gttccgcaga atggcgaatt tatcaacctg aaaaagcaga ttgagaactt  | 7320 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| caacgatgag gatgtgcaga aacgtaatgt gaccgaattht aacaaaaaag tgaatcatgc | 7380 |
| cctgagcgc aaagaatatg ttgtgattgg tattgatcgc ggtctgaaac aactggcgc    | 7440 |
| cctgtgtgtt ctggataaac gtggtaaaat tctgggcgat ttcgagatct acaagaaaga  | 7500 |
| atttgttcgt gccgaaaaac gtagcgaaag ccattgggaa cacaccagg cagaaacccg   | 7560 |
| tcatattctg gatctgagca atctgcgtgt tgaaaccaca attgaaggta aaaaagtgc   | 7620 |
| ggttgatcag agtctgaccc tggttaaaaa gaatcgtgat acaccggatg aagaagccac  | 7680 |
| cgaagaaaat aaacagaaga tcaaactgaa gcagctgagc tatattcgt aactgcagca   | 7740 |
| taaaatgcag accaatgaac aggatgttct ggacctgatt aataacgaac cgagtgatga  | 7800 |
| ggaattcaaa aaacgtattg aaggcctgat ttccagcttt ggtgaaggtc agaaatatgc  | 7860 |
| ggatctgcct attaatacca tgcgcgaaat gattagcgat ctgcagggtg ttattgcacg  | 7920 |
| tggtataaat cagaccgaga agaacaaaat cattgaactg gatgcagccg ataacttgaa  | 7980 |
| acagggtatt gttgcaaaca tgattggcat cgtgaactac atctttgcca aatacagcta  | 8040 |
| caaagcctat atcagcctgg aagatctgag ccgtgcatat ggtggtgcaa aaagcggtta  | 8100 |
| tgatggtcgc tatctgccga gtaccagcca ggacgaagat gtggatttta aagaacagca  | 8160 |
| gaatcagatg ctggcaggtc tgggcaccta tcagtttttc gaaatgcaac tgctgaagaa  | 8220 |
| gctgcagaaa attcagagtg ataataccgt tctgcgcttt gttccggcat ttcgtagcgc  | 8280 |
| agataactat cgtaatatct tgcgtctgga agaaaccaag tataaaagca aaccgtttgg  | 8340 |
| cgtggtgcac ttatttgatc cgaaatttac gagcaaaaaa tgtccggttt gtagcaaac   | 8400 |
| caatgtgtac cgcgataaag atgacattct ggtttgtaaa gaatgcggtt ttcgtagtga  | 8460 |
| tagccaactg aaagaacgcg aaaacaacat ccattatatt cacaatgggtg atgacaacgg | 8520 |
| tgcctatcat attgcactga aaagcgtgga aaatctgac cagatgaaat aatggtctag   | 8580 |
| aggtcgaaat tcaaattgtg agcggataac aatttgaatt ttctgtatga ggttttgcta  | 8640 |
| aacaactttc aacagtttca gtggagttag aatagaaagg aacaactaaa ggaattgcga  | 8700 |
| ataataattt ttacagttg aaaatctcca aaaaaaagg ctccaaaagg agcctttaat    | 8760 |
| tgtatcgggt tatcagcttg ctttcgaggt gaattttgac cctctagcga aaatgcaaga  | 8820 |
| gcaaagacga aaacatgcc aacatgagga ataccgattc tctcattaac atattcaggc   | 8880 |
| cagttatctg ggcttaaaag cagaagtcca accagataa cgatcatata catggttctc   | 8940 |

|                                                                    |       |
|--------------------------------------------------------------------|-------|
| tccagagggtt cattactgaa cactcgtccg agaataacga gtggatcccc tccaattcgc | 9000  |
| cctatagtga gtcgtattac gcgcgctcac tggccgtcgt ttacaacgt cgtgactggg   | 9060  |
| aaaaccctgg cggtacccaa cttaatcgcc ttgcagcaca tccccctttc gccagctggc  | 9120  |
| gtaatagcga agaggcccg accgatcgcc cttcccaaca gttgcgcagc ctgaatggcg   | 9180  |
| aatggaaatt gtaagcgta atattttgtt aaaattcgcg ttaaattttt gttaaatacag  | 9240  |
| ctcatttttt aaccaatagg ccgactgcga tgagtggcag ggcggggcgt aattttttta  | 9300  |
| aggcagttat tggtgccctt aaacgcctgg tgctacgcct gaataagtga taataagcgg  | 9360  |
| atgaatggca gaaattcgaa agcaaattcg acccggtcgt cggttcaggg cagggtcgtt  | 9420  |
| aaatagccgc ttatgtctat tgctggttta ccggtttatt gactaccgga agcagtgtga  | 9480  |
| ccgtgtgctt ctcaaagcc tgaggccagt ttgctcaggc tctccccgtg gaggtaataa   | 9540  |
| ttgacgatat gatcatttat tctgcctccc agagcctgat aaaaacggtg aatccgttag  | 9600  |
| cgaggtgccg ccggcttcca ttcaggtcga ggtggcccgg ctccatgcac cgcgacgcaa  | 9660  |
| cgcggggagg cagacaaggt atagggcggc gaggcggcta cagccgatag tctggaacag  | 9720  |
| cgcacttacg ggttgctgcg caaccaagt gctaccggcg cggcagcgtg acccgtgtcg   | 9780  |
| gcggctccaa cggctcgcca tcgtccagaa aacacggctc atcgggcatc ggcaggcgct  | 9840  |
| gtgcccgcg ccgttcccat tcctccgttt cggcgaaggc tggcaggtct ggttccatgc   | 9900  |
| ccggaatgcc gggctggctg ggcggctcct cgccggggcc ggtcggtagt tgctgctcgc  | 9960  |
| ccggatacag ggtcgggatg cggcgcaggt cgccatgccc caacagcgat tcgtcctggt  | 10020 |
| cgtcgtgatc aaccaccacg gcggcactga acaccgacag gcgcaactgg tcgcggggct  | 10080 |
| ggccccacgc cacgcggtca ttgaccacgt aggccgacac ggtgccgggg ccgttgagct  | 10140 |
| tcacgacgga gatccagcgc tcggccacca agtccttgac tgcgtattgg accgtccgca  | 10200 |
| aagaacgtcc gatgagcttg gaaagtgtct tttggctgac caccacggcg ttctggtggc  | 10260 |
| ccatctgcgc cacgaggtga tgcagcagca ttgccgccgt gggtttcctc gcaataagcc  | 10320 |
| cggccccacgc ctcatgcgct ttgcgttccg tttgcacca gtgaccgggc ttgttcttgg  | 10380 |
| cttgaatgcc gatttctctg gactgcgtgg                                   | 10410 |

<210> 36

<211> 10542

<212> DNA

<213> Artificial Sequence

<220>

<223> CRISPR/SeqID63\_Coli vector system

<400> 36

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ccatgcttat ctccatgcgg tagggtgccg cacggttgcg gcaccatgcg caatcagctg  | 60   |
| caactttttcg gcagcgcgac aacaattatg cgttgcgtaa aagtggcagt caattacaga | 120  |
| ttttcttttaa cctacgcaat gagctattgc ggggggtgcc gcaatgagct gttgcgtacc | 180  |
| ccccTTTTT aagttgttga tttttaagtc tttcgcattt cgccctatat ctagttcttt   | 240  |
| ggtgccccaaa gaagggcacc cctgcgggggt tccccacgc cttcggcgcg gctccccctc | 300  |
| cggcaaaaag tggccccctcc ggggcttggt gatcgactgc gcggccttcg gccttgccca | 360  |
| aggtggcgct gcccccttgg aacccccgca ctcgccgccg tgaggctcgg ggggcaggcg  | 420  |
| ggcgggcttc gccttcgact gccccactc gcataggctt gggtcgttcc aggcgcgtca   | 480  |
| aggccaagcc gctgcgcggt cgctgcgcga gccttgacct gccttcact tgggtgtccaa  | 540  |
| ccggcaagcg aagcgcgcag gccgcaggcc ggaggctttt cccagagaa aattaaanaa   | 600  |
| attgatgggg caaggccgca ggccgcgcag ttggagccgg tgggtatgtg gtcgaaggct  | 660  |
| gggtagccgg tgggcaatcc ctgtggtcaa gctcgtgggc aggcgcagcc tgtccatcag  | 720  |
| cttgtccagc agggttgtcc acgggccgag cgaagcgagc cagccggtgg ccgctcgcgg  | 780  |
| ccatcgtcca catatccacg ggctggcaag ggagcgcagc gaccgcgcag ggcgaagccc  | 840  |
| ggagagcaag cccgtagggc gccgcagccg ccgtaggcgg tcacgacttt gcgaagcaaa  | 900  |
| gtctagttag tatactcaag cattgagtgg cccgccggag gcaccgcctt gcgctgcccc  | 960  |
| cgtcgagccg gttggacacc aaaagggagg ggcaggcatg gcggcatacg cgatcatgcg  | 1020 |
| atgcaagaag ctggcgaaaa tgggcaacgt ggcgggcagt ctcaagcacg cctaccgcga  | 1080 |
| gcgcgagacg cccaacgctg acgccagcag gacgccagag aacgagcact gggcggccag  | 1140 |
| cagcaccgat gaagcgatgg gccgactgcg cgagttgctg ccagagaagc ggcgcaagga  | 1200 |
| cgctgtgttg gcggtcgagt acgtcatgac ggccagcccg gaatggtgga agtcggccag  | 1260 |
| ccaagaacag caggcggcgt tcttcgagaa ggcgcacaa tggctggcgg acaagtacgg   | 1320 |
| ggcggatcgc atcgtgacgg ccagcatcca ccgtgacgaa accagccgcg acatgaccgc  | 1380 |
| gttcgtggtg ccgctgacgc aggacggcag gctgtcggcc aaggagttca tcggcaacaa  | 1440 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agcgcagatg acccgcgacc agaccacgtt tgcggccgct gtggccgatc tagggctgca  | 1500 |
| acggggcatc gagggcagca aggcacgtca cacgcgcatt caggcgttct acgaggccct  | 1560 |
| ggagcggcca ccagtgggcc acgtcaccat cagcccgcaa gcggtcgagc cacgcgccta  | 1620 |
| tgcaccgcag ggattggccg aaaagctggg aatctcaaag cgcgttgaga cgccggaagc  | 1680 |
| cgtggccgac cggctgacaa aagcggttcg gcaggggtat gagcctgccc tacaggccgc  | 1740 |
| cgcaggagcg cgtgagatgc gcaagaaggc cgatcaagcc caagagacgg cccgagacct  | 1800 |
| tcgggagcgc ctgaagcccc ttctggacgc cctggggccg ttgaatcggg atatgcaggc  | 1860 |
| caaggccgcc gcgatcatca aggccgtggg cgaaaagctg ctgacggaac agcgggaagt  | 1920 |
| ccagcgccag aaacaggccc agcgccagca ggaacgcggg cgcgcacatt tccccgaaaa  | 1980 |
| gtgccacctg aaccccagag tcccgctcag aagaactcgt caagaaggcg atagaaggcg  | 2040 |
| atgcgctgcg aatcgggagc ggcgataccg taaagcacga ggaagcggtc agcccattcg  | 2100 |
| ccgccaagct cttcagcaat atcacgggta gccaacgcta tgtcctgata gcggtccgcc  | 2160 |
| acacccagcc ggccacagtc gatgaatcca gaaaagcggc cattttccac catgatattc  | 2220 |
| ggcaagcagg catcgccatg ggtcacgacg agatcctcgc cgtcgggcat ccgcgccttg  | 2280 |
| agcctggcga acagttcggc tggcgcgagc ccctgatgct cttcgtccag atcatcctga  | 2340 |
| tcgacaagac cggcttccat ccgagtacgt gctcgctcga tgcgatgttt cgcttggtgg  | 2400 |
| tcgaatgggc aggtagccgg atcaagcgta tgcagccgcc gcattgcatc agccatgatg  | 2460 |
| gatactttct cggcaggagc aaggtgagat gacaggagat cctgccccgg cacttcgccc  | 2520 |
| aatagcagcc agtcccttcc cgcttcagtg acaacgtcga gcacagctgc gcaaggaacg  | 2580 |
| cccgtcgtgg ccagccacga tagccgcgct gcctcgtctt ggagttcatt cagggcacccg | 2640 |
| gacaggtcgg tcttgacaaa aagaaccggg cgcccctgcg ctgacagccg gaacacggcg  | 2700 |
| gcatcagagc agccgattgt ctgttggtgcc cagtcatagc cgaatagcct ctccacccaa | 2760 |
| gcggccggag aacctgcgtg caatccatct tgttcaatca tgcgaaacga tcctcatcct  | 2820 |
| gtctcttgat cagatcttga tcccctgcgc catcagatcc ttggcggcaa gaaagccatc  | 2880 |
| cagtttactt tgcagggtct cccaacctta ccagagggcg cccagctgg caattccggt   | 2940 |
| tcgcttgctg tccataaaac cgcccagtct agctatcgcc atgtaagccc actgcaagct  | 3000 |
| acctgctttc tctttgcgct tgcgttttcc cttgtccaga tagcccagta gctgacattc  | 3060 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| atccggggtc agcaccgttt ctgcggactg gctttctacg tgttccgctt ccttttagcag | 3120 |
| cccttgcgcc ctgagtgcctt gcggcagcgt gaagctagca taaaacgaaa ggcccagtct | 3180 |
| ttcgactgag cctttcgttt tatttgatgc ctggcagttc cctactctcg catggggaga  | 3240 |
| ccccacacta ccatcggcgc tacggcggtt cacttctgag ttcggcatgg ggtcaggtgg  | 3300 |
| gaccaccgcg ctactgccgc caggcaaaaa aaaaagtccc ggttgagtac atcgcaggat  | 3360 |
| ctacaacagt agaaattcga cctcattcta ttagactctc gtttgattg caactggctt   | 3420 |
| attttcctct tttgtttgat agaaaatcat aaaaggattt gcagactacg ggcctaaaga  | 3480 |
| actaaaaaat ctatctgttt cttttcattc tctgtatttt ttatagtttc tgttgcatgg  | 3540 |
| gctgcataat gtgcctgtca aatggacgaa gcagggattc tgcaaaccct atgctactcc  | 3600 |
| gtcaagccgt caattgtctg attcgttacc aattatgaca acttgacggc tacatcattc  | 3660 |
| actttttctt cacaaccggc acggaactcg ctccgggtgg ccccggtgca ttttttaa    | 3720 |
| acccgcgaga aatagagttg atcgtcaaaa ccaacattgc gaccgacggg ggcataggg   | 3780 |
| atccgggtgg tgctcaaaag cagcttcgcc tggctgatac gttggctctc gcgccagctt  | 3840 |
| aagacgctaa tccctaactg ctggcggaaa agatgtgaca gacgcgacgg cgacaagcaa  | 3900 |
| acatgctgtg cgacgctggc gatatacaaaa ttgctgtctg ccaggatgac gctgatgtac | 3960 |
| tgacaagcct cgcgtacccg attatccatc ggtggatgga gcgactcgtt aatcgcttcc  | 4020 |
| atgcgccgca gtaacaattg ctcaagcaga tttatcgcca gcagctccga atagcgccct  | 4080 |
| tccccttgcc cggcgtaaat gatttgcca aacaggtcgc tgaaatgcgg ctggtgcgct   | 4140 |
| tcatccgggc gaaagaacct cgtattggca aatattgacg gccagttaag ccattcatgc  | 4200 |
| cagtaggcgc gcggacgaaa gtaaacccac tggatgatac attcgcgagc ctccgatga   | 4260 |
| cgaccgtagt gatgaatctc tcctggcggg aacagcaaaa tatcacccgg tcggcaaaaca | 4320 |
| aattctcgtc cctgattttt caccaccccc tgaccgcgaa tggatgagatt gagaatataa | 4380 |
| cctttcattc ccagcggctg gtcgataaaa aaatcgagat aaccgttggc ctcaatcggc  | 4440 |
| gttaaaccgc ccaccagatg ggcatataac gagtatcccg gcagcagggg atcattttgc  | 4500 |
| gcttcagcca tacttttcat actcccgcca ttcagagaag aaaccaattg tccatattgc  | 4560 |
| atcagacatt gccgtcactg cgtcttttac tggctcttct cgctaaccac accggttaacc | 4620 |
| ccgcttatta aaagcattct gtaacaaaagc gggaccaaag ccatgacaaa aacgcgtaac | 4680 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| aaaagtgtct ataatcacgg cagaaaagtc cacattgatt atttgcacgg cgtcacactt  | 4740 |
| tgctatgcca tagcattttt atccataaga ttagcggatc ctacctgacg ctttttatcg  | 4800 |
| caactctcta ctgtttctcc ataccggtt tttggtaccg ggccccct cgagtttatt     | 4860 |
| ttaggaggca aaaatgaaaa gctttgaaaa cagctgccag attagcaaaa ccctgcgttt  | 4920 |
| tggtgcaacc ctgaaagagg ataaaaagaa atgcaaaagc cacgaggaac tgcaagaatt  | 4980 |
| tgtggatatt agctataaaa ccatgaaaag cagcgcaacc attgcagaaa gcctgaatga  | 5040 |
| aattgaactg gtgaaaaagt gcgaacgctg ctatagcgaa atcatcaaat ttcataaagc  | 5100 |
| ctggggtcag atttattgtc gtaccgatca gattgccgtg tacaaagatt tttatcgtca  | 5160 |
| gctggcacgt aaagcccgtt ttgatgttgg tgatcagaat agccagctga ttaccctgag  | 5220 |
| cagcctgagt agcaaacata atgtttatca gggctgtaa cgcagccagc atattaccaa   | 5280 |
| ttattggaaa gataacattg cccgtcagaa aagcttctg aaagatttta gccagcagct   | 5340 |
| gcatcagtat aaacgtgcac tggaaaatag cgataaagca cataccaaac cgaacctgat  | 5400 |
| caacttcaat aaaaccttta gcattctggc caacctggtg aacgaaattg ttattccgct  | 5460 |
| gagcaatggt gcaattagct ttccgaatat cagcaaactg gaagatggtg aagaaagccg  | 5520 |
| tcattctgatt gaatttgccc tgaatgatta tagcgatctg gttggtagca ttggcgaact | 5580 |
| gaaagatgca attgccacca atggtgggta taccctgtt gcaaaagtta ccctgaacca   | 5640 |
| ttataccgca gaacagaaac cgcatgtgtt caaaaatgat atcgatgcca aaatccgtga  | 5700 |
| gctgaaactg atcgaactgg ttgagaaact gaaaaacaaa accagcaagc agatcgaaga  | 5760 |
| gtacttcagc aaattcgaca agttcaaaat ctatgatgat cgcaaccaga gcgtgattat  | 5820 |
| tcgtaccag tgctttaaat acaaaccgat tccgtttctg gtgaaacatg aactggccaa   | 5880 |
| atatatcgcc gaagatgaag atgcagttct gaaagtctg gatgccattg gtgcgacccg   | 5940 |
| tagtccggca catgattatg cacataatga agatgtgttc gacctgaaac actatccgat  | 6000 |
| taaagtggca tttgattatg cctgggaaca gctggcaaat ggtgtgtata ccaccgtgag  | 6060 |
| ctttccggaa gaaaaatgtc gtgaatatct gaacgccatt tatggttgcg aagttaccaa  | 6120 |
| agaaccggtg ttcaaatttt acgccgatct gctgtatatt cgcaaaaatc tggccgttct  | 6180 |
| ggaacacaaa aataacctgc cgagcaatcc ggaagagttt atttgcaaaa tcgaaaacac  | 6240 |
| cttcgagaaa atcgtgctgc cgtataaaat caaagagttc gaaacctaca aaaaggccat  | 6300 |

|            |            |             |            |             |             |      |
|------------|------------|-------------|------------|-------------|-------------|------|
| tctgacctgg | attaatgatg | gtcgtggtca  | tgagaaatat | accgatagca  | aacgtgaact  | 6360 |
| gggtctgatt | cgtgggtggc | tgaaaggctg  | tattggtgca | cagaaaatgt  | tccgcaaaaa  | 6420 |
| taagaaaggt | gagctgatcc | cgtattatga  | aaacccgtat | accaaactga  | ccaacgagtt  | 6480 |
| taaaaacatc | agcagcagct | atggcaaaaac | ctttgccgaa | ctgcgtgata  | agtttaaaga  | 6540 |
| gaaaagcgag | atcacgaaga | tcacccattt  | tggtatcatc | atcgaggaca  | ataacaaaga  | 6600 |
| tcgttatctg | ctggccaatg | gtctgcagca  | tgataataca | gatcagagca  | atacccaggt  | 6660 |
| tgaagcaatt | ctgggtaaac | tgaataccag  | cctggaattt | accacctatc  | aggttaaaag  | 6720 |
| cctgaccagc | aaaatcctga | ttaagctgat  | taaaaacat  | acgaccagtc  | cgaatgcaaa  | 6780 |
| aagcccgtat | gcagattttc | atacctcaa   | aattcatgtg | gactggacca  | aatcaagaa   | 6840 |
| agagtgggat | acctataaaa | gcaaccattc  | actgctgcag | tatgtgaaag  | attgtctgac  | 6900 |
| caatagcacc | atggccaaaa | atcagaattg  | ggcagaattt | ggctgggatt  | tagaaagctg  | 6960 |
| taatagctat | gaagccatcg | aacatgagat  | tgaccagaaa | agttatatcc  | tgcagaaaca  | 7020 |
| cacaattagc | aaagccagca | ttaaattccct | ggttgaaaat | ggttgctctgc | tgctgccgat  | 7080 |
| tgtgaatcag | gatattacca | gccagggctg  | caaagataaa | aaccagttta  | gcaaagattg  | 7140 |
| gaagcagatc | ttcgaggata | gcaaagaata  | tcgtctgcat | ccggaatttg  | cagtttagcta | 7200 |
| tcgtaccccg | atcaaagatt | atccgaaaaga | taaacgttat | ggtcgcctgc  | agtttatctg  | 7260 |
| tgccittaac | tgtgaaatca | ttccgcagaa  | tggcgaattt | atcaacctga  | aaaagcagat  | 7320 |
| tgagaacttc | aacgatgagg | atatccagaa  | aaataacgtg | gccgaattca  | acaacaaagt  | 7380 |
| gaatgaagcc | ctgctgggta | aagaatatgt  | tgtgattggg | attgatcgtg  | gcctgaaaca  | 7440 |
| actggcaacc | ctgtgtgttc | tgaataaacg  | tggtaaaatt | ctgggcgatt  | tcgagatcta  | 7500 |
| caagaaagaa | ttcgttcgta | ccgaaaaccg  | cagcaaaaac | tattggaaac  | acaccctggc  | 7560 |
| agaaacccgt | catattctgg | atctgagcaa  | tctgcgtgtt | gaaaccaccg  | ttgaagataa  | 7620 |
| taaagtgctg | gttgatcaga | gtctgaccct  | ggttaaaaag | aatcgtgata  | caccggatga  | 7680 |
| aaaagccacc | gaagaaaatc | gccagaaaat  | caaactgaaa | cagctgagct  | atattcgtaa  | 7740 |
| gctgcagtac | gcaatgcaga | ccaatgaaca  | ggcagtgctg | gatctgctga  | aagataatag  | 7800 |
| tgatgatgaa | gagttcaaaa | agcgtgtgga  | aggtgttatt | agcccgtttg  | gtgaagggtca | 7860 |
| agaatatgcg | gatctgccga | tcgataccat  | gcgtgcaatg | attcaggatc  | tgcaggggtg  | 7920 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| tattgccaaa ggtaataaac agaccgagaa aaacaagatc attgagctgg atgcagcggga | 7980 |
| tagtctgaaa caggggtgtg tggcaaatat gattgggtgtg gttaacttta tcctggcgaa | 8040 |
| attcaactat gaagcgtatg ttagcctgga agatctgagc cgtgcatata atgttgccaa  | 8100 |
| aagcggttat gatggacgct atctgccgag taccagtcag gatccggata tggattttaa  | 8160 |
| agaacagcag aatcagatgc tggcaggtct gggtacatat cagtttttcg aaattcagct  | 8220 |
| gctgaagaag ctgcagaaaa ttcagagtaa taataccgtg ctgcgctttg ttccggcatt  | 8280 |
| tcgtagcgca gataactatc gcaatattat caagctgaac ccgaaatatg ataacaccga  | 8340 |
| gtatgttcat aaaccgtttg gcattgtgca tttcattgat cctaaagaca ccagcagcaa  | 8400 |
| atgtccggtt tgtggtaaaa ccggcaaaaa gaatgttgat cgcaatgaga agaagaacaa  | 8460 |
| tatcctgctg tgcaaagcat gtggtttttcg taccgtgtgg gaattaaaac agccggaaaa | 8520 |
| cattaaaagc gagggttatt gttttagcga agatgagatt cagaaaacca tcaaaaacaa  | 8580 |
| ccagaaacaa atggaaatca aaaagctgag cgacaaaaac atccactaca ttcataacgg  | 8640 |
| tgatgataac ggtgcatatc atattgcact gaaaagcgtg gaaaacctga agcacaaaga  | 8700 |
| ataatggtct agaggtcgaa attcaaattg tgagcggata acaatttgaa ttttctgtat  | 8760 |
| gaggttttgc taaacaactt tcaacagttt cagtggagtg agaatagaaa ggaacaacta  | 8820 |
| aaggaattgc gaataataat tttttcacgt tgaaaatctc caaaaaaaaaa ggctccaaaa | 8880 |
| ggagccttta attgtatcgg tttatcagct tgctttcgag gtgaattttg accctctagc  | 8940 |
| gaaaatgcaa gagcaaagac gaaaacatgc cacacatgag gaataccgat tctctcatta  | 9000 |
| acatattcag gccagttatc tgggcttaaa agcagaagtc caaccagat aacgatcata   | 9060 |
| tacatggttc tctccagagg ttcattactg aacactcgtc cgagaataac gagtggatcc  | 9120 |
| cctccaattc gccctatagt gagtcgtatt acgcgcgctc actggccgctc gttttacaac | 9180 |
| gtcgtgactg ggaaaaccct ggcgttacct aacttaatcg ctttgagca catccccctt   | 9240 |
| tcgccagctg gcgtaatagc gaagaggccc gcaccgatcg cccttcccaa cagttgcgca  | 9300 |
| gcctgaatgg cgaatggaaa ttgtaagcgt taatatattg ttaaaattcg cgttaaattt  | 9360 |
| ttgttaaadc agctcatttt ttaaccaata ggccgactgc gatgagtggc agggcggggc  | 9420 |
| gtaatttttt taaggcagtt attggtgccc ttaaaccgct ggtgctacgc ctgaataagt  | 9480 |
| gataataagc ggatgaatgg cagaaattcg aaagcaaatt cgacccggtc gtcggttcag  | 9540 |

|                                                                     |       |
|---------------------------------------------------------------------|-------|
| ggcaggggtcg ttaaatagcc gcttatgtct attgctgggtt taccggttta ttgactaccg | 9600  |
| gaagcagtgt gaccgtgtgc ttctcaaag cctgaggcca gtttgctcag gctctccccg    | 9660  |
| tggaggtaat aattgacgat atgatcattt attctgcctc ccagagcctg ataaaaacgg   | 9720  |
| tgaatccgtt agcgagggtgc cgccggcttc cattcaggtc gaggtggccc ggctccatgc  | 9780  |
| accgcgacgc aacgcgggga ggagacaag gtatagggcg gcgaggcggc tacagccgat    | 9840  |
| agtctggaac agcgactta cgggttgctg cgcaacccaa gtgctaccgg cgcggcagcg    | 9900  |
| tgacccgtgt cggcgggtcc aacggctcgc catcgtccag aaaacacggc tcatcgggca   | 9960  |
| tcggcaggcg ctgctgcccg cgccgttccc attcctccgt ttcggtcaag gctggcaggt   | 10020 |
| ctggttccat gcccgggaatg ccgggctggc tgggcggctc ctgcccgggg ccggtcggta  | 10080 |
| gttgctgctc gcccggatac agggtcggga tgcggcgag gtcgcatgc cccaacagcg     | 10140 |
| attcgtcctg gtcgtcgtga tcaaccacca cggcggcact gaacaccgac aggcgcaact   | 10200 |
| ggtcgcgggg ctggccccac gccacgcggt cattgaccac gtaggccgac acggtgccgg   | 10260 |
| ggccgttgag cttcacgacg gagatccagc gctcggccac caagtccttg actgcgtatt   | 10320 |
| ggaccgtccg caaagaacgt ccgatgagct tggaaagtgt cttttggctg accaccacgg   | 10380 |
| cgttctgggtg gcccattctgc gccacgaggt gatgcagcag cattgccgcc gtgggtttcc | 10440 |
| tcgcaataag cccggcccac gcctcatgcg ctttgcggtc cgtttgcacc cagtgaccgg   | 10500 |
| gcttgttctt ggcttgaatg ccgatttctc tggactgcgt gg                      | 10542 |

<210> 37  
 <211> 3696  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> E. Coli codonoptimized NT sequences of BEC10

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| <400> 37                                                          |     |
| atgaaaagct ttgaaaacag ctgccagatt agcaaaaccc tgcgttttgg tgcaaccctg | 60  |
| aaagaggata aaaagaaatg taaaagccac ctggaactgc aagaatttgt ggatattagc | 120 |
| tacaagaccc tgaaaagcag cgcaaccatt gcagaaagcc tgaatgaaat tgagctggtg | 180 |
| aaaaaatgcg aacgctgcta tagcgaaatc atcaaatttc atgaagcctg gggtcagatt | 240 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| tattgtcgta ccaatcagat tgccgtgtac aaagattggt atcgtcagct ggcacgtaaa   | 300  |
| gcacgttttg atgttggtga tcagaatagc cagctgatta ccctgagcag cctgagtagc   | 360  |
| aaacataatg tttatcaggg tctgaaacgc agccagcata ttaccaatta ttggaaagat   | 420  |
| aacattgccc gtcagaaaaag cttcctgaaa gatttttagcc agcagctgaa acagtataaa | 480  |
| cgtgcactgg aaaatagcga taaagcacat accaaaccga acctgatcaa cttcaataaa   | 540  |
| accttttagca ttctggccaa cctgggtgaac gaaattgtta ttccgctgag caatggtgca | 600  |
| attagctttc cgaatatcag caaactggaa gatgggtgaag aaagccgtca tctgattgaa  | 660  |
| tttgccctga atgattatag cgatctgggt ggtagcattg gcgaactgaa agatgcaatt   | 720  |
| gccaccaatg gtggttatac cccgtttgca aaagttaccc tgaaccatta taccgcagaa   | 780  |
| cagaaaccgc atgtgttcaa aaatgatatc gatgccaaaa tccgtgagct gaaactgatt   | 840  |
| gaactgggtg agaaactgaa aaacaaaacc agcaagcaga tcgaagagta cttcagcaaa   | 900  |
| ttcgacaagt tcaaaatcta tgatgatcgc aacatcagcg tgattattcg taccagtg     | 960  |
| tttaaataca aaccgattcc gtttctgggtg aaacatgaac tggccaaata tatcgccgaa  | 1020 |
| gatgaagatg cagttctgaa agttctggat gccattgggtg cgacccgtag tccggcacat  | 1080 |
| gattatgcac ataatgaaga tgtgttcgat ctgaaccact atccgattaa agtggcattt   | 1140 |
| gattatgcct gggaacagct ggcaaatggt gtgtatacca ccgtgacctt tccgaaagaa   | 1200 |
| cagtgtgaaa aatatctgaa ggatgtgttt gattgcgagg ttagcaaaga accggtgttt   | 1260 |
| aaattctatg ccgatctgct gtatatccgc aaaaatctgg ccgttctgga acataaaaaac  | 1320 |
| aatctgccga gcaaccaaga agagttcatt tgcaaaatca acaacacctt cgaaaacatc   | 1380 |
| gtgctgccgt ataaaatcaa agagttcgaa acctacaaaa aagacatcct ggcctggatt   | 1440 |
| aatgatggtc gtggatcatga gaaatatacc gatgcaaaac agcagctggg ttttattcgt  | 1500 |
| ggtggtctga aaggctgtat taaagcccag aaaatgttcc gcaaagataa gtacggtaag   | 1560 |
| atcaaaagct attatgagaa cccgtatacc aaactgacca acgaatttaa gcagatcagc   | 1620 |
| agcacctatg gcaaaacctt tgccgaactg cgtgataagt ttaaagagaa gaacaacatc   | 1680 |
| acaaaaatca cccactttgg catcatcatc gaggataata acaaagatcg ttatctgctg   | 1740 |
| gccaatggtc tgcagcatga gcagattaat catgttgaag caattctggg caaactgaat   | 1800 |
| accagcagcg aatttatcac ctatcagggt aaaagcctga ccagtaaaac cctgattaag   | 1860 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ctgattaaaa accataccac caaaaagggc gcgattagcc cgtatgcaga ttttcataacc | 1920 |
| agcaaaaattc atgtggactg gacgaaaatc aaaaaagagt gggataacta taagcgcgaa | 1980 |
| caggttctgc tgcagtatgt taaagattgt ctgaccgata gcaccatggc caaaaatcag  | 2040 |
| aattgggcag aatttggctg gaactttgaa aaatgcaaca gctatgaaga tatcgagcac  | 2100 |
| gagattgacc agaaaagtta tatcctgcag aaacacacca tctccaaaca gagcattgca  | 2160 |
| agcctgggtg aagggtgggtg tctgctgctg ccgattatta accaggatat tacctcacag | 2220 |
| ggtcgcaaag acaaaaacca gtttagtaaa gattggaagc agatctttga aggcagcaaa  | 2280 |
| gaatttcgtc tgcacccgga atttgcagtt agctatcgta ccccgatcaa agattatccg  | 2340 |
| aaagataaac gttatggctg cctgcagttt gtttgtgcct ttaactgtga aatcattccg  | 2400 |
| cagaatggcg aattcatcaa tctgaaaaag cagattgaga acttcaacga tgaggatgca  | 2460 |
| cagaaagaag ccgttgaaga attcaacaaa aaagtgaatc atgccctgct gggcaaagaa  | 2520 |
| tatgtttgtga ttggtattga tcgtggcctg aaacaactgg caaccctgtg tgttctggat | 2580 |
| aaacgtggta aaatcctggg cgattttgag atctacaaga aagaattcgt tcgtgccgaa  | 2640 |
| aaacgcagca aaaactattg gaaacacaca ctggcagaaa cccgtcatat tctggatctg  | 2700 |
| agcaatctgc gtgttgaaac cacaatcgaa gataacaaag tgctgggtga tcagagtctg  | 2760 |
| accctgggta aaaagaatcg tgataaccg gatgaagaag ccaccgaaga aaataaacag   | 2820 |
| aagatcaaac tgaagcagct gagctatatt cgtaaaactgc agcataaaat gcagaccaat | 2880 |
| gaacaggatg ttctggacct gattaataac gaaccgagcg acgaagaatt taagaaacgt  | 2940 |
| attgaaggtc tgattagcag ctttggtgaa ggtcagaaat atgcggatct gcctattaat  | 3000 |
| accatgcgcg aaatgattag tgatctgcag ggtgttattg cccgtggtaa taatcagaca  | 3060 |
| gagaaaaaca agatcatcga actggatgca gccgataatc tgaaacaggg tattgttgca  | 3120 |
| aacatgattg gcatcgtgaa ctacatcttt gccaaataca gctacaaagc ctatatcagc  | 3180 |
| ctggaagatc tgagccgtgc atatggtggt gcaaaaagcg gttatgatgg acgctatctg  | 3240 |
| ccgtcaacca gccaggacga agatgtggat tttaaagaac agcagaatca gatgctggca  | 3300 |
| ggtctgggta catatcagtt ttttgaaatg cagctgctga agaagctgca gaaaattcag  | 3360 |
| agcgataata ccgttctgcg ctttgttccg gcatttcgta gcgcagataa ctatcgcaat  | 3420 |
| attatcaagc tggaagaaac caaatacaaa agcaaaccgt ttggcgtggt gcactttatt  | 3480 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gatccgaaat ttacgagcaa aaaatgtccg gtttgcagca aaaccaatgt gtatcgtgat  | 3540 |
| aaagatgaca ttctggtgtg taaagaatgc ggttttcgta gtgatagtca gctgaaagaa  | 3600 |
| cgcgaaaaca acatccacta tattcataat ggtgatgaca acgggtgccta tcatattgca | 3660 |
| ctgaaaagcg tggaaaatct gatccagatg aaataa                            | 3696 |

<210> 38  
 <211> 85  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> AraBAD promotor sequences

|                                                                   |    |
|-------------------------------------------------------------------|----|
| <400> 38                                                          |    |
| ggcgtcacac ttgtctatgc catagcattt ttatccataa gattagcgga tcctacctga | 60 |
| cgcttttttat cgcaactctc tactg                                      | 85 |

<210> 39  
 <211> 177  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Fdt terminator sequence

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| <400> 39                                                            |     |
| aatttttctgt atgagggtttt gctaaacaac tttcaacagt ttcagtggag tgagaataga | 60  |
| aaggaacaac taaaggaatt gcgaataata attttttcac gttgaaaatc tccaaaaaaa   | 120 |
| aaggctccaa aaggagcctt taattgtatc ggtttatcag cttgctttcg aggtgaa      | 177 |

<210> 40  
 <211> 164  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> SacB RNA polymerase III promotor sequence

|                                                                     |     |
|---------------------------------------------------------------------|-----|
| <400> 40                                                            |     |
| gccccatgcaa cagaaactat aaaaaataca gagaatgaaa agaaacagat agatttttta  | 60  |
| gttcttttagg cccgtagtct gcaaaticctt ttatgatttt ctatcaaaca aaagaggaaa | 120 |

atagaccagt tgcaatccaa acgagagtct aatagaatga ggtc 164

<210> 41  
<211> 169  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> RrnB terminator sequence

<400> 41  
tttgctggc ggcagtagcg cggtaggtccc acctgacccc atgccgaact cagaagtgaa 60  
acgccgtagc gccgatggta gtgtggggtc tcccatgcg agagtaggga actgccaggc 120  
atcaaataaa acgaaaggct cagtcgaaaag actgggcctt tcgttttat 169

<210> 42  
<211> 24  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> RpoB target-specific spacer sequences

<400> 42  
cctgcgatgt actcaaccgg gact 24