

# SEQUENCE LISTING

<110> Kabushiki Kaisha Yakult Honsha  
 <120> Method for producing secretory fÀ-galactosidase  
 <130> PF-190014-WO  
 <150> JP2018-212757  
 <151> 2018-11-13  
 <160> 29  
 <170> PatentIn version 3.5  
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 <211> 1785  
 <212> DNA  
 <213> Sporobolomyces singularis  
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 <221> CDS  
 <222> (1)..(1785)  
 <223> Inventor: Ishikawa, Eiji; Ikeda, Masakazu; Anbe, Minako; Hatano, Hiroshi  
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 Ala Arg Pro Ala Gly Ala Val Thr Tyr Pro Gly Ala Ile Pro Leu Ser  
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 Leu Thr Ser Asn Tyr Glu Thr Pro Ser Pro Thr Ala Ile Pro Leu Glu  
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 Pro Thr Pro Thr Ala Thr Gly Thr Ala Glu Leu Asp Ala Leu Trp Asn  
 30 35 40 45  
 ttg gtg gaa gca cag tac cct gtt cag acg gcg gct gtc acc acc ctg 240  
 Leu Val Glu Ala Gln Tyr Pro Val Gln Thr Ala Ala Val Thr Thr Leu  
 50 55 60

|                                                                 |     |
|-----------------------------------------------------------------|-----|
| gtg acg gtg ccc gac gac tac aag ttt gaa gca gac cct cct tcc tat | 288 |
| Val Thr Val Pro Asp Asp Tyr Lys Phe Glu Ala Asp Pro Pro Ser Tyr |     |
| 65 70 75                                                        |     |
| gct ctt gct ggc tac gag aca tca gaa att gcc ggc ttg aag ttc ccg | 336 |
| Ala Leu Ala Gly Tyr Glu Thr Ser Glu Ile Ala Gly Leu Lys Phe Pro |     |
| 80 85 90                                                        |     |
| aag ggg ttc aag ttt ggc gtg gcc ggc gcg gct att caa gtg gaa ggc | 384 |
| Lys Gly Phe Lys Phe Gly Val Ala Gly Ala Ala Ile Gln Val Glu Gly |     |
| 95 100 105                                                      |     |
| gca gcg aaa gca gag gga cga ggc cca tcc act tgg gat tac ttg tgc | 432 |
| Ala Ala Lys Ala Glu Gly Arg Gly Pro Ser Thr Trp Asp Tyr Leu Cys |     |
| 110 115 120 125                                                 |     |
| cac cat tac gcg tcc aca cag tgc aac aac tat gat cct gac att acg | 480 |
| His His Tyr Ala Ser Thr Gln Cys Asn Asn Tyr Asp Pro Asp Ile Thr |     |
| 130 135 140                                                     |     |
| acg aac cat tac tac ctt tac cct ctt gat ttc gcc cgg ctc cag cat | 528 |
| Thr Asn His Tyr Tyr Leu Tyr Pro Leu Asp Phe Ala Arg Leu Gln His |     |
| 145 150 155                                                     |     |
| cta ggc atc aac acg tat tcg ttt tca atc tcc tgg act cgt ata tac | 576 |
| Leu Gly Ile Asn Thr Tyr Ser Phe Ser Ile Ser Trp Thr Arg Ile Tyr |     |
| 160 165 170                                                     |     |
| cct ctg ggt gct ggc tac gtt aac gaa gcc ggt ttg gcg cat tac gac | 624 |
| Pro Leu Gly Ala Gly Tyr Val Asn Glu Ala Gly Leu Ala His Tyr Asp |     |
| 175 180 185                                                     |     |
| gcg gta atc cac tcg gcc aag aag tac ggg ctg gag cct gtc gga aca | 672 |
| Ala Val Ile His Ser Ala Lys Lys Tyr Gly Leu Glu Pro Val Gly Thr |     |
| 190 195 200 205                                                 |     |
| gta ttt cac tgg gac acc cct ctc agc ctc atg ctc aaa tat ggc gcg | 720 |
| Val Phe His Trp Asp Thr Pro Leu Ser Leu Met Leu Lys Tyr Gly Ala |     |
| 210 215 220                                                     |     |
| tgg caa gat acc ggc gac cag atc gtt aaa gat ttc gtc aca tac gcc | 768 |
| Trp Gln Asp Thr Gly Asp Gln Ile Val Lys Asp Phe Val Thr Tyr Ala |     |
| 225 230 235                                                     |     |
| acc acc gtc ttc aaa cga tac ggt aat gaa gtc aag acc tgg ttc acg | 816 |
| Thr Thr Val Phe Lys Arg Tyr Gly Asn Glu Val Lys Thr Trp Phe Thr |     |
| 240 245 250                                                     |     |
| ttc aat gag cct cgc gtg ttc tgt tct caa aac agt ggc ctt ccc tat | 864 |
| Phe Asn Glu Pro Arg Val Phe Cys Ser Gln Asn Ser Gly Leu Pro Tyr |     |
| 255 260 265                                                     |     |
| aac ctc acg tat cct gag gga atc aac tca act tca gcc gtc ttc cgg | 912 |

|                   |            |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |      |
|-------------------|------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| Asn<br>270        | Leu        | Thr               | Tyr               | Pro               | Glu<br>275        | Gly               | Ile               | Asn               | Ser               | Thr<br>280        | Ser               | Ala               | Val               | Phe               | Arg<br>285        |      |
| tgt<br>Cys        | act<br>Thr | tat<br>Tyr        | aac<br>Asn        | gtc<br>Val<br>290 | ctg<br>Leu        | aaa<br>Lys        | gcc<br>Ala        | cat<br>His        | ggc<br>Gly<br>295 | cac<br>His        | gcg<br>Ala        | gtt<br>Val        | aag<br>Lys<br>300 | gtt<br>Val        | tac<br>Tyr        | 960  |
| cgg<br>Arg        | gat<br>Asp | ctc<br>Leu        | gtt<br>Val<br>305 | gcc<br>Ala        | agc<br>Ser        | gga<br>Gly        | acc<br>Thr        | att<br>Ile<br>310 | gct<br>Ala        | gct<br>Ala        | gga<br>Gly        | gag<br>Glu        | atc<br>Ile<br>315 | ggc<br>Gly        | ttc<br>Phe        | 1008 |
| aag<br>Lys        | tcg<br>Ser | gac<br>Asp<br>320 | gac<br>Asp        | aac<br>Asn        | tac<br>Tyr        | cca<br>Pro        | atc<br>Ile<br>325 | cca<br>Pro        | gcg<br>Ala        | cgg<br>Arg        | ccc<br>Pro        | gga<br>Gly<br>330 | aac<br>Asn        | gcg<br>Ala        | gac<br>Asp        | 1056 |
| gac<br>Asp<br>335 | gag<br>Glu | gaa<br>Glu        | tcc<br>Ser        | gcc<br>Ala        | aaa<br>Lys        | cgt<br>Arg<br>340 | cac<br>His        | gaa<br>Glu        | gcg<br>Ala        | ttc<br>Phe        | cga<br>Arg<br>345 | atc<br>Ile        | gga<br>Gly        | atc<br>Ile        | ttt<br>Phe        | 1104 |
| gcc<br>Ala<br>350 | cag<br>Gln | cca<br>Pro        | gtt<br>Val        | tac<br>Tyr        | gga<br>Gly<br>355 | aac<br>Asn        | ggc<br>Gly        | gac<br>Asp        | tat<br>Tyr        | cct<br>Pro<br>360 | gat<br>Asp        | gta<br>Val        | gta<br>Val        | aaa<br>Lys        | gag<br>Glu<br>365 | 1152 |
| acc<br>Thr        | gtt<br>Val | ggc<br>Gly        | gac<br>Asp<br>370 | atg<br>Met        | ctg<br>Leu        | ccc<br>Pro        | gcc<br>Ala        | ctg<br>Leu        | acg<br>Thr<br>375 | gat<br>Asp        | gag<br>Glu        | gac<br>Asp        | aag<br>Lys        | ggc<br>Gly<br>380 | tac<br>Tyr        | 1200 |
| atc<br>Ile        | aag<br>Lys | ggc<br>Gly        | agc<br>Ser<br>385 | ggc<br>Gly        | gac<br>Asp        | atc<br>Ile        | ttc<br>Phe        | gcc<br>Ala<br>390 | att<br>Ile        | gac<br>Asp        | ggt<br>Gly        | tac<br>Tyr        | cgg<br>Arg<br>395 | acc<br>Thr        | gat<br>Asp        | 1248 |
| atc<br>Ile        | tcg<br>Ser | cat<br>His<br>400 | gcc<br>Ala        | gca<br>Ala        | ctg<br>Leu        | aat<br>Asn        | gga<br>Gly<br>405 | atc<br>Ile        | gcg<br>Ala        | aat<br>Asn        | tgc<br>Cys<br>410 | atc<br>Ile        | aga<br>Arg        | aac<br>Asn        | cag<br>Gln        | 1296 |
| tcg<br>Ser<br>415 | gac<br>Asp | cct<br>Pro        | aac<br>Asn        | tgg<br>Trp        | cct<br>Pro        | gtt<br>Val<br>420 | tgc<br>Cys        | gag<br>Glu        | gaa<br>Glu        | ggg<br>Gly        | tct<br>Ser<br>425 | gac<br>Asp        | ccg<br>Pro        | ttc<br>Phe        | gcc<br>Ala        | 1344 |
| cac<br>His<br>430 | gta<br>Val | tac<br>Tyr        | ccg<br>Pro        | tct<br>Ser        | ggt<br>Gly<br>435 | ttc<br>Phe        | gcc<br>Ala        | atc<br>Ile        | ggc<br>Gly        | cag<br>Gln        | tcc<br>Ser        | gcc<br>Ala        | gat<br>Asp        | ccg<br>Pro        | ctg<br>Leu<br>445 | 1392 |
| tcg<br>Ser        | tca<br>Ser | tgg<br>Trp        | ctc<br>Leu        | gtc<br>Val<br>450 | aac<br>Asn        | tcc<br>Ser        | gcc<br>Ala        | cca<br>Pro        | ttt<br>Phe<br>455 | att<br>Ile        | cgc<br>Arg        | gac<br>Asp        | cag<br>Gln        | ctg<br>Leu<br>460 | aag<br>Lys        | 1440 |
| ttc<br>Phe        | ctc<br>Leu | act<br>Thr        | caa<br>Gln<br>465 | acg<br>Thr        | tac<br>Tyr        | ccg<br>Pro        | gca<br>Ala        | aag<br>Lys<br>470 | gga<br>Gly        | ggt<br>Gly        | att<br>Ile        | tac<br>Tyr        | ttc<br>Phe<br>475 | agc<br>Ser        | gag<br>Glu        | 1488 |
| ttt<br>Phe        | ggg<br>Gly | tgg<br>Trp<br>480 | gcc<br>Ala        | gag<br>Glu        | gat<br>Asp        | gcg<br>Ala        | gag<br>Glu<br>485 | tac<br>Tyr        | gac<br>Asp        | cgc<br>Arg        | cag<br>Gln        | ctg<br>Leu<br>490 | ttg<br>Leu        | tac<br>Tyr        | caa<br>Gln        | 1536 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| atc | acc | tgg | gac | ggt | ctt | agg | acc | cag | tat | ctc | act | gac | tac | ctg | tcc | 1584 |
| Ile | Thr | Trp | Asp | Gly | Leu | Arg | Thr | Gln | Tyr | Leu | Thr | Asp | Tyr | Leu | Ser |      |
|     | 495 |     |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| caa | ctc | ctg | ctc | gcc | gtc | cat | aag | gat | ggg | att | aat | ctt | cgc | ggc | gcg | 1632 |
| Gln | Leu | Leu | Leu | Ala | Val | His | Lys | Asp | Gly | Ile | Asn | Leu | Arg | Gly | Ala |      |
|     | 510 |     |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| tta | acc | tgg | agt | ttc | gtc | gac | aac | tgg | gaa | tgg | gga | ctg | ggg | atg | caa | 1680 |
| Leu | Thr | Trp | Ser | Phe | Val | Asp | Asn | Trp | Glu | Trp | Gly | Leu | Gly | Met | Gln |      |
|     |     |     |     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| cag | aaa | ttc | gga | ttc | cag | ttt | gtc | aat | cag | tcg | gac | cca | gat | ctc | acc | 1728 |
| Gln | Lys | Phe | Gly | Phe | Gln | Phe | Val | Asn | Gln | Ser | Asp | Pro | Asp | Leu | Thr |      |
|     |     |     | 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| agg | acc | ttc | aaa | ctc | tct | gcg | cac | gct | tac | gct | caa | ttt | ggt | cgc | aac | 1776 |
| Arg | Thr | Phe | Lys | Leu | Ser | Ala | His | Ala | Tyr | Ala | Gln | Phe | Gly | Arg | Asn |      |
|     |     | 560 |     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |      |

|     |     |     |      |
|-----|-----|-----|------|
| cac | ctc | tga | 1785 |
| His | Leu |     |      |
|     | 575 |     |      |

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 <212> PRT  
 <213> Sporobolomyces singularis

<400> 2

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Met | Leu | His | Ala | Ala | Leu | Leu | Val | Ala | Leu | Pro | Cys | Val | Val | Leu |
|     |     |     |     | -15 |     |     |     |     | -10 |     |     |     |     | -5  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Arg | Pro | Ala | Gly | Ala | Val | Thr | Tyr | Pro | Gly | Ala | Ile | Pro | Leu | Ser |
|     | -1  | 1   |     |     |     |     | 5   |     |     |     |     | 10  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Thr | Ser | Asn | Tyr | Glu | Thr | Pro | Ser | Pro | Thr | Ala | Ile | Pro | Leu | Glu |
|     | 15  |     |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Thr | Pro | Thr | Ala | Thr | Gly | Thr | Ala | Glu | Leu | Asp | Ala | Leu | Trp | Asn |
| 30  |     |     |     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Val | Glu | Ala | Gln | Tyr | Pro | Val | Gln | Thr | Ala | Ala | Val | Thr | Thr | Leu |
|     |     |     |     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Thr | Val | Pro | Asp | Asp | Tyr | Lys | Phe | Glu | Ala | Asp | Pro | Pro | Ser | Tyr |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

65

70

75

Ala Leu Ala Gly Tyr Glu Thr Ser Glu Ile Ala Gly Leu Lys Phe Pro  
 80 85 90

Lys Gly Phe Lys Phe Gly Val Ala Gly Ala Ala Ile Gln Val Glu Gly  
 95 100 105

Ala Ala Lys Ala Glu Gly Arg Gly Pro Ser Thr Trp Asp Tyr Leu Cys  
 110 115 120 125

His His Tyr Ala Ser Thr Gln Cys Asn Asn Tyr Asp Pro Asp Ile Thr  
 130 135 140

Thr Asn His Tyr Tyr Leu Tyr Pro Leu Asp Phe Ala Arg Leu Gln His  
 145 150 155

Leu Gly Ile Asn Thr Tyr Ser Phe Ser Ile Ser Trp Thr Arg Ile Tyr  
 160 165 170

Pro Leu Gly Ala Gly Tyr Val Asn Glu Ala Gly Leu Ala His Tyr Asp  
 175 180 185

Ala Val Ile His Ser Ala Lys Lys Tyr Gly Leu Glu Pro Val Gly Thr  
 190 195 200 205

Val Phe His Trp Asp Thr Pro Leu Ser Leu Met Leu Lys Tyr Gly Ala  
 210 215 220

Trp Gln Asp Thr Gly Asp Gln Ile Val Lys Asp Phe Val Thr Tyr Ala  
 225 230 235

Thr Thr Val Phe Lys Arg Tyr Gly Asn Glu Val Lys Thr Trp Phe Thr  
 240 245 250

Phe Asn Glu Pro Arg Val Phe Cys Ser Gln Asn Ser Gly Leu Pro Tyr  
 255 260 265

Asn Leu Thr Tyr Pro Glu Gly Ile Asn Ser Thr Ser Ala Val Phe Arg  
 270 275 280 285

Cys Thr Tyr Asn Val Leu Lys Ala His Gly His Ala Val Lys Val Tyr  
290 295 300

Arg Asp Leu Val Ala Ser Gly Thr Ile Ala Ala Gly Glu Ile Gly Phe  
305 310 315

Lys Ser Asp Asp Asn Tyr Pro Ile Pro Ala Arg Pro Gly Asn Ala Asp  
320 325 330

Asp Glu Glu Ser Ala Lys Arg His Glu Ala Phe Arg Ile Gly Ile Phe  
335 340 345

Ala Gln Pro Val Tyr Gly Asn Gly Asp Tyr Pro Asp Val Val Lys Glu  
350 355 360 365

Thr Val Gly Asp Met Leu Pro Ala Leu Thr Asp Glu Asp Lys Gly Tyr  
370 375 380

Ile Lys Gly Ser Gly Asp Ile Phe Ala Ile Asp Gly Tyr Arg Thr Asp  
385 390 395

Ile Ser His Ala Ala Leu Asn Gly Ile Ala Asn Cys Ile Arg Asn Gln  
400 405 410

Ser Asp Pro Asn Trp Pro Val Cys Glu Glu Gly Ser Asp Pro Phe Ala  
415 420 425

His Val Tyr Pro Ser Gly Phe Ala Ile Gly Gln Ser Ala Asp Pro Leu  
430 435 440 445

Ser Ser Trp Leu Val Asn Ser Ala Pro Phe Ile Arg Asp Gln Leu Lys  
450 455 460

Phe Leu Thr Gln Thr Tyr Pro Ala Lys Gly Gly Ile Tyr Phe Ser Glu  
465 470 475

Phe Gly Trp Ala Glu Asp Ala Glu Tyr Asp Arg Gln Leu Leu Tyr Gln  
480 485 490

Ile Thr Trp Asp Gly Leu Arg Thr Gln Tyr Leu Thr Asp Tyr Leu Ser

495

500

505

Gln Leu Leu Leu Ala Val His Lys Asp Gly Ile Asn Leu Arg Gly Ala  
 510 515 520 525

Leu Thr Trp Ser Phe Val Asp Asn Trp Glu Trp Gly Leu Gly Met Gln  
 530 535 540

Gln Lys Phe Gly Phe Gln Phe Val Asn Gln Ser Asp Pro Asp Leu Thr  
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Arg Thr Phe Lys Leu Ser Ala His Ala Tyr Ala Gln Phe Gly Arg Asn  
 560 565 570

His Leu  
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 -20 -15 -10

gca cct gct ttg gct gcc ggt gca gtt acc tac ccc ggt gcg att cca 96  
 Ala Pro Ala Leu Ala Ala Gly Ala Val Thr Tyr Pro Gly Ala Ile Pro  
 -5 -1 1 5 10

ctt agc ttg acc agc aat tac gag acg ccg agt ccg acc gcc atc ccc 144

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Leu | Ser | Leu | Thr | Ser | Asn | Tyr | Glu | Thr | Pro | Ser | Pro | Thr | Ala | Ile | Pro |     |  |
|     |     |     | 15  |     |     |     |     | 20  |     |     |     |     | 25  |     |     |     |  |
| ctg | gag | ccg | acc | cca | acg | gcg | acc | gga | acc | gcc | gaa | ctt | gat | gcg | ctc | 192 |  |
| Leu | Glu | Pro | Thr | Pro | Thr | Ala | Thr | Gly | Thr | Ala | Glu | Leu | Asp | Ala | Leu |     |  |
|     |     | 30  |     |     |     |     | 35  |     |     |     |     | 40  |     |     |     |     |  |
| tgg | aat | ttg | gtg | gaa | gca | cag | tac | cct | ggt | cag | acg | gcg | gct | gtc | acc | 240 |  |
| Trp | Asn | Leu | Val | Glu | Ala | Gln | Tyr | Pro | Val | Gln | Thr | Ala | Ala | Val | Thr |     |  |
|     | 45  |     |     |     |     | 50  |     |     |     | 55  |     |     |     |     |     |     |  |
| acc | ctg | gtg | acg | gtg | ccc | gac | gac | tac | aag | ttt | gaa | gca | gac | cct | cct | 288 |  |
| Thr | Leu | Val | Thr | Val | Pro | Asp | Asp | Tyr | Lys | Phe | Glu | Ala | Asp | Pro | Pro |     |  |
| 60  |     |     |     |     | 65  |     |     |     | 70  |     |     |     |     |     | 75  |     |  |
| tcc | tat | gct | ctt | gct | ggc | tac | gag | aca | tca | gaa | att | gcc | ggc | ttg | aag | 336 |  |
| Ser | Tyr | Ala | Leu | Ala | Gly | Tyr | Glu | Thr | Ser | Glu | Ile | Ala | Gly | Leu | Lys |     |  |
|     |     |     |     | 80  |     |     |     | 85  |     |     |     |     |     | 90  |     |     |  |
| ttc | ccg | aag | ggg | ttc | aag | ttt | ggc | gtg | gcc | ggc | gcg | gct | att | caa | gtg | 384 |  |
| Phe | Pro | Lys | Gly | Phe | Lys | Phe | Gly | Val | Ala | Gly | Ala | Ala | Ile | Gln | Val |     |  |
|     |     |     | 95  |     |     |     |     | 100 |     |     |     |     | 105 |     |     |     |  |
| gaa | ggc | gca | gcg | aaa | gca | gag | gga | cga | ggc | cca | tcc | act | tgg | gat | tac | 432 |  |
| Glu | Gly | Ala | Ala | Lys | Ala | Glu | Gly | Arg | Gly | Pro | Ser | Thr | Trp | Asp | Tyr |     |  |
|     |     | 110 |     |     |     |     | 115 |     |     |     |     | 120 |     |     |     |     |  |
| ttg | tgc | cac | cat | tac | gcg | tcc | aca | cag | tgc | aac | aac | tat | gat | cct | gac | 480 |  |
| Leu | Cys | His | His | Tyr | Ala | Ser | Thr | Gln | Cys | Asn | Asn | Tyr | Asp | Pro | Asp |     |  |
|     | 125 |     |     |     |     | 130 |     |     |     |     | 135 |     |     |     |     |     |  |
| att | acg | acg | aac | cat | tac | tac | ctt | tac | cct | ctt | gat | ttc | gcc | cgg | ctc | 528 |  |
| Ile | Thr | Thr | Asn | His | Tyr | Tyr | Leu | Tyr | Pro | Leu | Asp | Phe | Ala | Arg | Leu |     |  |
| 140 |     |     |     |     | 145 |     |     |     | 150 |     |     |     |     |     | 155 |     |  |
| cag | cat | cta | ggc | atc | aac | acg | tat | tcg | ttt | tca | atc | tcc | tgg | act | cgt | 576 |  |
| Gln | His | Leu | Gly | Ile | Asn | Thr | Tyr | Ser | Phe | Ser | Ile | Ser | Trp | Thr | Arg |     |  |
|     |     |     |     | 160 |     |     |     | 165 |     |     |     |     |     | 170 |     |     |  |
| ata | tac | cct | ctg | ggt | gct | ggc | tac | gtt | aac | gaa | gcc | ggt | ttg | gcg | cat | 624 |  |
| Ile | Tyr | Pro | Leu | Gly | Ala | Gly | Tyr | Val | Asn | Glu | Ala | Gly | Leu | Ala | His |     |  |
|     |     |     | 175 |     |     |     |     | 180 |     |     |     |     | 185 |     |     |     |  |
| tac | gac | gcg | gta | atc | cac | tcg | gcc | aag | aag | tac | ggg | ctg | gag | cct | gtc | 672 |  |
| Tyr | Asp | Ala | Val | Ile | His | Ser | Ala | Lys | Lys | Tyr | Gly | Leu | Glu | Pro | Val |     |  |
|     |     | 190 |     |     |     |     | 195 |     |     |     |     | 200 |     |     |     |     |  |
| gga | aca | gta | ttt | cac | tgg | gac | acc | cct | ctc | agc | ctc | atg | ctc | aaa | tat | 720 |  |
| Gly | Thr | Val | Phe | His | Trp | Asp | Thr | Pro | Leu | Ser | Leu | Met | Leu | Lys | Tyr |     |  |
|     | 205 |     |     |     |     | 210 |     |     |     |     | 215 |     |     |     |     |     |  |
| ggc | gcg | tgg | caa | gat | acc | ggc | gac | cag | atc | gtt | aaa | gat | ttc | gtc | aca | 768 |  |
| Gly | Ala | Trp | Gln | Asp | Thr | Gly | Asp | Gln | Ile | Val | Lys | Asp | Phe | Val | Thr |     |  |
| 220 |     |     |     |     | 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |  |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| tac gcc acc acc gtc ttc aaa cga tac ggt aat gaa gtc aag acc tgg | 816  |
| Tyr Ala Thr Thr Val Phe Lys Arg Tyr Gly Asn Glu Val Lys Thr Trp |      |
| 240 245 250                                                     |      |
| ttc acg ttc aat gag cct cgc gtg ttc tgt tct caa aac agt ggc ctt | 864  |
| Phe Thr Phe Asn Glu Pro Arg Val Phe Cys Ser Gln Asn Ser Gly Leu |      |
| 255 260 265                                                     |      |
| ccc tat aac ctc acg tat cct gag gga atc aac tca act tca gcc gtc | 912  |
| Pro Tyr Asn Leu Thr Tyr Pro Glu Gly Ile Asn Ser Thr Ser Ala Val |      |
| 270 275 280                                                     |      |
| ttc cgg tgt act tat aac gtc ctg aaa gcc cat ggc cac gcg gtt aag | 960  |
| Phe Arg Cys Thr Tyr Asn Val Leu Lys Ala His Gly His Ala Val Lys |      |
| 285 290 295                                                     |      |
| gtt tac cgg gat ctc gtt gcc agc gga acc att gct gct gga gag atc | 1008 |
| Val Tyr Arg Asp Leu Val Ala Ser Gly Thr Ile Ala Ala Gly Glu Ile |      |
| 300 305 310 315                                                 |      |
| ggc ttc aag tcg gac gac aac tac cca atc cca gcg cgg ccc gga aac | 1056 |
| Gly Phe Lys Ser Asp Asp Asn Tyr Pro Ile Pro Ala Arg Pro Gly Asn |      |
| 320 325 330                                                     |      |
| gcg gac gac gag gaa tcc gcc aaa cgt cac gaa gcg ttc cga atc gga | 1104 |
| Ala Asp Asp Glu Glu Ser Ala Lys Arg His Glu Ala Phe Arg Ile Gly |      |
| 335 340 345                                                     |      |
| atc ttt gcc cag cca gtt tac gga aac ggc gac tat cct gat gta gta | 1152 |
| Ile Phe Ala Gln Pro Val Tyr Gly Asn Gly Asp Tyr Pro Asp Val Val |      |
| 350 355 360                                                     |      |
| aaa gag acc gtt ggc gac atg ctg ccc gcc ctg acg gat gag gac aag | 1200 |
| Lys Glu Thr Val Gly Asp Met Leu Pro Ala Leu Thr Asp Glu Asp Lys |      |
| 365 370 375                                                     |      |
| ggc tac atc aag ggc agc ggc gac atc ttc gcc att gac ggt tac cgg | 1248 |
| Gly Tyr Ile Lys Gly Ser Gly Asp Ile Phe Ala Ile Asp Gly Tyr Arg |      |
| 380 385 390 395                                                 |      |
| acc gat atc tcg cat gcc gca ctg aat gga atc gcg aat tgc atc aga | 1296 |
| Thr Asp Ile Ser His Ala Ala Leu Asn Gly Ile Ala Asn Cys Ile Arg |      |
| 400 405 410                                                     |      |
| aac cag tcg gac cct aac tgg cct gtt tgc gag gaa ggg tct gac ccg | 1344 |
| Asn Gln Ser Asp Pro Asn Trp Pro Val Cys Glu Glu Gly Ser Asp Pro |      |
| 415 420 425                                                     |      |
| ttc gcc cac gta tac ccg tct ggt ttc gcc atc ggc cag tcc gcc gat | 1392 |
| Phe Ala His Val Tyr Pro Ser Gly Phe Ala Ile Gly Gln Ser Ala Asp |      |
| 430 435 440                                                     |      |
| ccg ctg tcg tca tgg ctc gtc aac tcc gcc cca ttt att cgc gac cag | 1440 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Pro | Leu | Ser | Ser | Trp | Leu | Val | Asn | Ser | Ala | Pro | Phe | Ile | Arg | Asp | Gln |      |
| 445 |     |     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     |      |
| ctg | aag | ttc | ctc | act | caa | acg | tac | ccg | gca | aag | gga | ggg | att | tac | ttc | 1488 |
| Leu | Lys | Phe | Leu | Thr | Gln | Thr | Tyr | Pro | Ala | Lys | Gly | Gly | Ile | Tyr | Phe |      |
| 460 |     |     |     |     | 465 |     |     |     |     | 470 |     |     |     |     | 475 |      |
| agc | gag | ttt | ggg | tgg | gcc | gag | gat | gcg | gag | tac | gac | cgc | cag | ctg | ttg | 1536 |
| Ser | Glu | Phe | Gly | Trp | Ala | Glu | Asp | Ala | Glu | Tyr | Asp | Arg | Gln | Leu | Leu |      |
|     |     |     |     | 480 |     |     |     |     | 485 |     |     |     |     | 490 |     |      |
| tac | caa | atc | acc | tgg | gac | ggg | ctt | agg | acc | cag | tat | ctc | act | gac | tac | 1584 |
| Tyr | Gln | Ile | Thr | Trp | Asp | Gly | Leu | Arg | Thr | Gln | Tyr | Leu | Thr | Asp | Tyr |      |
|     |     |     | 495 |     |     |     |     | 500 |     |     |     |     | 505 |     |     |      |
| ctg | tcc | caa | ctc | ctg | ctc | gcc | gtc | cat | aag | gat | ggg | att | aat | ctt | cgc | 1632 |
| Leu | Ser | Gln | Leu | Leu | Leu | Ala | Val | His | Lys | Asp | Gly | Ile | Asn | Leu | Arg |      |
|     |     | 510 |     |     |     |     | 515 |     |     |     |     | 520 |     |     |     |      |
| ggc | gcg | tta | acc | tgg | agt | ttc | gtc | gac | aac | tgg | gaa | tgg | gga | ctg | ggg | 1680 |
| Gly | Ala | Leu | Thr | Trp | Ser | Phe | Val | Asp | Asn | Trp | Glu | Trp | Gly | Leu | Gly |      |
|     | 525 |     |     |     |     | 530 |     |     |     |     | 535 |     |     |     |     |      |
| atg | caa | cag | aaa | ttc | gga | ttc | cag | ttt | gtc | aat | cag | tcg | gac | cca | gat | 1728 |
| Met | Gln | Gln | Lys | Phe | Gly | Phe | Gln | Phe | Val | Asn | Gln | Ser | Asp | Pro | Asp |      |
| 540 |     |     |     |     | 545 |     |     |     |     | 550 |     |     |     |     | 555 |      |
| ctc | acc | agg | acc | ttc | aaa | ctc | tct | gcg | cac | gct | tac | gct | caa | ttt | ggg | 1776 |
| Leu | Thr | Arg | Thr | Phe | Lys | Leu | Ser | Ala | His | Ala | Tyr | Ala | Gln | Phe | Gly |      |
|     |     |     |     | 560 |     |     |     |     | 565 |     |     |     |     | 570 |     |      |
| cgc | aac | cac | ctc | tga |     |     |     |     |     |     |     |     |     |     |     | 1791 |
| Arg | Asn | His | Leu |     |     |     |     |     |     |     |     |     |     |     |     |      |
|     |     |     | 575 |     |     |     |     |     |     |     |     |     |     |     |     |      |

<210> 4  
 <211> 596  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Synthetic Construct

<400> 4

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Met | Val | Ala | Trp | Trp | Ser | Leu | Phe | Leu | Tyr | Gly | Leu | Gln | Val | Ala |
| -20 |     |     |     |     |     | -15 |     |     |     |     | -10 |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Pro | Ala | Leu | Ala | Ala | Gly | Ala | Val | Thr | Tyr | Pro | Gly | Ala | Ile | Pro |
| -5  |     |     |     | -1  | 1   |     |     |     | 5   |     |     |     |     | 10  |     |

Leu Ser Leu Thr Ser Asn Tyr Glu Thr Pro Ser Pro Thr Ala Ile Pro  
15 20 25

Leu Glu Pro Thr Pro Thr Ala Thr Gly Thr Ala Glu Leu Asp Ala Leu  
30 35 40

Trp Asn Leu Val Glu Ala Gln Tyr Pro Val Gln Thr Ala Ala Val Thr  
45 50 55

Thr Leu Val Thr Val Pro Asp Asp Tyr Lys Phe Glu Ala Asp Pro Pro  
60 65 70 75

Ser Tyr Ala Leu Ala Gly Tyr Glu Thr Ser Glu Ile Ala Gly Leu Lys  
80 85 90

Phe Pro Lys Gly Phe Lys Phe Gly Val Ala Gly Ala Ala Ile Gln Val  
95 100 105

Glu Gly Ala Ala Lys Ala Glu Gly Arg Gly Pro Ser Thr Trp Asp Tyr  
110 115 120

Leu Cys His His Tyr Ala Ser Thr Gln Cys Asn Asn Tyr Asp Pro Asp  
125 130 135

Ile Thr Thr Asn His Tyr Tyr Leu Tyr Pro Leu Asp Phe Ala Arg Leu  
140 145 150 155

Gln His Leu Gly Ile Asn Thr Tyr Ser Phe Ser Ile Ser Trp Thr Arg  
160 165 170

Ile Tyr Pro Leu Gly Ala Gly Tyr Val Asn Glu Ala Gly Leu Ala His  
175 180 185

Tyr Asp Ala Val Ile His Ser Ala Lys Lys Tyr Gly Leu Glu Pro Val  
190 195 200

Gly Thr Val Phe His Trp Asp Thr Pro Leu Ser Leu Met Leu Lys Tyr  
205 210 215

Gly Ala Trp Gln Asp Thr Gly Asp Gln Ile Val Lys Asp Phe Val Thr  
220 225 230 235

Tyr Ala Thr Thr Val Phe Lys Arg Tyr Gly Asn Glu Val Lys Thr Trp  
240 245 250

Phe Thr Phe Asn Glu Pro Arg Val Phe Cys Ser Gln Asn Ser Gly Leu  
255 260 265

Pro Tyr Asn Leu Thr Tyr Pro Glu Gly Ile Asn Ser Thr Ser Ala Val  
270 275 280

Phe Arg Cys Thr Tyr Asn Val Leu Lys Ala His Gly His Ala Val Lys  
285 290 295

Val Tyr Arg Asp Leu Val Ala Ser Gly Thr Ile Ala Ala Gly Glu Ile  
300 305 310 315

Gly Phe Lys Ser Asp Asp Asn Tyr Pro Ile Pro Ala Arg Pro Gly Asn  
320 325 330

Ala Asp Asp Glu Glu Ser Ala Lys Arg His Glu Ala Phe Arg Ile Gly  
335 340 345

Ile Phe Ala Gln Pro Val Tyr Gly Asn Gly Asp Tyr Pro Asp Val Val  
350 355 360

Lys Glu Thr Val Gly Asp Met Leu Pro Ala Leu Thr Asp Glu Asp Lys  
365 370 375

Gly Tyr Ile Lys Gly Ser Gly Asp Ile Phe Ala Ile Asp Gly Tyr Arg  
380 385 390 395

Thr Asp Ile Ser His Ala Ala Leu Asn Gly Ile Ala Asn Cys Ile Arg  
400 405 410

Asn Gln Ser Asp Pro Asn Trp Pro Val Cys Glu Glu Gly Ser Asp Pro  
415 420 425

Phe Ala His Val Tyr Pro Ser Gly Phe Ala Ile Gly Gln Ser Ala Asp  
430 435 440

Pro Leu Ser Ser Trp Leu Val Asn Ser Ala Pro Phe Ile Arg Asp Gln  
 445 450 455

Leu Lys Phe Leu Thr Gln Thr Tyr Pro Ala Lys Gly Gly Ile Tyr Phe  
 460 465 470 475

Ser Glu Phe Gly Trp Ala Glu Asp Ala Glu Tyr Asp Arg Gln Leu Leu  
 480 485 490

Tyr Gln Ile Thr Trp Asp Gly Leu Arg Thr Gln Tyr Leu Thr Asp Tyr  
 495 500 505

Leu Ser Gln Leu Leu Leu Ala Val His Lys Asp Gly Ile Asn Leu Arg  
 510 515 520

Gly Ala Leu Thr Trp Ser Phe Val Asp Asn Trp Glu Trp Gly Leu Gly  
 525 530 535

Met Gln Gln Lys Phe Gly Phe Gln Phe Val Asn Gln Ser Asp Pro Asp  
 540 545 550 555

Leu Thr Arg Thr Phe Lys Leu Ser Ala His Ala Tyr Ala Gln Phe Gly  
 560 565 570

Arg Asn His Leu  
 575

<210> 5  
 <211> 1791  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Beta-galactosidase

<220>  
 <221> CDS  
 <222> (1)..(1791)

<220>  
 <221> sig\_peptide  
 <222> (1)..(63)

<220>

<221> mat\_peptide  
 <222> (64)..(1788)

<400> 5

|                                                                                                                                                       |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| atg atg gtc gcg tgg tgg tct cta ttt ctg tac ggc ctt cag gtc gcg<br>Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala<br>-20 -15 -10     | 48  |
| gca cct gct ttg gct gct ggc gcc gtc aca tac ccc gga gct att cca<br>Ala Pro Ala Leu Ala Ala Gly Ala Val Thr Tyr Pro Gly Ala Ile Pro<br>-5 -1 1 5 10    | 96  |
| ctg tcc ctc aca agc aac tac gag aca cct tct cct acc gcc att cct<br>Leu Ser Leu Thr Ser Asn Tyr Glu Thr Pro Ser Pro Thr Ala Ile Pro<br>15 20 25        | 144 |
| ttg gag cca act ccg act gca act gga acc gca gaa ctg gat gcg ctc<br>Leu Glu Pro Thr Pro Thr Ala Thr Gly Thr Ala Glu Leu Asp Ala Leu<br>30 35 40        | 192 |
| tgg aac ctt gtc gaa gct cag tat ccc gtc caa acg gcc gca gtc acc<br>Trp Asn Leu Val Glu Ala Gln Tyr Pro Val Gln Thr Ala Ala Val Thr<br>45 50 55        | 240 |
| acc ctc gtc acc gtc cct gac gac tac aag ttc gag gcc gat cct cct<br>Thr Leu Val Thr Val Pro Asp Asp Tyr Lys Phe Glu Ala Asp Pro Pro<br>60 65 70 75     | 288 |
| agc tat gca ctc gca ggt tac gag act tcc gag att gcg gga ctg aag<br>Ser Tyr Ala Leu Ala Gly Tyr Glu Thr Ser Glu Ile Ala Gly Leu Lys<br>80 85 90        | 336 |
| ttc ccc aaa ggt ttc aag ttc ggc gtt gct ggg gcc gcg att cag gtc<br>Phe Pro Lys Gly Phe Lys Phe Gly Val Ala Gly Ala Ala Ile Gln Val<br>95 100 105      | 384 |
| gaa ggc gct gct aaa gcg gaa gga cgt ggg ccc tct aca tgg gat tac<br>Glu Gly Ala Ala Lys Ala Glu Gly Arg Gly Pro Ser Thr Trp Asp Tyr<br>110 115 120     | 432 |
| ctc tgt cat cac tat gcc agc act cag tgc aac aac tac gat ccc gat<br>Leu Cys His His Tyr Ala Ser Thr Gln Cys Asn Asn Tyr Asp Pro Asp<br>125 130 135     | 480 |
| atc acc acc aac cat tac tac ctc tac ccc ctc gat ttc gcg cgt ctt<br>Ile Thr Thr Asn His Tyr Tyr Leu Tyr Pro Leu Asp Phe Ala Arg Leu<br>140 145 150 155 | 528 |
| caa cat ctg ggc atc aac acc tac tcc ttt tcc att tcc tgg acc cga<br>Gln His Leu Gly Ile Asn Thr Tyr Ser Phe Ser Ile Ser Trp Thr Arg<br>160 165 170     | 576 |
| atc tac cct ctc ggc gcc ggt tac gtc aac gag gcc ggc ttg gca cac<br>Ile Tyr Pro Leu Gly Ala Gly Tyr Val Asn Glu Ala Gly Leu Ala His                    | 624 |

| 175                                                                                                                                                   | 180 | 185 |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| tac gat gct gtc att cac tcc gcc aag aag tac gga ttg gag cca gtt<br>Tyr Asp Ala Val Ile His Ser Ala Lys Lys Tyr Gly Leu Glu Pro Val<br>190 195 200     |     |     | 672  |
| ggc acg gtc ttt cac tgg gac act cct ctg tcg ctc atg ctt aag tac<br>Gly Thr Val Phe His Trp Asp Thr Pro Leu Ser Leu Met Leu Lys Tyr<br>205 210 215     |     |     | 720  |
| ggg gcg tgg cag gat act ggt gat cag atc gtc aag gac ttt gtg acg<br>Gly Ala Trp Gln Asp Thr Gly Asp Gln Ile Val Lys Asp Phe Val Thr<br>220 225 230 235 |     |     | 768  |
| tat gcc acg acc gtt ttc aag cgc tat ggt aac gag gtc aag aca tgg<br>Tyr Ala Thr Thr Val Phe Lys Arg Tyr Gly Asn Glu Val Lys Thr Trp<br>240 245 250     |     |     | 816  |
| ttc aca ttc aac gag cca cgt gtc ttc tgc tcc cag aat tcc ggg ctt<br>Phe Thr Phe Asn Glu Pro Arg Val Phe Cys Ser Gln Asn Ser Gly Leu<br>255 260 265     |     |     | 864  |
| ccg tac aac ctg acc tat cct gaa ggc atc aac tct act tct gcg gtg<br>Pro Tyr Asn Leu Thr Tyr Pro Glu Gly Ile Asn Ser Thr Ser Ala Val<br>270 275 280     |     |     | 912  |
| ttc cgt tgc acg tac aac gtg ctt aag gct cat ggt cat gct gtc aaa<br>Phe Arg Cys Thr Tyr Asn Val Leu Lys Ala His Gly His Ala Val Lys<br>285 290 295     |     |     | 960  |
| gtg tat cga gat ctt gtg gca tcg ggt aca atc gct gcc ggc gag atc<br>Val Tyr Arg Asp Leu Val Ala Ser Gly Thr Ile Ala Ala Gly Glu Ile<br>300 305 310 315 |     |     | 1008 |
| ggc ttc aag agc gac gac aac tac ccg atc ccg gct cgg cct ggt aat<br>Gly Phe Lys Ser Asp Asp Asn Tyr Pro Ile Pro Ala Arg Pro Gly Asn<br>320 325 330     |     |     | 1056 |
| gcc gac gac gag gag tcg gcc aag cgc cac gaa gca ttt cga atc ggc<br>Ala Asp Asp Glu Glu Ser Ala Lys Arg His Glu Ala Phe Arg Ile Gly<br>335 340 345     |     |     | 1104 |
| atc ttc gcc cag cct gtg tat ggg aat ggt gac tat ccc gat gtg gtg<br>Ile Phe Ala Gln Pro Val Tyr Gly Asn Gly Asp Tyr Pro Asp Val Val<br>350 355 360     |     |     | 1152 |
| aag gag acc gtg ggc gac atg ctc ccc gcc ctt acc gat gag gac aaa<br>Lys Glu Thr Val Gly Asp Met Leu Pro Ala Leu Thr Asp Glu Asp Lys<br>365 370 375     |     |     | 1200 |
| ggt tac atc aag ggc tcg ggc gac atc ttc gcg att gac ggc tat cgg<br>Gly Tyr Ile Lys Gly Ser Gly Asp Ile Phe Ala Ile Asp Gly Tyr Arg<br>380 385 390 395 |     |     | 1248 |

|                                                                                                                                                       |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| act gac atc tcg cac gcg gct ctg aat ggc atc gca aac tgc att cgc<br>Thr Asp Ile Ser His Ala Ala Leu Asn Gly Ile Ala Asn Cys Ile Arg<br>400 405 410     | 1296 |
| aat cag agc gac cct aac tgg ccg gtg tgt gaa gaa gga agc gat ccg<br>Asn Gln Ser Asp Pro Asn Trp Pro Val Cys Glu Glu Gly Ser Asp Pro<br>415 420 425     | 1344 |
| ttt gcc cat gtg tat ccc tct ggc ttt gca att gga caa agc gct gat<br>Phe Ala His Val Tyr Pro Ser Gly Phe Ala Ile Gly Gln Ser Ala Asp<br>430 435 440     | 1392 |
| cct ctg tct tct tgg ctc gtt aac tcc gct ccc ttc atc cga gat caa<br>Pro Leu Ser Ser Trp Leu Val Asn Ser Ala Pro Phe Ile Arg Asp Gln<br>445 450 455     | 1440 |
| ctg aag ttc ctg acg caa acc tat cct gca aaa ggc ggc atc tac ttc<br>Leu Lys Phe Leu Thr Gln Thr Tyr Pro Ala Lys Gly Gly Ile Tyr Phe<br>460 465 470 475 | 1488 |
| tcc gag ttt gga tgg gca gag gat gcg gaa tac gat cgg caa ctc ctt<br>Ser Glu Phe Gly Trp Ala Glu Asp Ala Glu Tyr Asp Arg Gln Leu Leu<br>480 485 490     | 1536 |
| tac cag atc acc tgg gac ggg ctt cgc act cag tat ctc acc gat tac<br>Tyr Gln Ile Thr Trp Asp Gly Leu Arg Thr Gln Tyr Leu Thr Asp Tyr<br>495 500 505     | 1584 |
| ctc tcc cag ctg ctg ttg gct gtg cat aag gat ggg atc aac ctt cgg<br>Leu Ser Gln Leu Leu Leu Ala Val His Lys Asp Gly Ile Asn Leu Arg<br>510 515 520     | 1632 |
| ggc gca ttg acc tgg tct ttc gtg gac aac tgg gaa tgg ggt ctg ggc<br>Gly Ala Leu Thr Trp Ser Phe Val Asp Asn Trp Glu Trp Gly Leu Gly<br>525 530 535     | 1680 |
| atg cag cag aag ttc gga ttc caa ttc gtc aat cag agc gat cca gac<br>Met Gln Gln Lys Phe Gly Phe Gln Phe Val Asn Gln Ser Asp Pro Asp<br>540 545 550 555 | 1728 |
| ttg acc cgc aca ttc aag ctc agc gct cat gcg tat gcc cag ttc ggg<br>Leu Thr Arg Thr Phe Lys Leu Ser Ala His Ala Tyr Ala Gln Phe Gly<br>560 565 570     | 1776 |
| cgc aat cac ctg taa<br>Arg Asn His Leu<br>575                                                                                                         | 1791 |

<210> 6  
 <211> 596  
 <212> PRT  
 <213> Artificial Sequence

<220>

<223> Synthetic Construct

<400> 6

Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
-20 -15 -10

Ala Pro Ala Leu Ala Ala Gly Ala Val Thr Tyr Pro Gly Ala Ile Pro  
-5 -1 1 5 10

Leu Ser Leu Thr Ser Asn Tyr Glu Thr Pro Ser Pro Thr Ala Ile Pro  
15 20 25

Leu Glu Pro Thr Pro Thr Ala Thr Gly Thr Ala Glu Leu Asp Ala Leu  
30 35 40

Trp Asn Leu Val Glu Ala Gln Tyr Pro Val Gln Thr Ala Ala Val Thr  
45 50 55

Thr Leu Val Thr Val Pro Asp Asp Tyr Lys Phe Glu Ala Asp Pro Pro  
60 65 70 75

Ser Tyr Ala Leu Ala Gly Tyr Glu Thr Ser Glu Ile Ala Gly Leu Lys  
80 85 90

Phe Pro Lys Gly Phe Lys Phe Gly Val Ala Gly Ala Ala Ile Gln Val  
95 100 105

Glu Gly Ala Ala Lys Ala Glu Gly Arg Gly Pro Ser Thr Trp Asp Tyr  
110 115 120

Leu Cys His His Tyr Ala Ser Thr Gln Cys Asn Asn Tyr Asp Pro Asp  
125 130 135

Ile Thr Thr Asn His Tyr Tyr Leu Tyr Pro Leu Asp Phe Ala Arg Leu  
140 145 150 155

Gln His Leu Gly Ile Asn Thr Tyr Ser Phe Ser Ile Ser Trp Thr Arg  
160 165 170

Ile Tyr Pro Leu Gly Ala Gly Tyr Val Asn Glu Ala Gly Leu Ala His

175

180

185

Tyr Asp Ala Val Ile His Ser Ala Lys Lys Tyr Gly Leu Glu Pro Val  
 190 195 200

Gly Thr Val Phe His Trp Asp Thr Pro Leu Ser Leu Met Leu Lys Tyr  
 205 210 215

Gly Ala Trp Gln Asp Thr Gly Asp Gln Ile Val Lys Asp Phe Val Thr  
 220 225 230 235

Tyr Ala Thr Thr Val Phe Lys Arg Tyr Gly Asn Glu Val Lys Thr Trp  
 240 245 250

Phe Thr Phe Asn Glu Pro Arg Val Phe Cys Ser Gln Asn Ser Gly Leu  
 255 260 265

Pro Tyr Asn Leu Thr Tyr Pro Glu Gly Ile Asn Ser Thr Ser Ala Val  
 270 275 280

Phe Arg Cys Thr Tyr Asn Val Leu Lys Ala His Gly His Ala Val Lys  
 285 290 295

Val Tyr Arg Asp Leu Val Ala Ser Gly Thr Ile Ala Ala Gly Glu Ile  
 300 305 310 315

Gly Phe Lys Ser Asp Asp Asn Tyr Pro Ile Pro Ala Arg Pro Gly Asn  
 320 325 330

Ala Asp Asp Glu Glu Ser Ala Lys Arg His Glu Ala Phe Arg Ile Gly  
 335 340 345

Ile Phe Ala Gln Pro Val Tyr Gly Asn Gly Asp Tyr Pro Asp Val Val  
 350 355 360

Lys Glu Thr Val Gly Asp Met Leu Pro Ala Leu Thr Asp Glu Asp Lys  
 365 370 375

Gly Tyr Ile Lys Gly Ser Gly Asp Ile Phe Ala Ile Asp Gly Tyr Arg  
 380 385 390 395

Thr Asp Ile Ser His Ala Ala Leu Asn Gly Ile Ala Asn Cys Ile Arg  
400 405 410

Asn Gln Ser Asp Pro Asn Trp Pro Val Cys Glu Glu Gly Ser Asp Pro  
415 420 425

Phe Ala His Val Tyr Pro Ser Gly Phe Ala Ile Gly Gln Ser Ala Asp  
430 435 440

Pro Leu Ser Ser Trp Leu Val Asn Ser Ala Pro Phe Ile Arg Asp Gln  
445 450 455

Leu Lys Phe Leu Thr Gln Thr Tyr Pro Ala Lys Gly Gly Ile Tyr Phe  
460 465 470 475

Ser Glu Phe Gly Trp Ala Glu Asp Ala Glu Tyr Asp Arg Gln Leu Leu  
480 485 490

Tyr Gln Ile Thr Trp Asp Gly Leu Arg Thr Gln Tyr Leu Thr Asp Tyr  
495 500 505

Leu Ser Gln Leu Leu Leu Ala Val His Lys Asp Gly Ile Asn Leu Arg  
510 515 520

Gly Ala Leu Thr Trp Ser Phe Val Asp Asn Trp Glu Trp Gly Leu Gly  
525 530 535

Met Gln Gln Lys Phe Gly Phe Gln Phe Val Asn Gln Ser Asp Pro Asp  
540 545 550 555

Leu Thr Arg Thr Phe Lys Leu Ser Ala His Ala Tyr Ala Gln Phe Gly  
560 565 570

Arg Asn His Leu  
575

<210> 7

<211> 2106

<212> DNA

<213> Sirobasidium magnum

<220>  
 <221> CDS  
 <222> (1)..(2106)

<220>  
 <221> sig\_peptide  
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<220>  
 <221> mat\_peptide  
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<400> 7  
 atg ttc aag ctt acc tct gtg ctg ttg ctg ctc ggt gca gct caa gca 48  
 Met Phe Lys Leu Thr Ser Val Leu Leu Leu Leu Gly Ala Ala Gln Ala  
 -15 -10 -5 -1  
  
 gct gtt cta aac cct cgt caa gct ggc agc ggt aat tcc act gcc agc 96  
 Ala Val Leu Asn Pro Arg Gln Ala Gly Ser Gly Asn Ser Thr Ala Ser  
 1 5 10 15  
  
 ggc tcg ata gcc ggc gat tcc act aga cca gcc acg aca tcc tcg gtc 144  
 Gly Ser Ile Ala Gly Asp Ser Thr Arg Pro Ala Thr Thr Ser Ser Val  
 20 25 30  
  
 gtc tca ccc tct gca gcc aga aac tcc act gcc gca gct act ggt aat 192  
 Val Ser Pro Ser Ala Ala Arg Asn Ser Thr Ala Ala Ala Thr Gly Asn  
 35 40 45  
  
 gct tct cgc aat gct act gcg aca ggt act gcc gtc gct aca gcc act 240  
 Ala Ser Arg Asn Ala Thr Ala Thr Gly Thr Ala Val Ala Thr Ala Thr  
 50 55 60  
  
 ggc ggg gtt aca gca gcc acg tcc act gga atg gcg gtg act tcc cct 288  
 Gly Gly Val Thr Ala Ala Thr Ser Thr Gly Met Ala Val Thr Ser Pro  
 65 70 75 80  
  
 gcc cag gga gcc ggt acc gga gtc ggt acc gca gcc gct gct acg acg 336  
 Ala Gln Gly Ala Gly Thr Gly Val Gly Thr Ala Ala Ala Ala Thr Thr  
 85 90 95  
  
 act acc gcc acg cct agc caa tcc gac ttt gat aat tgg gtc ctc acc 384  
 Thr Thr Ala Thr Pro Ser Gln Ser Asp Phe Asp Asn Trp Val Leu Thr  
 100 105 110  
  
 agt gga ttg cct acc atc acc act tca ttg atc agt acc aat ccc gat 432  
 Ser Gly Leu Pro Thr Ile Thr Thr Ser Leu Ile Ser Thr Asn Pro Asp  
 115 120 125  
  
 gcc att act ccg act gcc agt act tca gga ccg aag cct acg gtc acg 480  
 Ala Ile Thr Pro Thr Ala Ser Thr Ser Gly Pro Lys Pro Thr Val Thr  
 130 135 140

|                                                                 |      |
|-----------------------------------------------------------------|------|
| ttc agc tcg tac tcg gac caa gag ctg gag aat ctc tgg gac gac ttt | 528  |
| Phe Ser Ser Tyr Ser Asp Gln Glu Leu Glu Asn Leu Trp Asp Asp Phe |      |
| 145 150 155 160                                                 |      |
| gtg gga caa gta caa caa cct cca ttc agc tat gtt cca gaa ccc caa | 576  |
| Val Gly Gln Val Gln Gln Pro Pro Phe Ser Tyr Val Pro Glu Pro Gln |      |
| 165 170 175                                                     |      |
| aac ccc tat cct ctg cca aac acc cca cca tcc ctc tat cca gac tgg | 624  |
| Asn Pro Tyr Pro Leu Pro Asn Thr Pro Pro Ser Leu Tyr Pro Asp Trp |      |
| 180 185 190                                                     |      |
| tac gtc aat tgc cct aca aag agt cta ccg ggg tac aaa ttc ccc aga | 672  |
| Tyr Val Asn Cys Pro Thr Lys Ser Leu Pro Gly Tyr Lys Phe Pro Arg |      |
| 195 200 205                                                     |      |
| gga ttc ctg ttc ggc tgg gct aca gct gcg caa cag tgg gaa ggg gct | 720  |
| Gly Phe Leu Phe Gly Trp Ala Thr Ala Ala Gln Gln Trp Glu Gly Ala |      |
| 210 215 220                                                     |      |
| gtc aag gcg gat ggt aag ggt cct agt atc tgg gac tgg gca agt aga | 768  |
| Val Lys Ala Asp Gly Lys Gly Pro Ser Ile Trp Asp Trp Ala Ser Arg |      |
| 225 230 235 240                                                 |      |
| tac ccc ggc ttc atc gcg gac aac act act tct gat gtg gga gat ctg | 816  |
| Tyr Pro Gly Phe Ile Ala Asp Asn Thr Thr Ser Asp Val Gly Asp Leu |      |
| 245 250 255                                                     |      |
| gga tat tac cta tac aaa gaa gat atg gca cgc ctc gct gcg ttg gga | 864  |
| Gly Tyr Tyr Leu Tyr Lys Glu Asp Met Ala Arg Leu Ala Ala Leu Gly |      |
| 260 265 270                                                     |      |
| gga aac gtc tac tct ttc tcc atc ttc tgg act cgt atc ctc ccc ttt | 912  |
| Gly Asn Val Tyr Ser Phe Ser Ile Phe Trp Thr Arg Ile Leu Pro Phe |      |
| 275 280 285                                                     |      |
| gcg gtc caa gga tcc ccc gtg aac caa aag gga gta gac ttt tat cgg | 960  |
| Ala Val Gln Gly Ser Pro Val Asn Gln Lys Gly Val Asp Phe Tyr Arg |      |
| 290 295 300                                                     |      |
| gac ttg atc gat tat tgc tgg agt ttg ggt atc gag cct gtc gtg aca | 1008 |
| Asp Leu Ile Asp Tyr Cys Trp Ser Leu Gly Ile Glu Pro Val Val Thr |      |
| 305 310 315 320                                                 |      |
| ctg ttc cac tgg gat aca cct tta gcg gtg caa ctg ctc tat gga gga | 1056 |
| Leu Phe His Trp Asp Thr Pro Leu Ala Val Gln Leu Leu Tyr Gly Gly |      |
| 325 330 335                                                     |      |
| ttc gca agt gac aag atc att gat gat tat gtc aat tat gcc gaa acg | 1104 |
| Phe Ala Ser Asp Lys Ile Ile Asp Asp Tyr Val Asn Tyr Ala Glu Thr |      |
| 340 345 350                                                     |      |
| gtg ttc act gcc tat aat ggc tcg gtt cac aaa tgg atc acc ttc aac | 1152 |
| Val Phe Thr Ala Tyr Asn Gly Ser Val His Lys Trp Ile Thr Phe Asn |      |

| 355                                                                                                                                                   | 360 | 365 |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| gaa cca gta gta ttc tgc agc cag atg gct tct cct gtg aat tca aca<br>Glu Pro Val Val Phe Cys Ser Gln Met Ala Ser Pro Val Asn Ser Thr<br>370 375 380     |     |     | 1200 |
| ctg ccc gaa ggg ttg aac agc acc aca tac cca tac aca tgt agc tac<br>Leu Pro Glu Gly Leu Asn Ser Thr Thr Tyr Pro Tyr Thr Cys Ser Tyr<br>385 390 395 400 |     |     | 1248 |
| cat ctc acc ctg gct cac gcc aag acc gtc caa cga ttc aga gag ctc<br>His Leu Thr Leu Ala His Ala Lys Thr Val Gln Arg Phe Arg Glu Leu<br>405 410 415     |     |     | 1296 |
| aac atc cag gga gag att gcg ctc aag tcg gac aac ttt aat ggt atc<br>Asn Ile Gln Gly Glu Ile Ala Leu Lys Ser Asp Asn Phe Asn Gly Ile<br>420 425 430     |     |     | 1344 |
| cct tgg agg gaa ggg aat ccc gac gat gaa gaa gcc gtt gct agg cat<br>Pro Trp Arg Glu Gly Asn Pro Asp Asp Glu Glu Ala Val Ala Arg His<br>435 440 445     |     |     | 1392 |
| tct gca tac cag att ggc atc ttt gcg gaa ccg ata tac aac act ggc<br>Ser Ala Tyr Gln Ile Gly Ile Phe Ala Glu Pro Ile Tyr Asn Thr Gly<br>450 455 460     |     |     | 1440 |
| gac tgg cca gaa ctg atc aag aac gat ctt gga ccc gac atc ttg ccc<br>Asp Trp Pro Glu Leu Ile Lys Asn Asp Leu Gly Pro Asp Ile Leu Pro<br>465 470 475 480 |     |     | 1488 |
| cga ttc acc gat gag cag atc cag atg atc aag ggt act gcc gac ttc<br>Arg Phe Thr Asp Glu Gln Ile Gln Met Ile Lys Gly Thr Ala Asp Phe<br>485 490 495     |     |     | 1536 |
| ttt gcc att gat ggg tat cga gat ggc tgg gtc act gcc cca cct gct<br>Phe Ala Ile Asp Gly Tyr Arg Asp Gly Trp Val Thr Ala Pro Pro Ala<br>500 505 510     |     |     | 1584 |
| gga gtg cag gct tgc gtg gcc aat atc agt gat ccc ctc tgg cct gtg<br>Gly Val Gln Ala Cys Val Ala Asn Ile Ser Asp Pro Leu Trp Pro Val<br>515 520 525     |     |     | 1632 |
| tgc aat caa gtc aac ttc tac gac tct tct ccc gca ggt tgg gga atc<br>Cys Asn Gln Val Asn Phe Tyr Asp Ser Ser Pro Ala Gly Trp Gly Ile<br>530 535 540     |     |     | 1680 |
| gga gcg ttt ggt aat tgg cct acc act ccc tgg ctg caa aac act tgg<br>Gly Ala Phe Gly Asn Trp Pro Thr Thr Pro Trp Leu Gln Asn Thr Trp<br>545 550 555 560 |     |     | 1728 |
| caa ttt gtc cgg cca ttt ttg aaa gaa ttg act cag cag tac ccc acc<br>Gln Phe Val Arg Pro Phe Leu Lys Glu Leu Thr Gln Gln Tyr Pro Thr<br>565 570 575     |     |     | 1776 |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| aaa ggt ggt atc tac ctc tcg gaa ttt ggc ttc tcc gaa cca ttc gag | 1824 |
| Lys Gly Gly Ile Tyr Leu Ser Glu Phe Gly Phe Ser Glu Pro Phe Glu |      |
| 580 585 590                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| aac gag aaa aac ttc atc tac cag atc acg act gac ccg gga cgg gtg | 1872 |
| Asn Glu Lys Asn Phe Ile Tyr Gln Ile Thr Thr Asp Pro Gly Arg Val |      |
| 595 600 605                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gca tac ttt aac agt tac ctc ggt gaa gtg ctc ttg gcg atc aac gag | 1920 |
| Ala Tyr Phe Asn Ser Tyr Leu Gly Glu Val Leu Leu Ala Ile Asn Glu |      |
| 610 615 620                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gat gaa aca gat gtg aga ggg act ttt gga tgg agt ctt ttg gac aac | 1968 |
| Asp Glu Thr Asp Val Arg Gly Thr Phe Gly Trp Ser Leu Leu Asp Asn |      |
| 625 630 635 640                                                 |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| ttt gag tgg aac tcg ggg ttg tcg act cgg ttc ggt gtc caa tat gtc | 2016 |
| Phe Glu Trp Asn Ser Gly Leu Ser Thr Arg Phe Gly Val Gln Tyr Val |      |
| 645 650 655                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gat tac aac agt cct acg ctc gaa agg acg ttc aag cgc tct gcg atc | 2064 |
| Asp Tyr Asn Ser Pro Thr Leu Glu Arg Thr Phe Lys Arg Ser Ala Ile |      |
| 660 665 670                                                     |      |

|                                                         |      |
|---------------------------------------------------------|------|
| gag atg agc cag ttc tgg aac act cat cgt tgc gag gac tag | 2106 |
| Glu Met Ser Gln Phe Trp Asn Thr His Arg Cys Glu Asp     |      |
| 675 680 685                                             |      |

<210> 8  
 <211> 701  
 <212> PRT  
 <213> Sirobasidium magnum

<400> 8

|                                                                 |
|-----------------------------------------------------------------|
| Met Phe Lys Leu Thr Ser Val Leu Leu Leu Leu Gly Ala Ala Gln Ala |
| -15 -10 -5 -1                                                   |

|                                                                 |
|-----------------------------------------------------------------|
| Ala Val Leu Asn Pro Arg Gln Ala Gly Ser Gly Asn Ser Thr Ala Ser |
| 1 5 10 15                                                       |

|                                                                 |
|-----------------------------------------------------------------|
| Gly Ser Ile Ala Gly Asp Ser Thr Arg Pro Ala Thr Thr Ser Ser Val |
| 20 25 30                                                        |

|                                                                 |
|-----------------------------------------------------------------|
| Val Ser Pro Ser Ala Ala Arg Asn Ser Thr Ala Ala Ala Thr Gly Asn |
| 35 40 45                                                        |

|                                                                 |
|-----------------------------------------------------------------|
| Ala Ser Arg Asn Ala Thr Ala Thr Gly Thr Ala Val Ala Thr Ala Thr |
| 50 55 60                                                        |

Gly Gly Val Thr Ala Ala Thr Ser Thr Gly Met Ala Val Thr Ser Pro  
65 70 75 80

Ala Gln Gly Ala Gly Thr Gly Val Gly Thr Ala Ala Ala Ala Thr Thr  
85 90 95

Thr Thr Ala Thr Pro Ser Gln Ser Asp Phe Asp Asn Trp Val Leu Thr  
100 105 110

Ser Gly Leu Pro Thr Ile Thr Thr Ser Leu Ile Ser Thr Asn Pro Asp  
115 120 125

Ala Ile Thr Pro Thr Ala Ser Thr Ser Gly Pro Lys Pro Thr Val Thr  
130 135 140

Phe Ser Ser Tyr Ser Asp Gln Glu Leu Glu Asn Leu Trp Asp Asp Phe  
145 150 155 160

Val Gly Gln Val Gln Gln Pro Pro Phe Ser Tyr Val Pro Glu Pro Gln  
165 170 175

Asn Pro Tyr Pro Leu Pro Asn Thr Pro Pro Ser Leu Tyr Pro Asp Trp  
180 185 190

Tyr Val Asn Cys Pro Thr Lys Ser Leu Pro Gly Tyr Lys Phe Pro Arg  
195 200 205

Gly Phe Leu Phe Gly Trp Ala Thr Ala Ala Gln Gln Trp Glu Gly Ala  
210 215 220

Val Lys Ala Asp Gly Lys Gly Pro Ser Ile Trp Asp Trp Ala Ser Arg  
225 230 235 240

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

Gly Tyr Tyr Leu Tyr Lys Glu Asp Met Ala Arg Leu Ala Ala Leu Gly  
260 265 270

Gly Asn Val Tyr Ser Phe Ser Ile Phe Trp Thr Arg Ile Leu Pro Phe  
275 280 285

Ala Val Gln Gly Ser Pro Val Asn Gln Lys Gly Val Asp Phe Tyr Arg  
290 295 300

Asp Leu Ile Asp Tyr Cys Trp Ser Leu Gly Ile Glu Pro Val Val Thr  
305 310 315 320

Leu Phe His Trp Asp Thr Pro Leu Ala Val Gln Leu Leu Tyr Gly Gly  
325 330 335

Phe Ala Ser Asp Lys Ile Ile Asp Asp Tyr Val Asn Tyr Ala Glu Thr  
340 345 350

Val Phe Thr Ala Tyr Asn Gly Ser Val His Lys Trp Ile Thr Phe Asn  
355 360 365

Glu Pro Val Val Phe Cys Ser Gln Met Ala Ser Pro Val Asn Ser Thr  
370 375 380

Leu Pro Glu Gly Leu Asn Ser Thr Thr Tyr Pro Tyr Thr Cys Ser Tyr  
385 390 395 400

His Leu Thr Leu Ala His Ala Lys Thr Val Gln Arg Phe Arg Glu Leu  
405 410 415

Asn Ile Gln Gly Glu Ile Ala Leu Lys Ser Asp Asn Phe Asn Gly Ile  
420 425 430

Pro Trp Arg Glu Gly Asn Pro Asp Asp Glu Glu Ala Val Ala Arg His  
435 440 445

Ser Ala Tyr Gln Ile Gly Ile Phe Ala Glu Pro Ile Tyr Asn Thr Gly  
450 455 460

Asp Trp Pro Glu Leu Ile Lys Asn Asp Leu Gly Pro Asp Ile Leu Pro  
465 470 475 480

Arg Phe Thr Asp Glu Gln Ile Gln Met Ile Lys Gly Thr Ala Asp Phe  
485 490 495

Phe Ala Ile Asp Gly Tyr Arg Asp Gly Trp Val Thr Ala Pro Pro Ala  
500 505 510

Gly Val Gln Ala Cys Val Ala Asn Ile Ser Asp Pro Leu Trp Pro Val  
515 520 525

Cys Asn Gln Val Asn Phe Tyr Asp Ser Ser Pro Ala Gly Trp Gly Ile  
530 535 540

Gly Ala Phe Gly Asn Trp Pro Thr Thr Pro Trp Leu Gln Asn Thr Trp  
545 550 555 560

Gln Phe Val Arg Pro Phe Leu Lys Glu Leu Thr Gln Gln Tyr Pro Thr  
565 570 575

Lys Gly Gly Ile Tyr Leu Ser Glu Phe Gly Phe Ser Glu Pro Phe Glu  
580 585 590

Asn Glu Lys Asn Phe Ile Tyr Gln Ile Thr Thr Asp Pro Gly Arg Val  
595 600 605

Ala Tyr Phe Asn Ser Tyr Leu Gly Glu Val Leu Leu Ala Ile Asn Glu  
610 615 620

Asp Glu Thr Asp Val Arg Gly Thr Phe Gly Trp Ser Leu Leu Asp Asn  
625 630 635 640

Phe Glu Trp Asn Ser Gly Leu Ser Thr Arg Phe Gly Val Gln Tyr Val  
645 650 655

Asp Tyr Asn Ser Pro Thr Leu Glu Arg Thr Phe Lys Arg Ser Ala Ile  
660 665 670

Glu Met Ser Gln Phe Trp Asn Thr His Arg Cys Glu Asp  
675 680 685

<210> 9

<211> 2121

<212> DNA

<213> Artificial Sequence

<220>

<223> Beta-galactosidase

<220>

<221> CDS

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<220>

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<222> (1)..(63)

<220>

<221> mat\_peptide

<222> (64)..(2118)

<400> 9

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| atg | atg | gtc | gcg | tgg | tgg | tct | cta | ttt | ctg | tac | ggc | ctt | cag | gtc | gcg | 48 |
| Met | Met | Val | Ala | Trp | Trp | Ser | Leu | Phe | Leu | Tyr | Gly | Leu | Gln | Val | Ala |    |
|     | -20 |     |     |     |     | -15 |     |     |     |     | -10 |     |     |     |     |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| gca | cct | gct | ttg | gct | gct | gtt | cta | aac | cct | cgt | caa | gct | ggc | agc | ggt | 96 |
| Ala | Pro | Ala | Leu | Ala | Ala | Val | Leu | Asn | Pro | Arg | Gln | Ala | Gly | Ser | Gly |    |
| -5  |     |     |     | -1  | 1   |     |     |     | 5   |     |     |     |     | 10  |     |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| aat | tcc | act | gcc | agc | ggc | tcg | ata | gcc | ggc | gat | tcc | act | aga | cca | gcc | 144 |
| Asn | Ser | Thr | Ala | Ser | Gly | Ser | Ile | Ala | Gly | Asp | Ser | Thr | Arg | Pro | Ala |     |
|     |     |     | 15  |     |     |     |     | 20  |     |     |     |     | 25  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| acg | aca | tcc | tcg | gtc | gtc | tca | ccc | tct | gca | gcc | aga | aac | tcc | act | gcc | 192 |
| Thr | Thr | Ser | Ser | Val | Val | Ser | Pro | Ser | Ala | Ala | Arg | Asn | Ser | Thr | Ala |     |
|     |     | 30  |     |     |     |     | 35  |     |     |     |     | 40  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gca | gct | act | ggt | aat | gct | tct | cgc | aat | gct | act | gcg | aca | ggt | act | gcc | 240 |
| Ala | Ala | Thr | Gly | Asn | Ala | Ser | Arg | Asn | Ala | Thr | Ala | Thr | Gly | Thr | Ala |     |
|     | 45  |     |     |     |     | 50  |     |     |     |     | 55  |     |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gtc | gct | aca | gcc | act | ggc | ggg | gtt | aca | gca | gcc | acg | tcc | act | gga | atg | 288 |
| Val | Ala | Thr | Ala | Thr | Gly | Gly | Val | Thr | Ala | Ala | Thr | Ser | Thr | Gly | Met |     |
| 60  |     |     |     |     | 65  |     |     |     | 70  |     |     |     |     | 75  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gcg | gtg | act | tcc | cct | gcc | cag | gga | gcc | ggt | acc | gga | gtc | ggt | acc | gca | 336 |
| Ala | Val | Thr | Ser | Pro | Ala | Gln | Gly | Ala | Gly | Thr | Gly | Val | Gly | Thr | Ala |     |
|     |     |     |     | 80  |     |     |     |     | 85  |     |     |     |     | 90  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| gcc | gct | gct | acg | acg | act | acc | gcc | acg | cct | agc | caa | tcc | gac | ttt | gat | 384 |
| Ala | Ala | Ala | Thr | Thr | Thr | Thr | Ala | Thr | Pro | Ser | Gln | Ser | Asp | Phe | Asp |     |
|     |     |     | 95  |     |     |     |     | 100 |     |     |     |     | 105 |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| aat | tgg | gtc | ctc | acc | agt | gga | ttg | cct | acc | atc | acc | act | tca | ttg | atc | 432 |
| Asn | Trp | Val | Leu | Thr | Ser | Gly | Leu | Pro | Thr | Ile | Thr | Thr | Ser | Leu | Ile |     |
|     |     | 110 |     |     |     |     | 115 |     |     |     |     |     | 120 |     |     |     |

|                                                                                                                                    |      |
|------------------------------------------------------------------------------------------------------------------------------------|------|
| agt acc aat ccc gat gcc att act ccg act gcc agt act tca gga ccg<br>Ser Thr Asn Pro Asp Ala Ile Thr Pro Thr Ala Ser Thr Ser Gly Pro | 480  |
| 125 130 135                                                                                                                        |      |
| aag cct acg gtc acg ttc agc tcg tac tcg gac caa gag ctg gag aat<br>Lys Pro Thr Val Thr Phe Ser Ser Tyr Ser Asp Gln Glu Leu Glu Asn | 528  |
| 140 145 150 155                                                                                                                    |      |
| ctc tgg gac gac ttt gtg gga caa gta caa caa cct cca ttc agc tat<br>Leu Trp Asp Asp Phe Val Gly Gln Val Gln Gln Pro Pro Phe Ser Tyr | 576  |
| 160 165 170                                                                                                                        |      |
| gtt cca gaa ccc caa aac ccc tat cct ctg cca aac acc cca cca tcc<br>Val Pro Glu Pro Gln Asn Pro Tyr Pro Leu Pro Asn Thr Pro Pro Ser | 624  |
| 175 180 185                                                                                                                        |      |
| ctc tat cca gac tgg tac gtc aat tgc cct aca aag agt cta ccg ggg<br>Leu Tyr Pro Asp Trp Tyr Val Asn Cys Pro Thr Lys Ser Leu Pro Gly | 672  |
| 190 195 200                                                                                                                        |      |
| tac aaa ttc ccc aga gga ttc ctg ttc ggc tgg gct aca gct gcg caa<br>Tyr Lys Phe Pro Arg Gly Phe Leu Phe Gly Trp Ala Thr Ala Ala Gln | 720  |
| 205 210 215                                                                                                                        |      |
| cag tgg gaa ggg gct gtc aag gcg gat ggt aag ggt cct agt atc tgg<br>Gln Trp Glu Gly Ala Val Lys Ala Asp Gly Lys Gly Pro Ser Ile Trp | 768  |
| 220 225 230 235                                                                                                                    |      |
| gac tgg gca agt aga tac ccc ggc ttc atc gcg gac aac act act tct<br>Asp Trp Ala Ser Arg Tyr Pro Gly Phe Ile Ala Asp Asn Thr Thr Ser | 816  |
| 240 245 250                                                                                                                        |      |
| gat gtg gga gat ctg gga tat tac cta tac aaa gaa gat atg gca cgc<br>Asp Val Gly Asp Leu Gly Tyr Tyr Leu Tyr Lys Glu Asp Met Ala Arg | 864  |
| 255 260 265                                                                                                                        |      |
| ctc gct gcg ttg gga gga aac gtc tac tct ttc tcc atc ttc tgg act<br>Leu Ala Ala Leu Gly Gly Asn Val Tyr Ser Phe Ser Ile Phe Trp Thr | 912  |
| 270 275 280                                                                                                                        |      |
| cgt atc ctc ccc ttt gcg gtc caa gga tcc ccc gtg aac caa aag gga<br>Arg Ile Leu Pro Phe Ala Val Gln Gly Ser Pro Val Asn Gln Lys Gly | 960  |
| 285 290 295                                                                                                                        |      |
| gta gac ttt tat cgg gac ttg atc gat tat tgc tgg agt ttg ggt atc<br>Val Asp Phe Tyr Arg Asp Leu Ile Asp Tyr Cys Trp Ser Leu Gly Ile | 1008 |
| 300 305 310 315                                                                                                                    |      |
| gag cct gtc gtg aca ctg ttc cac tgg gat aca cct tta gcg gtg caa<br>Glu Pro Val Val Thr Leu Phe His Trp Asp Thr Pro Leu Ala Val Gln | 1056 |
| 320 325 330                                                                                                                        |      |
| ctg ctc tat gga gga ttc gca agt gac aag atc att gat gat tat gtc<br>Leu Leu Tyr Gly Gly Phe Ala Ser Asp Lys Ile Ile Asp Asp Tyr Val | 1104 |

| 335 |     |     |     |     |     |     | 340 |     |     |     |     |     |     | 345 |     |      |  |  |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|--|--|--|--|
| aat | tat | gcc | gaa | acg | gtg | ttc | act | gcc | tat | aat | ggc | tcg | gtt | cac | aaa | 1152 |  |  |  |  |  |
| Asn | Tyr | Ala | Glu | Thr | Val | Phe | Thr | Ala | Tyr | Asn | Gly | Ser | Val | His | Lys |      |  |  |  |  |  |
|     |     | 350 |     |     |     |     |     | 355 |     |     |     | 360 |     |     |     |      |  |  |  |  |  |
| tgg | atc | acc | ttc | aac | gaa | cca | gta | gta | ttc | tgc | agc | cag | atg | gct | tct | 1200 |  |  |  |  |  |
| Trp | Ile | Thr | Phe | Asn | Glu | Pro | Val | Val | Phe | Cys | Ser | Gln | Met | Ala | Ser |      |  |  |  |  |  |
|     | 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     |      |  |  |  |  |  |
| cct | gtg | aat | tca | aca | ctg | ccc | gaa | ggg | ttg | aac | agc | acc | aca | tac | cca | 1248 |  |  |  |  |  |
| Pro | Val | Asn | Ser | Thr | Leu | Pro | Glu | Gly | Leu | Asn | Ser | Thr | Thr | Tyr | Pro |      |  |  |  |  |  |
| 380 |     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |      |  |  |  |  |  |
| tac | aca | tgt | agc | tac | cat | ctc | acc | ctg | gct | cac | gcc | aag | acc | gtc | caa | 1296 |  |  |  |  |  |
| Tyr | Thr | Cys | Ser | Tyr | His | Leu | Thr | Leu | Ala | His | Ala | Lys | Thr | Val | Gln |      |  |  |  |  |  |
|     |     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |      |  |  |  |  |  |
| cga | ttc | aga | gag | ctc | aac | atc | cag | gga | gag | att | gcg | ctc | aag | tcg | gac | 1344 |  |  |  |  |  |
| Arg | Phe | Arg | Glu | Leu | Asn | Ile | Gln | Gly | Glu | Ile | Ala | Leu | Lys | Ser | Asp |      |  |  |  |  |  |
|     |     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |      |  |  |  |  |  |
| aac | ttt | aat | ggt | atc | cct | tgg | agg | gaa | ggg | aat | ccc | gac | gat | gaa | gaa | 1392 |  |  |  |  |  |
| Asn | Phe | Asn | Gly | Ile | Pro | Trp | Arg | Glu | Gly | Asn | Pro | Asp | Asp | Glu | Glu |      |  |  |  |  |  |
|     |     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |      |  |  |  |  |  |
| gcc | gtt | gct | agg | cat | tct | gca | tac | cag | att | ggc | atc | ttt | gcg | gaa | ccg | 1440 |  |  |  |  |  |
| Ala | Val | Ala | Arg | His | Ser | Ala | Tyr | Gln | Ile | Gly | Ile | Phe | Ala | Glu | Pro |      |  |  |  |  |  |
|     | 445 |     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     |      |  |  |  |  |  |
| ata | tac | aac | act | ggc | gac | tgg | cca | gaa | ctg | atc | aag | aac | gat | ctt | gga | 1488 |  |  |  |  |  |
| Ile | Tyr | Asn | Thr | Gly | Asp | Trp | Pro | Glu | Leu | Ile | Lys | Asn | Asp | Leu | Gly |      |  |  |  |  |  |
| 460 |     |     |     |     | 465 |     |     |     |     | 470 |     |     |     |     | 475 |      |  |  |  |  |  |
| ccc | gac | atc | ttg | ccc | cga | ttc | acc | gat | gag | cag | atc | cag | atg | atc | aag | 1536 |  |  |  |  |  |
| Pro | Asp | Ile | Leu | Pro | Arg | Phe | Thr | Asp | Glu | Gln | Ile | Gln | Met | Ile | Lys |      |  |  |  |  |  |
|     |     |     |     | 480 |     |     |     |     | 485 |     |     |     |     | 490 |     |      |  |  |  |  |  |
| ggt | act | gcc | gac | ttc | ttt | gcc | att | gat | ggg | tat | cga | gat | ggc | tgg | gtc | 1584 |  |  |  |  |  |
| Gly | Thr | Ala | Asp | Phe | Phe | Ala | Ile | Asp | Gly | Tyr | Arg | Asp | Gly | Trp | Val |      |  |  |  |  |  |
|     |     |     | 495 |     |     |     |     | 500 |     |     |     |     | 505 |     |     |      |  |  |  |  |  |
| act | gcc | cca | cct | gct | gga | gtg | cag | gct | tgc | gtg | gcc | aat | atc | agt | gat | 1632 |  |  |  |  |  |
| Thr | Ala | Pro | Pro | Ala | Gly | Val | Gln | Ala | Cys | Val | Ala | Asn | Ile | Ser | Asp |      |  |  |  |  |  |
|     |     | 510 |     |     |     |     | 515 |     |     |     |     | 520 |     |     |     |      |  |  |  |  |  |
| ccc | ctc | tgg | cct | gtg | tgc | aat | caa | gtc | aac | ttc | tac | gac | tct | tct | ccc | 1680 |  |  |  |  |  |
| Pro | Leu | Trp | Pro | Val | Cys | Asn | Gln | Val | Asn | Phe | Tyr | Asp | Ser | Ser | Pro |      |  |  |  |  |  |
|     | 525 |     |     |     |     | 530 |     |     |     |     | 535 |     |     |     |     |      |  |  |  |  |  |
| gca | ggt | tgg | gga | atc | gga | gcg | ttt | ggt | aat | tgg | cct | acc | act | ccc | tgg | 1728 |  |  |  |  |  |
| Ala | Gly | Trp | Gly | Ile | Gly | Ala | Phe | Gly | Asn | Trp | Pro | Thr | Thr | Pro | Trp |      |  |  |  |  |  |
| 540 |     |     |     |     | 545 |     |     |     |     | 550 |     |     |     |     | 555 |      |  |  |  |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| ctg | caa | aac | act | tgg | caa | ttt | gtc | cgg | cca | ttt | ttg | aaa | gaa | ttg | act | 1776 |
| Leu | Gln | Asn | Thr | Trp | Gln | Phe | Val | Arg | Pro | Phe | Leu | Lys | Glu | Leu | Thr |      |
|     |     |     |     | 560 |     |     |     |     | 565 |     |     |     |     | 570 |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| cag | cag | tac | ccc | acc | aaa | ggg | ggg | atc | tac | ctc | tcg | gaa | ttt | ggc | ttc | 1824 |
| Gln | Gln | Tyr | Pro | Thr | Lys | Gly | Gly | Ile | Tyr | Leu | Ser | Glu | Phe | Gly | Phe |      |
|     |     |     | 575 |     |     |     |     | 580 |     |     |     |     | 585 |     |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| tcc | gaa | cca | ttc | gag | aac | gag | aaa | aac | ttc | atc | tac | cag | atc | acg | act | 1872 |
| Ser | Glu | Pro | Phe | Glu | Asn | Glu | Lys | Asn | Phe | Ile | Tyr | Gln | Ile | Thr | Thr |      |
|     |     | 590 |     |     |     |     | 595 |     |     |     |     | 600 |     |     |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| gac | ccg | gga | cgg | gtg | gca | tac | ttt | aac | agt | tac | ctc | ggg | gaa | gtg | ctc | 1920 |
| Asp | Pro | Gly | Arg | Val | Ala | Tyr | Phe | Asn | Ser | Tyr | Leu | Gly | Glu | Val | Leu |      |
|     | 605 |     |     |     |     | 610 |     |     |     |     | 615 |     |     |     |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| ttg | gcg | atc | aac | gag | gat | gaa | aca | gat | gtg | aga | ggg | act | ttt | gga | tgg | 1968 |
| Leu | Ala | Ile | Asn | Glu | Asp | Glu | Thr | Asp | Val | Arg | Gly | Thr | Phe | Gly | Trp |      |
| 620 |     |     |     |     | 625 |     |     |     | 630 |     |     |     |     |     | 635 |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| agt | ctt | ttg | gac | aac | ttt | gag | tgg | aac | tcg | ggg | ttg | tcg | act | cgg | ttc | 2016 |
| Ser | Leu | Leu | Asp | Asn | Phe | Glu | Trp | Asn | Ser | Gly | Leu | Ser | Thr | Arg | Phe |      |
|     |     |     | 640 |     |     |     |     | 645 |     |     |     |     |     | 650 |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| ggg | gtc | caa | tat | gtc | gat | tac | aac | agt | cct | acg | ctc | gaa | agg | acg | ttc | 2064 |
| Gly | Val | Gln | Tyr | Val | Asp | Tyr | Asn | Ser | Pro | Thr | Leu | Glu | Arg | Thr | Phe |      |
|     |     | 655 |     |     |     |     | 660 |     |     |     |     | 665 |     |     |     |      |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| aag | cgc | tct | gcg | atc | gag | atg | agc | cag | ttc | tgg | aac | act | cat | cgt | tgc | 2112 |
| Lys | Arg | Ser | Ala | Ile | Glu | Met | Ser | Gln | Phe | Trp | Asn | Thr | His | Arg | Cys |      |
|     |     | 670 |     |     |     |     | 675 |     |     |     |     | 680 |     |     |     |      |

|     |     |     |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
|-----|-----|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|------|
| gag | gac | tag |  |  |  |  |  |  |  |  |  |  |  |  |  | 2121 |
| Glu | Asp |     |  |  |  |  |  |  |  |  |  |  |  |  |  |      |
|     | 685 |     |  |  |  |  |  |  |  |  |  |  |  |  |  |      |

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<400> 10

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Met | Val | Ala | Trp | Trp | Ser | Leu | Phe | Leu | Tyr | Gly | Leu | Gln | Val | Ala |  |
|     | -20 |     |     |     |     | -15 |     |     |     |     | -10 |     |     |     |     |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Ala | Pro | Ala | Leu | Ala | Ala | Val | Leu | Asn | Pro | Arg | Gln | Ala | Gly | Ser | Gly |  |
| -5  |     |     |     | -1  | 1   |     |     |     | 5   |     |     |     |     | 10  |     |  |

Asn Ser Thr Ala Ser Gly Ser Ile Ala Gly Asp Ser Thr Arg Pro Ala  
15 20 25

Thr Thr Ser Ser Val Val Ser Pro Ser Ala Ala Arg Asn Ser Thr Ala  
30 35 40

Ala Ala Thr Gly Asn Ala Ser Arg Asn Ala Thr Ala Thr Gly Thr Ala  
45 50 55

Val Ala Thr Ala Thr Gly Gly Val Thr Ala Ala Thr Ser Thr Gly Met  
60 65 70 75

Ala Val Thr Ser Pro Ala Gln Gly Ala Gly Thr Gly Val Gly Thr Ala  
80 85 90

Ala Ala Ala Thr Thr Thr Thr Ala Thr Pro Ser Gln Ser Asp Phe Asp  
95 100 105

Asn Trp Val Leu Thr Ser Gly Leu Pro Thr Ile Thr Thr Ser Leu Ile  
110 115 120

Ser Thr Asn Pro Asp Ala Ile Thr Pro Thr Ala Ser Thr Ser Gly Pro  
125 130 135

Lys Pro Thr Val Thr Phe Ser Ser Tyr Ser Asp Gln Glu Leu Glu Asn  
140 145 150 155

Leu Trp Asp Asp Phe Val Gly Gln Val Gln Gln Pro Pro Phe Ser Tyr  
160 165 170

Val Pro Glu Pro Gln Asn Pro Tyr Pro Leu Pro Asn Thr Pro Pro Ser  
175 180 185

Leu Tyr Pro Asp Trp Tyr Val Asn Cys Pro Thr Lys Ser Leu Pro Gly  
190 195 200

Tyr Lys Phe Pro Arg Gly Phe Leu Phe Gly Trp Ala Thr Ala Ala Gln  
205 210 215

Gln Trp Glu Gly Ala Val Lys Ala Asp Gly Lys Gly Pro Ser Ile Trp

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 220 |     | 225 |     | 230 |     | 235 |     |     |     |     |     |     |     |     |     |
| Asp | Trp | Ala | Ser | Arg | Tyr | Pro | Gly | Phe | Ile | Ala | Asp | Asn | Thr | Thr | Ser |
|     |     |     |     | 240 |     |     |     |     | 245 |     |     |     |     | 250 |     |
| Asp | Val | Gly | Asp | Leu | Gly | Tyr | Tyr | Leu | Tyr | Lys | Glu | Asp | Met | Ala | Arg |
|     |     |     | 255 |     |     |     |     | 260 |     |     |     |     | 265 |     |     |
| Leu | Ala | Ala | Leu | Gly | Gly | Asn | Val | Tyr | Ser | Phe | Ser | Ile | Phe | Trp | Thr |
|     |     | 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |
| Arg | Ile | Leu | Pro | Phe | Ala | Val | Gln | Gly | Ser | Pro | Val | Asn | Gln | Lys | Gly |
|     | 285 |     |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     |
| Val | Asp | Phe | Tyr | Arg | Asp | Leu | Ile | Asp | Tyr | Cys | Trp | Ser | Leu | Gly | Ile |
| 300 |     |     |     |     | 305 |     |     |     |     | 310 |     |     |     |     | 315 |
| Glu | Pro | Val | Val | Thr | Leu | Phe | His | Trp | Asp | Thr | Pro | Leu | Ala | Val | Gln |
|     |     |     |     | 320 |     |     |     |     | 325 |     |     |     |     | 330 |     |
| Leu | Leu | Tyr | Gly | Gly | Phe | Ala | Ser | Asp | Lys | Ile | Ile | Asp | Asp | Tyr | Val |
|     |     |     | 335 |     |     |     |     | 340 |     |     |     |     | 345 |     |     |
| Asn | Tyr | Ala | Glu | Thr | Val | Phe | Thr | Ala | Tyr | Asn | Gly | Ser | Val | His | Lys |
|     |     | 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |     |     |
| Trp | Ile | Thr | Phe | Asn | Glu | Pro | Val | Val | Phe | Cys | Ser | Gln | Met | Ala | Ser |
|     | 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     |
| Pro | Val | Asn | Ser | Thr | Leu | Pro | Glu | Gly | Leu | Asn | Ser | Thr | Thr | Tyr | Pro |
| 380 |     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |
| Tyr | Thr | Cys | Ser | Tyr | His | Leu | Thr | Leu | Ala | His | Ala | Lys | Thr | Val | Gln |
|     |     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |
| Arg | Phe | Arg | Glu | Leu | Asn | Ile | Gln | Gly | Glu | Ile | Ala | Leu | Lys | Ser | Asp |
|     |     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |
| Asn | Phe | Asn | Gly | Ile | Pro | Trp | Arg | Glu | Gly | Asn | Pro | Asp | Asp | Glu | Glu |
|     |     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |

Ala Val Ala Arg His Ser Ala Tyr Gln Ile Gly Ile Phe Ala Glu Pro  
445 450 455

Ile Tyr Asn Thr Gly Asp Trp Pro Glu Leu Ile Lys Asn Asp Leu Gly  
460 465 470 475

Pro Asp Ile Leu Pro Arg Phe Thr Asp Glu Gln Ile Gln Met Ile Lys  
480 485 490

Gly Thr Ala Asp Phe Phe Ala Ile Asp Gly Tyr Arg Asp Gly Trp Val  
495 500 505

Thr Ala Pro Pro Ala Gly Val Gln Ala Cys Val Ala Asn Ile Ser Asp  
510 515 520

Pro Leu Trp Pro Val Cys Asn Gln Val Asn Phe Tyr Asp Ser Ser Pro  
525 530 535

Ala Gly Trp Gly Ile Gly Ala Phe Gly Asn Trp Pro Thr Thr Pro Trp  
540 545 550 555

Leu Gln Asn Thr Trp Gln Phe Val Arg Pro Phe Leu Lys Glu Leu Thr  
560 565 570

Gln Gln Tyr Pro Thr Lys Gly Gly Ile Tyr Leu Ser Glu Phe Gly Phe  
575 580 585

Ser Glu Pro Phe Glu Asn Glu Lys Asn Phe Ile Tyr Gln Ile Thr Thr  
590 595 600

Asp Pro Gly Arg Val Ala Tyr Phe Asn Ser Tyr Leu Gly Glu Val Leu  
605 610 615

Leu Ala Ile Asn Glu Asp Glu Thr Asp Val Arg Gly Thr Phe Gly Trp  
620 625 630 635

Ser Leu Leu Asp Asn Phe Glu Trp Asn Ser Gly Leu Ser Thr Arg Phe  
640 645 650

Gly Val Gln Tyr Val Asp Tyr Asn Ser Pro Thr Leu Glu Arg Thr Phe

655

660

665

Lys Arg Ser Ala Ile Glu Met Ser Gln Phe Trp Asn Thr His Arg Cys  
 670 675 680

Glu Asp  
 685

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 Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
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gca cct gct ttg gct gcg gtg ctc aac cca cgc cag gct ggc tct gga 96  
 Ala Pro Ala Leu Ala Ala Val Leu Asn Pro Arg Gln Ala Gly Ser Gly  
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aac tct act gcc tct ggg tcc att gct ggc gac tcg aca cgc ccg gct 144  
 Asn Ser Thr Ala Ser Gly Ser Ile Ala Gly Asp Ser Thr Arg Pro Ala  
 15 20 25

acg acc tct tcg gtt gtc tcc cct tcc gca gcc cga aac tcc act gcc 192  
 Thr Thr Ser Ser Val Val Ser Pro Ser Ala Ala Arg Asn Ser Thr Ala  
 30 35 40

gcc gcc acg ggt aat gct tcc cgc aac gct acg gcc acc gga aca gcc 240  
 Ala Ala Thr Gly Asn Ala Ser Arg Asn Ala Thr Ala Thr Gly Thr Ala  
 45 50 55

gtt gcc act gcc acg ggc ggc gtt acg gcg gca acg tcc acg ggc atg 288

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ala | Thr | Ala | Thr | Gly | Gly | Val | Thr | Ala | Ala | Thr | Ser | Thr | Gly | Met |     |
| 60  |     |     |     |     | 65  |     |     |     | 70  |     |     |     |     |     | 75  |     |
| gct | gtt | acg | tct | ccc | gct | cag | ggg | gcc | gga | acg | ggg | gtt | ggc | acc | gcc | 336 |
| Ala | Val | Thr | Ser | Pro | Ala | Gln | Gly | Ala | Gly | Thr | Gly | Val | Gly | Thr | Ala |     |
|     |     |     |     | 80  |     |     |     | 85  |     |     |     |     | 90  |     |     |     |
| gca | gcc | gca | aca | aca | acg | acg | gca | acg | ccc | tct | caa | tcc | gac | ttc | gac | 384 |
| Ala | Ala | Ala | Thr | Thr | Thr | Thr | Ala | Thr | Pro | Ser | Gln | Ser | Asp | Phe | Asp |     |
|     |     |     | 95  |     |     |     | 100 |     |     |     |     |     | 105 |     |     |     |
| aac | tgg | gtg | ctc | acg | tcg | ggg | ctc | ccc | aca | atc | aca | act | agc | ctg | atc | 432 |
| Asn | Trp | Val | Leu | Thr | Ser | Gly | Leu | Pro | Thr | Ile | Thr | Thr | Ser | Leu | Ile |     |
|     |     | 110 |     |     |     |     | 115 |     |     |     |     | 120 |     |     |     |     |
| tcg | aca | aac | cct | gac | gcc | att | acc | cca | acc | gca | tct | acc | tcg | gga | ccc | 480 |
| Ser | Thr | Asn | Pro | Asp | Ala | Ile | Thr | Pro | Thr | Ala | Ser | Thr | Ser | Gly | Pro |     |
|     | 125 |     |     |     |     | 130 |     |     |     |     | 135 |     |     |     |     |     |
| aaa | cca | acg | gtt | acc | ttc | tcc | tcc | tac | tct | gat | cag | gag | ttg | gag | aat | 528 |
| Lys | Pro | Thr | Val | Thr | Phe | Ser | Ser | Tyr | Ser | Asp | Gln | Glu | Leu | Glu | Asn |     |
| 140 |     |     |     |     | 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |
| ctg | tgg | gac | gac | ttt | gtc | ggg | cag | gtt | cag | cag | cct | ccg | ttc | tcg | tat | 576 |
| Leu | Trp | Asp | Asp | Phe | Val | Gly | Gln | Val | Gln | Gln | Pro | Pro | Phe | Ser | Tyr |     |
|     |     |     |     | 160 |     |     |     | 165 |     |     |     |     | 170 |     |     |     |
| gtt | cca | gaa | ccc | caa | aac | ccg | tac | cca | ttg | ccc | aac | acc | cca | ccg | tct | 624 |
| Val | Pro | Glu | Pro | Gln | Asn | Pro | Tyr | Pro | Leu | Pro | Asn | Thr | Pro | Pro | Ser |     |
|     |     |     | 175 |     |     |     | 180 |     |     |     |     |     | 185 |     |     |     |
| ctc | tac | ccc | gac | tgg | tac | gtc | aat | tgt | ccc | acc | aag | agc | ttg | cct | ggg | 672 |
| Leu | Tyr | Pro | Asp | Trp | Tyr | Val | Asn | Cys | Pro | Thr | Lys | Ser | Leu | Pro | Gly |     |
|     |     | 190 |     |     |     |     | 195 |     |     |     |     | 200 |     |     |     |     |
| tac | aag | ttc | cct | cga | ggc | ttc | ctc | ttc | ggg | tgg | gcg | acg | gct | gcg | caa | 720 |
| Tyr | Lys | Phe | Pro | Arg | Gly | Phe | Leu | Phe | Gly | Trp | Ala | Thr | Ala | Ala | Gln |     |
|     | 205 |     |     |     |     | 210 |     |     |     |     | 215 |     |     |     |     |     |
| cag | tgg | gag | ggg | gct | gtg | aaa | gct | gac | ggc | aaa | gga | cca | tcc | atc | tgg | 768 |
| Gln | Trp | Glu | Gly | Ala | Val | Lys | Ala | Asp | Gly | Lys | Gly | Pro | Ser | Ile | Trp |     |
| 220 |     |     |     | 225 |     |     |     |     |     | 230 |     |     |     | 235 |     |     |
| gac | tgg | gcc | tcc | cga | tat | ccg | ggc | ttc | atc | gcc | gat | aac | acc | aca | tcg | 816 |
| Asp | Trp | Ala | Ser | Arg | Tyr | Pro | Gly | Phe | Ile | Ala | Asp | Asn | Thr | Thr | Ser |     |
|     |     |     |     | 240 |     |     |     | 245 |     |     |     |     |     | 250 |     |     |
| gac | gtg | ggc | gac | ttg | ggc | tac | tac | ttg | tac | aag | gag | gat | atg | gct | cgt | 864 |
| Asp | Val | Gly | Asp | Leu | Gly | Tyr | Tyr | Leu | Tyr | Lys | Glu | Asp | Met | Ala | Arg |     |
|     |     |     | 255 |     |     |     | 260 |     |     |     |     |     | 265 |     |     |     |
| ctc | gcc | gcc | ctc | ggc | ggc | aat | gtg | tat | tcc | ttt | tcc | atc | ttc | tgg | acg | 912 |
| Leu | Ala | Ala | Leu | Gly | Gly | Asn | Val | Tyr | Ser | Phe | Ser | Ile | Phe | Trp | Thr |     |
|     |     | 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |     |

|                                                                                                                                                       |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| cga att ctg ccg ttc gca gtg caa ggt tct ccg gtc aat cag aag ggt<br>Arg Ile Leu Pro Phe Ala Val Gln Gly Ser Pro Val Asn Gln Lys Gly<br>285 290 295     | 960  |
| gtt gac ttc tac cgg gac ctg atc gat tac tgt tgg agc ctt ggt atc<br>Val Asp Phe Tyr Arg Asp Leu Ile Asp Tyr Cys Trp Ser Leu Gly Ile<br>300 305 310 315 | 1008 |
| gaa ccg gtc gtc aca ttg ttc cac tgg gat act ccg ttg gca gtg caa<br>Glu Pro Val Val Thr Leu Phe His Trp Asp Thr Pro Leu Ala Val Gln<br>320 325 330     | 1056 |
| ctg ctc tat gga ggt ttc gcc tcg gac aag atc atc gac gac tac gtc<br>Leu Leu Tyr Gly Gly Phe Ala Ser Asp Lys Ile Ile Asp Asp Tyr Val<br>335 340 345     | 1104 |
| aac tac gcc gaa acc gtg ttc aca gcg tac aac ggt tcg gtc cat aag<br>Asn Tyr Ala Glu Thr Val Phe Thr Ala Tyr Asn Gly Ser Val His Lys<br>350 355 360     | 1152 |
| tgg atc acc ttc aac gag cca gtt gtg ttc tgt tcc caa atg gca tcg<br>Trp Ile Thr Phe Asn Glu Pro Val Val Phe Cys Ser Gln Met Ala Ser<br>365 370 375     | 1200 |
| cca gtg aat agc acg ctg cca gag ggg ttg aac tcg acc acc tac ccc<br>Pro Val Asn Ser Thr Leu Pro Glu Gly Leu Asn Ser Thr Thr Tyr Pro<br>380 385 390 395 | 1248 |
| tat acg tgc tcg tac cat ctg acc ctt gcg cac gcg aag acc gtg caa<br>Tyr Thr Cys Ser Tyr His Leu Thr Leu Ala His Ala Lys Thr Val Gln<br>400 405 410     | 1296 |
| cgg ttc cgt gag ctc aac atc cag ggg gag att gcc ttg aag agc gat<br>Arg Phe Arg Glu Leu Asn Ile Gln Gly Glu Ile Ala Leu Lys Ser Asp<br>415 420 425     | 1344 |
| aac ttc aac ggc att ccg tgg cgg gag gga aac cct gat gat gaa gag<br>Asn Phe Asn Gly Ile Pro Trp Arg Glu Gly Asn Pro Asp Asp Glu Glu<br>430 435 440     | 1392 |
| gct gtc gcc cga cat tct gcc tat cag atc gga atc ttc gca gaa cct<br>Ala Val Ala Arg His Ser Ala Tyr Gln Ile Gly Ile Phe Ala Glu Pro<br>445 450 455     | 1440 |
| atc tac aac act ggt gat tgg ccg gag ctg atc aag aac gat ctg ggg<br>Ile Tyr Asn Thr Gly Asp Trp Pro Glu Leu Ile Lys Asn Asp Leu Gly<br>460 465 470 475 | 1488 |
| ccg gat atc ttg ccc cgc ttc act gat gaa cag atc cag atg atc aag<br>Pro Asp Ile Leu Pro Arg Phe Thr Asp Glu Gln Ile Gln Met Ile Lys<br>480 485 490     | 1536 |
| ggg acc gct gat ttc ttc gcg atc gat ggt tac cgt gac ggc tgg gtc                                                                                       | 1584 |

|       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |  |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Gly   | Thr | Ala | Asp | Phe | Phe | Ala | Ile | Asp | Gly | Tyr | Arg | Asp | Gly | Trp | Val |      |  |
|       |     |     | 495 |     |     |     |     | 500 |     |     |     |     | 505 |     |     |      |  |
| aca   | gca | cca | cct | gct | ggt | gtc | caa | gct | tgc | gtg | gcg | aac | atc | tct | gat | 1632 |  |
| Thr   | Ala | Pro | Pro | Ala | Gly | Val | Gln | Ala | Cys | Val | Ala | Asn | Ile | Ser | Asp |      |  |
|       |     | 510 |     |     |     |     | 515 |     |     |     |     | 520 |     |     |     |      |  |
| ccg   | ttg | tgg | ccc | gtg | tgt | aac | cag | gtc | aac | ttc | tac | gat | tcg | agc | ccg | 1680 |  |
| Pro   | Leu | Trp | Pro | Val | Cys | Asn | Gln | Val | Asn | Phe | Tyr | Asp | Ser | Ser | Pro |      |  |
|       | 525 |     |     |     |     | 530 |     |     |     | 535 |     |     |     |     |     |      |  |
| gcc   | ggt | tgg | gga | att | ggc | gca | ttt | ggt | aac | tgg | cca | act | act | ccg | tgg | 1728 |  |
| Ala   | Gly | Trp | Gly | Ile | Gly | Ala | Phe | Gly | Asn | Trp | Pro | Thr | Thr | Pro | Trp |      |  |
| 540   |     |     |     |     | 545 |     |     |     | 550 |     |     |     |     |     | 555 |      |  |
| ctt   | cag | aac | aca | tgg | cag | ttt | gtc | cgc | ccg | ttt | ctc | aag | gag | ctt | act | 1776 |  |
| Leu   | Gln | Asn | Thr | Trp | Gln | Phe | Val | Arg | Pro | Phe | Leu | Lys | Glu | Leu | Thr |      |  |
|       |     |     |     | 560 |     |     |     |     | 565 |     |     |     |     | 570 |     |      |  |
| cag   | caa | tac | cca | acg | aag | ggg | ggt | atc | tac | ctc | tcc | gaa | ttc | ggt | ttc | 1824 |  |
| Gln   | Gln | Tyr | Pro | Thr | Lys | Gly | Gly | Ile | Tyr | Leu | Ser | Glu | Phe | Gly | Phe |      |  |
|       |     |     | 575 |     |     |     |     | 580 |     |     |     |     | 585 |     |     |      |  |
| tcg   | gag | ccc | ttt | gag | aac | gaa | aag | aac | ttc | atc | tac | caa | atc | aca | aca | 1872 |  |
| Ser   | Glu | Pro | Phe | Glu | Asn | Glu | Lys | Asn | Phe | Ile | Tyr | Gln | Ile | Thr | Thr |      |  |
|       |     | 590 |     |     |     |     | 595 |     |     |     |     | 600 |     |     |     |      |  |
| gac   | ccc | ggc | cgg | gtg | gcc | tac | ttc | aac | agc | tat | ctg | ggg | gaa | gtg | ctc | 1920 |  |
| Asp   | Pro | Gly | Arg | Val | Ala | Tyr | Phe | Asn | Ser | Tyr | Leu | Gly | Glu | Val | Leu |      |  |
|       | 605 |     |     |     |     | 610 |     |     |     |     | 615 |     |     |     |     |      |  |
| ttg   | gcc | atc | aac | gaa | gat | gag | acg | gac | gtc | cgc | ggt | act | ttc | gga | tgg | 1968 |  |
| Leu   | Ala | Ile | Asn | Glu | Asp | Glu | Thr | Asp | Val | Arg | Gly | Thr | Phe | Gly | Trp |      |  |
| 620   |     |     |     |     | 625 |     |     |     | 630 |     |     |     |     |     | 635 |      |  |
| tct   | ctt | ctc | gac | aac | ttc | gag | tgg | aac | tct | gga | ctg | agc | aca | cga | ttc | 2016 |  |
| Ser   | Leu | Leu | Asp | Asn | Phe | Glu | Trp | Asn | Ser | Gly | Leu | Ser | Thr | Arg | Phe |      |  |
|       |     |     |     | 640 |     |     |     | 645 |     |     |     |     |     | 650 |     |      |  |
| ggg   | gtc | cag | tat | gtg | gac | tac | aac | tcc | cct | acg | ctt | gaa | cgg | acc | ttc | 2064 |  |
| Gly   | Val | Gln | Tyr | Val | Asp | Tyr | Asn | Ser | Pro | Thr | Leu | Glu | Arg | Thr | Phe |      |  |
|       |     |     | 655 |     |     |     |     | 660 |     |     |     |     | 665 |     |     |      |  |
| aag   | cgc | tct | gcg | atc | gaa | atg | tcc | cag | ttc | tgg | aac | acg | cat | cgt | tgc | 2112 |  |
| Lys   | Arg | Ser | Ala | Ile | Glu | Met | Ser | Gln | Phe | Trp | Asn | Thr | His | Arg | Cys |      |  |
|       |     | 670 |     |     |     |     | 675 |     |     |     |     | 680 |     |     |     |      |  |
| gag   | gac | taa |     |     |     |     |     |     |     |     |     |     |     |     |     | 2121 |  |
| Glu   | Asp |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |  |
|       | 685 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |  |
| <210> | 12  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |  |
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<223> Synthetic Construct

<400> 12

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-5 -1 1 5 10

Asn Ser Thr Ala Ser Gly Ser Ile Ala Gly Asp Ser Thr Arg Pro Ala  
15 20 25

Thr Thr Ser Ser Val Val Ser Pro Ser Ala Ala Arg Asn Ser Thr Ala  
30 35 40

Ala Ala Thr Gly Asn Ala Ser Arg Asn Ala Thr Ala Thr Gly Thr Ala  
45 50 55

Val Ala Thr Ala Thr Gly Gly Val Thr Ala Ala Thr Ser Thr Gly Met  
60 65 70 75

Ala Val Thr Ser Pro Ala Gln Gly Ala Gly Thr Gly Val Gly Thr Ala  
80 85 90

Ala Ala Ala Thr Thr Thr Thr Ala Thr Pro Ser Gln Ser Asp Phe Asp  
95 100 105

Asn Trp Val Leu Thr Ser Gly Leu Pro Thr Ile Thr Thr Ser Leu Ile  
110 115 120

Ser Thr Asn Pro Asp Ala Ile Thr Pro Thr Ala Ser Thr Ser Gly Pro  
125 130 135

Lys Pro Thr Val Thr Phe Ser Ser Tyr Ser Asp Gln Glu Leu Glu Asn  
140 145 150 155

Leu Trp Asp Asp Phe Val Gly Gln Val Gln Gln Pro Pro Phe Ser Tyr  
160 165 170

Val Pro Glu Pro Gln Asn Pro Tyr Pro Leu Pro Asn Thr Pro Pro Ser  
175 180 185

Leu Tyr Pro Asp Trp Tyr Val Asn Cys Pro Thr Lys Ser Leu Pro Gly  
190 195 200

Tyr Lys Phe Pro Arg Gly Phe Leu Phe Gly Trp Ala Thr Ala Ala Gln  
205 210 215

Gln Trp Glu Gly Ala Val Lys Ala Asp Gly Lys Gly Pro Ser Ile Trp  
220 225 230 235

Asp Trp Ala Ser Arg Tyr Pro Gly Phe Ile Ala Asp Asn Thr Thr Ser  
240 245 250

Asp Val Gly Asp Leu Gly Tyr Tyr Leu Tyr Lys Glu Asp Met Ala Arg  
255 260 265

Leu Ala Ala Leu Gly Gly Asn Val Tyr Ser Phe Ser Ile Phe Trp Thr  
270 275 280

Arg Ile Leu Pro Phe Ala Val Gln Gly Ser Pro Val Asn Gln Lys Gly  
285 290 295

Val Asp Phe Tyr Arg Asp Leu Ile Asp Tyr Cys Trp Ser Leu Gly Ile  
300 305 310 315

Glu Pro Val Val Thr Leu Phe His Trp Asp Thr Pro Leu Ala Val Gln  
320 325 330

Leu Leu Tyr Gly Gly Phe Ala Ser Asp Lys Ile Ile Asp Asp Tyr Val  
335 340 345

Asn Tyr Ala Glu Thr Val Phe Thr Ala Tyr Asn Gly Ser Val His Lys  
350 355 360

Trp Ile Thr Phe Asn Glu Pro Val Val Phe Cys Ser Gln Met Ala Ser  
365 370 375

Pro Val Asn Ser Thr Leu Pro Glu Gly Leu Asn Ser Thr Thr Tyr Pro  
 380 385 390 395

Tyr Thr Cys Ser Tyr His Leu Thr Leu Ala His Ala Lys Thr Val Gln  
 400 405 410

Arg Phe Arg Glu Leu Asn Ile Gln Gly Glu Ile Ala Leu Lys Ser Asp  
 415 420 425

Asn Phe Asn Gly Ile Pro Trp Arg Glu Gly Asn Pro Asp Asp Glu Glu  
 430 435 440

Ala Val Ala Arg His Ser Ala Tyr Gln Ile Gly Ile Phe Ala Glu Pro  
 445 450 455

Ile Tyr Asn Thr Gly Asp Trp Pro Glu Leu Ile Lys Asn Asp Leu Gly  
 460 465 470 475

Pro Asp Ile Leu Pro Arg Phe Thr Asp Glu Gln Ile Gln Met Ile Lys  
 480 485 490

Gly Thr Ala Asp Phe Phe Ala Ile Asp Gly Tyr Arg Asp Gly Trp Val  
 495 500 505

Thr Ala Pro Pro Ala Gly Val Gln Ala Cys Val Ala Asn Ile Ser Asp  
 510 515 520

Pro Leu Trp Pro Val Cys Asn Gln Val Asn Phe Tyr Asp Ser Ser Pro  
 525 530 535

Ala Gly Trp Gly Ile Gly Ala Phe Gly Asn Trp Pro Thr Thr Pro Trp  
 540 545 550 555

Leu Gln Asn Thr Trp Gln Phe Val Arg Pro Phe Leu Lys Glu Leu Thr  
 560 565 570

Gln Gln Tyr Pro Thr Lys Gly Gly Ile Tyr Leu Ser Glu Phe Gly Phe  
 575 580 585

Ser Glu Pro Phe Glu Asn Glu Lys Asn Phe Ile Tyr Gln Ile Thr Thr  
 590 595 600

Asp Pro Gly Arg Val Ala Tyr Phe Asn Ser Tyr Leu Gly Glu Val Leu  
605 610 615

Leu Ala Ile Asn Glu Asp Glu Thr Asp Val Arg Gly Thr Phe Gly Trp  
620 625 630 635

Ser Leu Leu Asp Asn Phe Glu Trp Asn Ser Gly Leu Ser Thr Arg Phe  
640 645 650

Gly Val Gln Tyr Val Asp Tyr Asn Ser Pro Thr Leu Glu Arg Thr Phe  
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Lys Arg Ser Ala Ile Glu Met Ser Gln Phe Trp Asn Thr His Arg Cys  
670 675 680

Glu Asp  
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Met Val Ile Leu Arg His Thr Val Leu Ala Ala Ala Val Val Gln Ile  
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gcc ctc ggg gct ccg cag ttt agc ccc aca gtc aat acg gaa ggt atc 96  
Ala Leu Gly Ala Pro Gln Phe Ser Pro Thr Val Asn Thr Glu Gly Ile  
-1 1 5 10

att cca att tcg gag cgc cct tcg cct aca caa tct tcg tcg tcc agc 144

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Ile | Pro | Ile | Ser | Glu | Arg | Pro | Ser | Pro | Thr | Gln | Ser | Ser | Ser | Ser | Ser |     |  |
| 15  |     |     |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |     |  |
| gga | ccc | gtg | att | cca | gct | ggc | tca | tat | gtc | tcc | gac | ttt | gat | gcc | agc | 192 |  |
| Gly | Pro | Val | Ile | Pro | Ala | Gly | Ser | Tyr | Val | Ser | Asp | Phe | Asp | Ala | Ser |     |  |
| 30  |     |     |     |     | 35  |     |     |     | 40  |     |     |     |     |     | 45  |     |  |
| gga | ctt | gca | aac | tta | tgg | agc | caa | gtc | gaa | gta | gac | ata | cct | gtc | gag | 240 |  |
| Gly | Leu | Ala | Asn | Leu | Trp | Ser | Gln | Val | Glu | Val | Asp | Ile | Pro | Val | Glu |     |  |
|     |     |     |     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |  |
| tct | cca | agg | att | tct | gcc | gta | cct | cct | ctc | aac | aaa | acg | ttc | agt | gtt | 288 |  |
| Ser | Pro | Arg | Ile | Ser | Ala | Val | Pro | Pro | Leu | Asn | Lys | Thr | Phe | Ser | Val |     |  |
|     |     |     | 65  |     |     |     | 70  |     |     |     |     |     | 75  |     |     |     |  |
| ccg | aaa | act | cca | gtc | ctg | ccc | aac | tcc | ctg | cag | gat | cac | ctt | cca | aaa | 336 |  |
| Pro | Lys | Thr | Pro | Val | Leu | Pro | Asn | Ser | Leu | Gln | Asp | His | Leu | Pro | Lys |     |  |
|     |     | 80  |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     |  |
| gat | gtc | aaa | gca | ccc | gaa | ggc | ttt | gca | tgg | ggc | gtg | gcc | tcc | gtt | gct | 384 |  |
| Asp | Val | Lys | Ala | Pro | Glu | Gly | Phe | Ala | Trp | Gly | Val | Ala | Ser | Val | Ala |     |  |
|     | 95  |     |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     |     |  |
| cag | cag | tac | gag | ggc | gtc | aaa | gca | gat | gga | cga | gga | cca | tct | cat |     | 432 |  |
| Gln | Gln | Tyr | Glu | Gly | Ala | Val | Lys | Ala | Asp | Gly | Arg | Gly | Pro | Ser | His |     |  |
| 110 |     |     |     |     | 115 |     |     |     | 120 |     |     |     |     |     | 125 |     |  |
| tgg | gat | ttc | ctt | tgc | cat | aga | aac | cct | tcc | agc | tgc | aca | aac | tac | acc | 480 |  |
| Trp | Asp | Phe | Leu | Cys | His | Arg | Asn | Pro | Ser | Ser | Cys | Thr | Asn | Tyr | Thr |     |  |
|     |     |     |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |  |
| agt | gat | atc | act | gat | ctt | ggc | cgt | tac | tac | tat | aag | aat | gac | ttg | gca | 528 |  |
| Ser | Asp | Ile | Thr | Asp | Leu | Gly | Arg | Tyr | Tyr | Tyr | Lys | Asn | Asp | Leu | Ala |     |  |
|     |     |     | 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |  |
| cga | atg | gct | gcc | atg | ggc | ata | act | cac | tac | tca | ttt | tca | gtg | agc | tgg | 576 |  |
| Arg | Met | Ala | Ala | Met | Gly | Ile | Thr | His | Tyr | Ser | Phe | Ser | Val | Ser | Trp |     |  |
|     |     | 160 |     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |  |
| acc | aga | gtt | gtg | cca | ttc | ggc | aag | aag | ggc | agt | cca | gtc | agc | aac | gaa | 624 |  |
| Thr | Arg | Val | Val | Pro | Phe | Gly | Lys | Lys | Gly | Ser | Pro | Val | Ser | Asn | Glu |     |  |
|     |     | 175 |     |     |     | 180 |     |     |     |     | 185 |     |     |     |     |     |  |
| ggc | ctc | gac | tat | tac | gaa | gat | atc | tgc | aag | acg | gct | ttg | agc | ttt | gga | 672 |  |
| Gly | Leu | Asp | Tyr | Tyr | Glu | Asp | Ile | Cys | Lys | Thr | Ala | Leu | Ser | Phe | Gly |     |  |
| 190 |     |     |     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |  |
| atc | aag | cct | gtc | att | act | tta | ttc | cac | tgg | gat | act | cct | gcc | aac | tta | 720 |  |
| Ile | Lys | Pro | Val | Ile | Thr | Leu | Phe | His | Trp | Asp | Thr | Pro | Ala | Asn | Leu |     |  |
|     |     |     |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |  |
| ctc | ttc | gaa | tat | gga | ggc | ttc | ctc | aac | ggg | aca | atc | gta | gat | gac | tac | 768 |  |
| Leu | Phe | Glu | Tyr | Gly | Gly | Phe | Leu | Asn | Gly | Thr | Ile | Val | Asp | Asp | Tyr |     |  |
|     |     |     | 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |  |

|                                                                                                                                                       |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| tac tat tat gca gat ata gta ttc aga aga cta ggc aaa tat gcc gaa<br>Tyr Tyr Tyr Ala Asp Ile Val Phe Arg Arg Leu Gly Lys Tyr Ala Glu<br>240 245 250     | 816  |
| acc ttc ttc acc ttc aat gag cct cgt gta tac tgc agc gag tat act<br>Thr Phe Phe Thr Phe Asn Glu Pro Arg Val Tyr Cys Ser Glu Tyr Thr<br>255 260 265     | 864  |
| ggt cct ccg ttc gat gcc tat tac gaa cgc tat ggg ctg aat tct agc<br>Gly Pro Pro Phe Asp Ala Tyr Tyr Glu Arg Tyr Gly Leu Asn Ser Ser<br>270 275 280 285 | 912  |
| act gca cca tat ccc tgc tcg tac aat ctg ctc cga gcc cat ggt gcc<br>Thr Ala Pro Tyr Pro Cys Ser Tyr Asn Leu Leu Arg Ala His Gly Ala<br>290 295 300     | 960  |
| gca gtc ggc agg tat cgt gcc ctg gtc aaa gaa ggc agc atc aaa tct<br>Ala Val Gly Arg Tyr Arg Ala Leu Val Lys Glu Gly Ser Ile Lys Ser<br>305 310 315     | 1008 |
| ggt gaa atc gca ttc aaa aac gac gat agt tac cag cta cct caa aat<br>Gly Glu Ile Ala Phe Lys Asn Asp Asp Ser Tyr Gln Leu Pro Gln Asn<br>320 325 330     | 1056 |
| cca gac tct gac gcc gac aag cga gct gca aaa cgc cac ttc gac ttc<br>Pro Asp Ser Asp Ala Asp Lys Arg Ala Ala Lys Arg His Phe Asp Phe<br>335 340 345     | 1104 |
| tac atc ggc ata ttc tcg caa ccc gta tac ggc aac ggc tac tat ccc<br>Tyr Ile Gly Ile Phe Ser Gln Pro Val Tyr Gly Asn Gly Tyr Tyr Pro<br>350 355 360 365 | 1152 |
| gaa acc gtc cgg aac aca att tca gag cgc ttc ctc cca gag ttc acc<br>Glu Thr Val Arg Asn Thr Ile Ser Glu Arg Phe Leu Pro Glu Phe Thr<br>370 375 380     | 1200 |
| gca gcc gag cgc gaa caa att cag gga tca gcg gac ttc tac gcc atc<br>Ala Ala Glu Arg Glu Gln Ile Gln Gly Ser Ala Asp Phe Tyr Ala Ile<br>385 390 395     | 1248 |
| gac ggt tat agg acg aat atc gca agc gct gct ccc aat ggt att gac<br>Asp Gly Tyr Arg Thr Asn Ile Ala Ser Ala Ala Pro Asn Gly Ile Asp<br>400 405 410     | 1296 |
| gcg tgc ttg aga aac gct agt gat ccc aac tgg cca gtt tgc cag gac<br>Ala Cys Leu Arg Asn Ala Ser Asp Pro Asn Trp Pro Val Cys Gln Asp<br>415 420 425     | 1344 |
| aac agt aac aca ggc caa tac gct act ctt gag gga ttc gca ttg gga<br>Asn Ser Asn Thr Gly Gln Tyr Ala Thr Leu Glu Gly Phe Ala Leu Gly<br>430 435 440 445 | 1392 |
| cct cct gca gat ccc aac gcg aat tgg cta tac aac act gca cct tac                                                                                       | 1440 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|------|
| Pro | Pro | Ala | Asp | Pro | Asn | Ala | Asn | Trp | Leu | Tyr | Asn | Thr | Ala | Pro | Tyr |  |      |
|     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |  |      |
| ctg | cgt | tac | caa | ttc | aaa | gtt | ctg | aaa | gag | aac | ttc | aat | tac | aag | aag |  | 1488 |
| Leu | Arg | Tyr | Gln | Phe | Lys | Val | Leu | Lys | Glu | Asn | Phe | Asn | Tyr | Lys | Lys |  |      |
|     |     |     | 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |  |      |
| atc | tac | ttg | acg | gaa | ttc | ggc | ttt | gca | gaa | cct | ttt | agc | tat | ttg | cga |  | 1536 |
| Ile | Tyr | Leu | Thr | Glu | Phe | Gly | Phe | Ala | Glu | Pro | Phe | Ser | Tyr | Leu | Arg |  |      |
|     |     | 480 |     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |  |      |
| cag | gat | ctg | tat | gca | ttg | ctg | tat | gac | act | gat | cgc | act | gca | tat | tat |  | 1584 |
| Gln | Asp | Leu | Tyr | Ala | Leu | Leu | Tyr | Asp | Thr | Asp | Arg | Thr | Ala | Tyr | Tyr |  |      |
|     | 495 |     |     |     |     | 500 |     |     |     |     | 505 |     |     |     |     |  |      |
| caa | gac | tat | cta | gcg | cag | tgc | atg | ctg | gct | atc | aaa | gaa | gat | ggc | atc |  | 1632 |
| Gln | Asp | Tyr | Leu | Ala | Gln | Cys | Met | Leu | Ala | Ile | Lys | Glu | Asp | Gly | Ile |  |      |
| 510 |     |     |     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |  |      |
| cct | ctt | gct | ggc | gtt | ttc | gca | tgg | tca | ttt | gtt | gat | aac | ttc | gaa | tgg |  | 1680 |
| Pro | Leu | Ala | Gly | Val | Phe | Ala | Trp | Ser | Phe | Val | Asp | Asn | Phe | Glu | Trp |  |      |
|     |     |     |     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |  |      |
| ggc | tcc | ggc | ctt | gag | cag | aga | ttt | gga | atg | caa | tat | gtc | aac | tac | acc |  | 1728 |
| Gly | Ser | Gly | Leu | Glu | Gln | Arg | Phe | Gly | Met | Gln | Tyr | Val | Asn | Tyr | Thr |  |      |
|     |     |     | 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |  |      |
| gat | ccg | gat | ctc | cca | cga | acc | ttc | aag | ctt | tct | ttc | ctg | gca | tat | cgt |  | 1776 |
| Asp | Pro | Asp | Leu | Pro | Arg | Thr | Phe | Lys | Leu | Ser | Phe | Leu | Ala | Tyr | Arg |  |      |
|     |     | 560 |     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |  |      |
| gat | ttc | atc | aaa | aac | cac | aaa | aag | tga |     |     |     |     |     |     |     |  | 1803 |
| Asp | Phe | Ile | Lys | Asn | His | Lys | Lys |     |     |     |     |     |     |     |     |  |      |
|     | 575 |     |     |     |     | 580 |     |     |     |     |     |     |     |     |     |  |      |

<210> 14  
 <211> 600  
 <212> PRT  
 <213> Rodotorula minuta

<400> 14

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| Met | Val | Ile | Leu | Arg | His | Thr | Val | Leu | Ala | Ala | Ala | Val | Val | Gln | Ile |  |  |
|     |     |     |     | -15 |     |     |     |     | -10 |     |     |     |     | -5  |     |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| Ala | Leu | Gly | Ala | Pro | Gln | Phe | Ser | Pro | Thr | Val | Asn | Thr | Glu | Gly | Ile |  |  |
|     | -1  | 1   |     |     |     |     | 5   |     |     |     |     | 10  |     |     |     |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| Ile | Pro | Ile | Ser | Glu | Arg | Pro | Ser | Pro | Thr | Gln | Ser | Ser | Ser | Ser | Ser |  |  |
|     | 15  |     |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |  |  |

Gly Pro Val Ile Pro Ala Gly Ser Tyr Val Ser Asp Phe Asp Ala Ser  
 30 35 40 45

Gly Leu Ala Asn Leu Trp Ser Gln Val Glu Val Asp Ile Pro Val Glu  
 50 55 60

Ser Pro Arg Ile Ser Ala Val Pro Pro Leu Asn Lys Thr Phe Ser Val  
 65 70 75

Pro Lys Thr Pro Val Leu Pro Asn Ser Leu Gln Asp His Leu Pro Lys  
 80 85 90

Asp Val Lys Ala Pro Glu Gly Phe Ala Trp Gly Val Ala Ser Val Ala  
 95 100 105

Gln Gln Tyr Glu Gly Ala Val Lys Ala Asp Gly Arg Gly Pro Ser His  
 110 115 120 125

Trp Asp Phe Leu Cys His Arg Asn Pro Ser Ser Cys Thr Asn Tyr Thr  
 130 135 140

Ser Asp Ile Thr Asp Leu Gly Arg Tyr Tyr Tyr Lys Asn Asp Leu Ala  
 145 150 155

Arg Met Ala Ala Met Gly Ile Thr His Tyr Ser Phe Ser Val Ser Trp  
 160 165 170

Thr Arg Val Val Pro Phe Gly Lys Lys Gly Ser Pro Val Ser Asn Glu  
 175 180 185

Gly Leu Asp Tyr Tyr Glu Asp Ile Cys Lys Thr Ala Leu Ser Phe Gly  
 190 195 200 205

Ile Lys Pro Val Ile Thr Leu Phe His Trp Asp Thr Pro Ala Asn Leu  
 210 215 220

Leu Phe Glu Tyr Gly Gly Phe Leu Asn Gly Thr Ile Val Asp Asp Tyr  
 225 230 235

Tyr Tyr Tyr Ala Asp Ile Val Phe Arg Arg Leu Gly Lys Tyr Ala Glu

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 240 |     |     |     |     |     |     | 245 |     |     |     |     |     |     |     | 250 |
| Thr | Phe | Phe | Thr | Phe | Asn | Glu | Pro | Arg | Val | Tyr | Cys | Ser | Glu | Tyr | Thr |
|     | 255 |     |     |     |     | 260 |     |     |     |     | 265 |     |     |     |     |
| Gly | Pro | Pro | Phe | Asp | Ala | Tyr | Tyr | Glu | Arg | Tyr | Gly | Leu | Asn | Ser | Ser |
| 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |
| Thr | Ala | Pro | Tyr | Pro | Cys | Ser | Tyr | Asn | Leu | Leu | Arg | Ala | His | Gly | Ala |
|     |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |
| Ala | Val | Gly | Arg | Tyr | Arg | Ala | Leu | Val | Lys | Glu | Gly | Ser | Ile | Lys | Ser |
|     |     |     | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |
| Gly | Glu | Ile | Ala | Phe | Lys | Asn | Asp | Asp | Ser | Tyr | Gln | Leu | Pro | Gln | Asn |
|     |     | 320 |     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |
| Pro | Asp | Ser | Asp | Ala | Asp | Lys | Arg | Ala | Ala | Lys | Arg | His | Phe | Asp | Phe |
|     | 335 |     |     |     |     | 340 |     |     |     |     | 345 |     |     |     |     |
| Tyr | Ile | Gly | Ile | Phe | Ser | Gln | Pro | Val | Tyr | Gly | Asn | Gly | Tyr | Tyr | Pro |
| 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |
| Glu | Thr | Val | Arg | Asn | Thr | Ile | Ser | Glu | Arg | Phe | Leu | Pro | Glu | Phe | Thr |
|     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |
| Ala | Ala | Glu | Arg | Glu | Gln | Ile | Gln | Gly | Ser | Ala | Asp | Phe | Tyr | Ala | Ile |
|     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |
| Asp | Gly | Tyr | Arg | Thr | Asn | Ile | Ala | Ser | Ala | Ala | Pro | Asn | Gly | Ile | Asp |
|     | 400 |     |     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |
| Ala | Cys | Leu | Arg | Asn | Ala | Ser | Asp | Pro | Asn | Trp | Pro | Val | Cys | Gln | Asp |
|     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |     |     |
| Asn | Ser | Asn | Thr | Gly | Gln | Tyr | Ala | Thr | Leu | Glu | Gly | Phe | Ala | Leu | Gly |
| 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |
| Pro | Pro | Ala | Asp | Pro | Asn | Ala | Asn | Trp | Leu | Tyr | Asn | Thr | Ala | Pro | Tyr |
|     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |

Leu Arg Tyr Gln Phe Lys Val Leu Lys Glu Asn Phe Asn Tyr Lys Lys  
465 470 475

Ile Tyr Leu Thr Glu Phe Gly Phe Ala Glu Pro Phe Ser Tyr Leu Arg  
480 485 490

Gln Asp Leu Tyr Ala Leu Leu Tyr Asp Thr Asp Arg Thr Ala Tyr Tyr  
495 500 505

Gln Asp Tyr Leu Ala Gln Cys Met Leu Ala Ile Lys Glu Asp Gly Ile  
510 515 520 525

Pro Leu Ala Gly Val Phe Ala Trp Ser Phe Val Asp Asn Phe Glu Trp  
530 535 540

Gly Ser Gly Leu Glu Gln Arg Phe Gly Met Gln Tyr Val Asn Tyr Thr  
545 550 555

Asp Pro Asp Leu Pro Arg Thr Phe Lys Leu Ser Phe Leu Ala Tyr Arg  
560 565 570

Asp Phe Ile Lys Asn His Lys Lys  
575 580

<210> 15  
<211> 1809  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Beta-galactosidase

<220>  
<221> CDS  
<222> (1)..(1809)

<220>  
<221> sig\_peptide  
<222> (1)..(63)

<220>  
<221> mat\_peptide  
<222> (64)..(1806)

<400> 15  
atg atg gtc gcg tgg tgg tct cta ttt ctg tac ggc ctt cag gtc gcg 48  
Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
-20 -15 -10

gca cct gct ttg gct gct ccg cag ttt agc ccc aca gtc aat acg gaa 96  
Ala Pro Ala Leu Ala Ala Pro Gln Phe Ser Pro Thr Val Asn Thr Glu  
-5 -1 1 5 10

ggt atc att cca att tcg gag cgc cct tcg cct aca caa tct tcg tcg 144  
Gly Ile Ile Pro Ile Ser Glu Arg Pro Ser Pro Thr Gln Ser Ser Ser  
15 20 25

tcc agc gga ccc gtg att cca gct ggc tca tat gtc tcc gac ttt gat 192  
Ser Ser Gly Pro Val Ile Pro Ala Gly Ser Tyr Val Ser Asp Phe Asp  
30 35 40

gcc agc gga ctt gca aac tta tgg agc caa gtc gaa gta gac ata cct 240  
Ala Ser Gly Leu Ala Asn Leu Trp Ser Gln Val Glu Val Asp Ile Pro  
45 50 55

gtc gag tct cca agg att tct gcc gta cct cct ctc aac aaa acg ttc 288  
Val Glu Ser Pro Arg Ile Ser Ala Val Pro Pro Leu Asn Lys Thr Phe  
60 65 70 75

agt gtt ccg aaa act cca gtc ctg ccc aac tcc ctg cag gat cac ctt 336  
Ser Val Pro Lys Thr Pro Val Leu Pro Asn Ser Leu Gln Asp His Leu  
80 85 90

cca aaa gat gtc aaa gca ccc gaa ggc ttt gca tgg ggc gtg gcc tcc 384  
Pro Lys Asp Val Lys Ala Pro Glu Gly Phe Ala Trp Gly Val Ala Ser  
95 100 105

gtt gct cag cag tac gag ggt gcc gtc aaa gca gat gga cga gga cca 432  
Val Ala Gln Gln Tyr Glu Gly Ala Val Lys Ala Asp Gly Arg Gly Pro  
110 115 120

tct cat tgg gat ttc ctt tgc cat aga aac cct tcc agc tgc aca aac 480  
Ser His Trp Asp Phe Leu Cys His Arg Asn Pro Ser Ser Cys Thr Asn  
125 130 135

tac acc agt gat atc act gat ctt ggc cgt tac tac tat aag aat gac 528  
Tyr Thr Ser Asp Ile Thr Asp Leu Gly Arg Tyr Tyr Tyr Lys Asn Asp  
140 145 150 155

ttg gca cga atg gct gcc atg ggt ata act cac tac tca ttt tca gtg 576  
Leu Ala Arg Met Ala Ala Met Gly Ile Thr His Tyr Ser Phe Ser Val  
160 165 170

agc tgg acc aga gtt gtg cca ttc ggc aag aag ggc agt cca gtc agc 624  
Ser Trp Thr Arg Val Val Pro Phe Gly Lys Lys Gly Ser Pro Val Ser  
175 180 185

aac gaa ggc ctc gac tat tac gaa gat atc tgc aag acg gct ttg agc 672

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Asn | Glu | Gly | Leu | Asp | Tyr | Tyr | Glu | Asp | Ile | Cys | Lys | Thr | Ala | Leu | Ser |      |  |
|     |     | 190 |     |     |     |     | 195 |     |     |     |     | 200 |     |     |     |      |  |
| ttt | gga | atc | aag | cct | gtc | att | act | tta | ttc | cac | tgg | gat | act | cct | gcc | 720  |  |
| Phe | Gly | Ile | Lys | Pro | Val | Ile | Thr | Leu | Phe | His | Trp | Asp | Thr | Pro | Ala |      |  |
|     | 205 |     |     |     |     | 210 |     |     |     | 215 |     |     |     |     |     |      |  |
| aac | tta | ctc | ttc | gaa | tat | gga | ggt | ttc | ctc | aac | ggg | aca | atc | gta | gat | 768  |  |
| Asn | Leu | Leu | Phe | Glu | Tyr | Gly | Gly | Phe | Leu | Asn | Gly | Thr | Ile | Val | Asp |      |  |
| 220 |     |     |     |     | 225 |     |     |     |     | 230 |     |     |     |     | 235 |      |  |
| gac | tac | tac | tat | tat | gca | gat | ata | gta | ttc | aga | aga | cta | ggc | aaa | tat | 816  |  |
| Asp | Tyr | Tyr | Tyr | Tyr | Ala | Asp | Ile | Val | Phe | Arg | Arg | Leu | Gly | Lys | Tyr |      |  |
|     |     |     |     | 240 |     |     |     | 245 |     |     |     |     |     | 250 |     |      |  |
| gcc | gaa | acc | ttc | ttc | acc | ttc | aat | gag | cct | cgt | gta | tac | tgc | agc | gag | 864  |  |
| Ala | Glu | Thr | Phe | Phe | Thr | Phe | Asn | Glu | Pro | Arg | Val | Tyr | Cys | Ser | Glu |      |  |
|     |     |     | 255 |     |     |     |     | 260 |     |     |     |     | 265 |     |     |      |  |
| tat | act | ggt | cct | ccg | ttc | gat | gcc | tat | tac | gaa | cgc | tat | ggg | ctg | aat | 912  |  |
| Tyr | Thr | Gly | Pro | Pro | Phe | Asp | Ala | Tyr | Tyr | Glu | Arg | Tyr | Gly | Leu | Asn |      |  |
|     |     | 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |      |  |
| tct | agc | act | gca | cca | tat | ccc | tgc | tcg | tac | aat | ctg | ctc | cga | gcc | cat | 960  |  |
| Ser | Ser | Thr | Ala | Pro | Tyr | Pro | Cys | Ser | Tyr | Asn | Leu | Leu | Arg | Ala | His |      |  |
|     | 285 |     |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     |      |  |
| ggt | gcc | gca | gtc | ggc | agg | tat | cgt | gcc | ctg | gtc | aaa | gaa | ggc | agc | atc | 1008 |  |
| Gly | Ala | Ala | Val | Gly | Arg | Tyr | Arg | Ala | Leu | Val | Lys | Glu | Gly | Ser | Ile |      |  |
| 300 |     |     |     |     | 305 |     |     |     | 310 |     |     |     |     |     | 315 |      |  |
| aaa | tct | ggt | gaa | atc | gca | ttc | aaa | aac | gac | gat | agt | tac | cag | cta | cct | 1056 |  |
| Lys | Ser | Gly | Glu | Ile | Ala | Phe | Lys | Asn | Asp | Asp | Ser | Tyr | Gln | Leu | Pro |      |  |
|     |     |     |     | 320 |     |     |     |     | 325 |     |     |     |     | 330 |     |      |  |
| caa | aat | cca | gac | tct | gac | gcc | gac | aag | cga | gct | gca | aaa | cgc | cac | ttc | 1104 |  |
| Gln | Asn | Pro | Asp | Ser | Asp | Ala | Asp | Lys | Arg | Ala | Ala | Lys | Arg | His | Phe |      |  |
|     |     |     | 335 |     |     |     |     | 340 |     |     |     |     | 345 |     |     |      |  |
| gac | ttc | tac | atc | ggc | ata | ttc | tcg | caa | ccc | gta | tac | ggc | aac | ggc | tac | 1152 |  |
| Asp | Phe | Tyr | Ile | Gly | Ile | Phe | Ser | Gln | Pro | Val | Tyr | Gly | Asn | Gly | Tyr |      |  |
|     |     | 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |     |     |      |  |
| tat | ccc | gaa | acc | gtc | cgg | aac | aca | att | tca | gag | cgc | ttc | ctc | cca | gag | 1200 |  |
| Tyr | Pro | Glu | Thr | Val | Arg | Asn | Thr | Ile | Ser | Glu | Arg | Phe | Leu | Pro | Glu |      |  |
|     | 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     |      |  |
| ttc | acc | gca | gcc | gag | cgc | gaa | caa | att | cag | gga | tca | gcg | gac | ttc | tac | 1248 |  |
| Phe | Thr | Ala | Ala | Glu | Arg | Glu | Gln | Ile | Gln | Gly | Ser | Ala | Asp | Phe | Tyr |      |  |
| 380 |     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |      |  |
| gcc | atc | gac | ggt | tat | agg | acg | aat | atc | gca | agc | gct | gct | ccc | aat | ggt | 1296 |  |
| Ala | Ile | Asp | Gly | Tyr | Arg | Thr | Asn | Ile | Ala | Ser | Ala | Ala | Pro | Asn | Gly |      |  |
|     |     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |      |  |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| att gac gcg tgc ttg aga aac gct agt gat ccc aac tgg cca gtt tgc | 1344 |
| Ile Asp Ala Cys Leu Arg Asn Ala Ser Asp Pro Asn Trp Pro Val Cys |      |
| 415 420 425                                                     |      |
| cag gac aac agt aac aca ggc caa tac gct act ctt gag gga ttc gca | 1392 |
| Gln Asp Asn Ser Asn Thr Gly Gln Tyr Ala Thr Leu Glu Gly Phe Ala |      |
| 430 435 440                                                     |      |
| ttg gga cct cct gca gat ccc aac gcg aat tgg cta tac aac act gca | 1440 |
| Leu Gly Pro Pro Ala Asp Pro Asn Ala Asn Trp Leu Tyr Asn Thr Ala |      |
| 445 450 455                                                     |      |
| cct tac ctg cgt tac caa ttc aaa gtt ctg aaa gag aac ttc aat tac | 1488 |
| Pro Tyr Leu Arg Tyr Gln Phe Lys Val Leu Lys Glu Asn Phe Asn Tyr |      |
| 460 465 470 475                                                 |      |
| aag aag atc tac ttg acg gaa ttc ggc ttt gca gaa cct ttt agc tat | 1536 |
| Lys Lys Ile Tyr Leu Thr Glu Phe Gly Phe Ala Glu Pro Phe Ser Tyr |      |
| 480 485 490                                                     |      |
| ttg cga cag gat ctg tat gca ttg ctg tat gac act gat cgc act gca | 1584 |
| Leu Arg Gln Asp Leu Tyr Ala Leu Leu Tyr Asp Thr Asp Arg Thr Ala |      |
| 495 500 505                                                     |      |
| tat tat caa gac tat cta gcg cag tgc atg ctg gct atc aaa gaa gat | 1632 |
| Tyr Tyr Gln Asp Tyr Leu Ala Gln Cys Met Leu Ala Ile Lys Glu Asp |      |
| 510 515 520                                                     |      |
| ggc atc cct ctt gct ggt gtt ttc gca tgg tca ttt gtt gat aac ttc | 1680 |
| Gly Ile Pro Leu Ala Gly Val Phe Ala Trp Ser Phe Val Asp Asn Phe |      |
| 525 530 535                                                     |      |
| gaa tgg ggt tcc ggt ctt gag cag aga ttt gga atg caa tat gtc aac | 1728 |
| Glu Trp Gly Ser Gly Leu Glu Gln Arg Phe Gly Met Gln Tyr Val Asn |      |
| 540 545 550 555                                                 |      |
| tac acc gat ccg gat ctc cca cga acc ttc aag ctt tct ttc ctg gca | 1776 |
| Tyr Thr Asp Pro Asp Leu Pro Arg Thr Phe Lys Leu Ser Phe Leu Ala |      |
| 560 565 570                                                     |      |
| tat cgt gat ttc atc aaa aac cac aaa aag tga                     | 1809 |
| Tyr Arg Asp Phe Ile Lys Asn His Lys Lys                         |      |
| 575 580                                                         |      |

<210> 16  
 <211> 602  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Synthetic Construct

<400> 16

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Ala Pro Ala Leu Ala Ala Pro Gln Phe Ser Pro Thr Val Asn Thr Glu  
-5 -1 1 5 10

Gly Ile Ile Pro Ile Ser Glu Arg Pro Ser Pro Thr Gln Ser Ser Ser  
15 20 25

Ser Ser Gly Pro Val Ile Pro Ala Gly Ser Tyr Val Ser Asp Phe Asp  
30 35 40

Ala Ser Gly Leu Ala Asn Leu Trp Ser Gln Val Glu Val Asp Ile Pro  
45 50 55

Val Glu Ser Pro Arg Ile Ser Ala Val Pro Pro Leu Asn Lys Thr Phe  
60 65 70 75

Ser Val Pro Lys Thr Pro Val Leu Pro Asn Ser Leu Gln Asp His Leu  
80 85 90

Pro Lys Asp Val Lys Ala Pro Glu Gly Phe Ala Trp Gly Val Ala Ser  
95 100 105

Val Ala Gln Gln Tyr Glu Gly Ala Val Lys Ala Asp Gly Arg Gly Pro  
110 115 120

Ser His Trp Asp Phe Leu Cys His Arg Asn Pro Ser Ser Cys Thr Asn  
125 130 135

Tyr Thr Ser Asp Ile Thr Asp Leu Gly Arg Tyr Tyr Tyr Lys Asn Asp  
140 145 150 155

Leu Ala Arg Met Ala Ala Met Gly Ile Thr His Tyr Ser Phe Ser Val  
160 165 170

Ser Trp Thr Arg Val Val Pro Phe Gly Lys Lys Gly Ser Pro Val Ser  
175 180 185

Asn Glu Gly Leu Asp Tyr Tyr Glu Asp Ile Cys Lys Thr Ala Leu Ser  
190 195 200

Phe Gly Ile Lys Pro Val Ile Thr Leu Phe His Trp Asp Thr Pro Ala  
205 210 215

Asn Leu Leu Phe Glu Tyr Gly Gly Phe Leu Asn Gly Thr Ile Val Asp  
220 225 230 235

Asp Tyr Tyr Tyr Tyr Ala Asp Ile Val Phe Arg Arg Leu Gly Lys Tyr  
240 245 250

Ala Glu Thr Phe Phe Thr Phe Asn Glu Pro Arg Val Tyr Cys Ser Glu  
255 260 265

Tyr Thr Gly Pro Pro Phe Asp Ala Tyr Tyr Glu Arg Tyr Gly Leu Asn  
270 275 280

Ser Ser Thr Ala Pro Tyr Pro Cys Ser Tyr Asn Leu Leu Arg Ala His  
285 290 295

Gly Ala Ala Val Gly Arg Tyr Arg Ala Leu Val Lys Glu Gly Ser Ile  
300 305 310 315

Lys Ser Gly Glu Ile Ala Phe Lys Asn Asp Asp Ser Tyr Gln Leu Pro  
320 325 330

Gln Asn Pro Asp Ser Asp Ala Asp Lys Arg Ala Ala Lys Arg His Phe  
335 340 345

Asp Phe Tyr Ile Gly Ile Phe Ser Gln Pro Val Tyr Gly Asn Gly Tyr  
350 355 360

Tyr Pro Glu Thr Val Arg Asn Thr Ile Ser Glu Arg Phe Leu Pro Glu  
365 370 375

Phe Thr Ala Ala Glu Arg Glu Gln Ile Gln Gly Ser Ala Asp Phe Tyr  
380 385 390 395

Ala Ile Asp Gly Tyr Arg Thr Asn Ile Ala Ser Ala Ala Pro Asn Gly  
400 405 410

Ile Asp Ala Cys Leu Arg Asn Ala Ser Asp Pro Asn Trp Pro Val Cys  
415 420 425

Gln Asp Asn Ser Asn Thr Gly Gln Tyr Ala Thr Leu Glu Gly Phe Ala  
430 435 440

Leu Gly Pro Pro Ala Asp Pro Asn Ala Asn Trp Leu Tyr Asn Thr Ala  
445 450 455

Pro Tyr Leu Arg Tyr Gln Phe Lys Val Leu Lys Glu Asn Phe Asn Tyr  
460 465 470 475

Lys Lys Ile Tyr Leu Thr Glu Phe Gly Phe Ala Glu Pro Phe Ser Tyr  
480 485 490

Leu Arg Gln Asp Leu Tyr Ala Leu Leu Tyr Asp Thr Asp Arg Thr Ala  
495 500 505

Tyr Tyr Gln Asp Tyr Leu Ala Gln Cys Met Leu Ala Ile Lys Glu Asp  
510 515 520

Gly Ile Pro Leu Ala Gly Val Phe Ala Trp Ser Phe Val Asp Asn Phe  
525 530 535

Glu Trp Gly Ser Gly Leu Glu Gln Arg Phe Gly Met Gln Tyr Val Asn  
540 545 550 555

Tyr Thr Asp Pro Asp Leu Pro Arg Thr Phe Lys Leu Ser Phe Leu Ala  
560 565 570

Tyr Arg Asp Phe Ile Lys Asn His Lys Lys  
575 580

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

<220>  
<223> Beta-galactosidase

<220>  
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 <222> (1)..(1809)

<220>  
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 <222> (1)..(63)

<220>  
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 Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
 -20 -15 -10

gca cct gct ttg gct gcg cca cag ttc tcg cca aca gtc aac acc gaa 96  
 Ala Pro Ala Leu Ala Ala Pro Gln Phe Ser Pro Thr Val Asn Thr Glu  
 -5 -1 1 5 10

ggc atc atc ccc atc agc gag cgg cca agc ccg aca cag agc tcc tct 144  
 Gly Ile Ile Pro Ile Ser Glu Arg Pro Ser Pro Thr Gln Ser Ser Ser  
 15 20 25

tct tct ggg ccc gtg atc cca gcg ggt tcc tat gtc agc gac ttc gat 192  
 Ser Ser Gly Pro Val Ile Pro Ala Gly Ser Tyr Val Ser Asp Phe Asp  
 30 35 40

gcc agc ggg ttg gcg aac ctt tgg tcg cag gtt gaa gtg gac att ccg 240  
 Ala Ser Gly Leu Ala Asn Leu Trp Ser Gln Val Glu Val Asp Ile Pro  
 45 50 55

gtt gag tct cca cgc att tcg gcc gtt cct ccg ctg aac aag acc ttc 288  
 Val Glu Ser Pro Arg Ile Ser Ala Val Pro Pro Leu Asn Lys Thr Phe  
 60 65 70 75

tcg gtt ccg aag act cca gtt ctc ccc aat tcg ctt caa gac cat ctg 336  
 Ser Val Pro Lys Thr Pro Val Leu Pro Asn Ser Leu Gln Asp His Leu  
 80 85 90

ccc aag gat gtg aaa gct cct gag ggc ttt gcc tgg gga gtg gcg tcc 384  
 Pro Lys Asp Val Lys Ala Pro Glu Gly Phe Ala Trp Gly Val Ala Ser  
 95 100 105

gtg gca cag caa tac gag ggc gca gtc aaa gca gac gga cga ggc cct 432  
 Val Ala Gln Gln Tyr Glu Gly Ala Val Lys Ala Asp Gly Arg Gly Pro  
 110 115 120

tct cac tgg gac ttc ctg tgc cat cgc aac ccc tcc tct tgt acc aac 480  
 Ser His Trp Asp Phe Leu Cys His Arg Asn Pro Ser Ser Cys Thr Asn  
 125 130 135

|                                                                                                                                                       |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| tac acc tct gac atc act gat ctg ggc cgc tac tac tac aag aac gat<br>Tyr Thr Ser Asp Ile Thr Asp Leu Gly Arg Tyr Tyr Tyr Lys Asn Asp<br>140 145 150 155 | 528  |
| ctc gcc cgt atg gcc gca atg ggg atc act cac tac tcc ttt tcg gtg<br>Leu Ala Arg Met Ala Ala Met Gly Ile Thr His Tyr Ser Phe Ser Val<br>160 165 170     | 576  |
| tct tgg acc cga gtt gtc ccc ttc ggc aag aag ggt tcg cct gtt tcc<br>Ser Trp Thr Arg Val Val Pro Phe Gly Lys Lys Gly Ser Pro Val Ser<br>175 180 185     | 624  |
| aac gag gga ttg gac tac tac gag gac atc tgc aag act gcc ctc tct<br>Asn Glu Gly Leu Asp Tyr Tyr Glu Asp Ile Cys Lys Thr Ala Leu Ser<br>190 195 200     | 672  |
| ttc ggc atc aag ccc gtc atc acg ctg ttc cac tgg gat acc ccg gca<br>Phe Gly Ile Lys Pro Val Ile Thr Leu Phe His Trp Asp Thr Pro Ala<br>205 210 215     | 720  |
| aac ctc ctg ttt gag tat gga ggt ttc ctc aat ggc acg atc gtc gat<br>Asn Leu Leu Phe Glu Tyr Gly Gly Phe Leu Asn Gly Thr Ile Val Asp<br>220 225 230 235 | 768  |
| gac tac tac tac tac gcc gac att gtc ttc cgg cgg ttg ggc aag tac<br>Asp Tyr Tyr Tyr Tyr Ala Asp Ile Val Phe Arg Arg Leu Gly Lys Tyr<br>240 245 250     | 816  |
| gcg gag acg ttc ttc acg ttc aac gag cca cgc gtc tac tgc agc gag<br>Ala Glu Thr Phe Phe Thr Phe Asn Glu Pro Arg Val Tyr Cys Ser Glu<br>255 260 265     | 864  |
| tac act ggt cct ccc ttc gat gcc tac tac gag cga tac ggc ctc aac<br>Tyr Thr Gly Pro Pro Phe Asp Ala Tyr Tyr Glu Arg Tyr Gly Leu Asn<br>270 275 280     | 912  |
| tcc tcg act gcc cca tac cct tgt tcg tac aac ctt ttg cgc gct cat<br>Ser Ser Thr Ala Pro Tyr Pro Cys Ser Tyr Asn Leu Leu Arg Ala His<br>285 290 295     | 960  |
| ggc gcc gct gtc ggg cga tac cgc gcc ctt gtc aag gag ggc tcc atc<br>Gly Ala Ala Val Gly Arg Tyr Arg Ala Leu Val Lys Glu Gly Ser Ile<br>300 305 310 315 | 1008 |
| aag tcc ggt gag att gcg ttc aag aac gat gac agc tat cag ctt cct<br>Lys Ser Gly Glu Ile Ala Phe Lys Asn Asp Asp Ser Tyr Gln Leu Pro<br>320 325 330     | 1056 |
| cag aat cct gat tcc gat gca gac aaa cgg gca gca aaa cgt cac ttt<br>Gln Asn Pro Asp Ser Asp Ala Asp Lys Arg Ala Ala Lys Arg His Phe<br>335 340 345     | 1104 |
| gac ttc tac atc ggg atc ttc tcc caa ccg gtt tac gga aat ggg tac<br>Asp Phe Tyr Ile Gly Ile Phe Ser Gln Pro Val Tyr Gly Asn Gly Tyr                    | 1152 |

| 350                                                                                                                                                   | 355 | 360 |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| tac ccg gaa aca gtg cgt aac aca atc tcc gaa cgc ttc ctg cct gag<br>Tyr Pro Glu Thr Val Arg Asn Thr Ile Ser Glu Arg Phe Leu Pro Glu<br>365 370 375     |     |     | 1200 |
| ttc acc gct gct gaa cgc gag cag att cag ggt agc gcc gac ttc tac<br>Phe Thr Ala Ala Glu Arg Glu Gln Ile Gln Gly Ser Ala Asp Phe Tyr<br>380 385 390 395 |     |     | 1248 |
| gcg atc gat gga tat cgg acc aac atc gca tct gca gcc ccg aat ggg<br>Ala Ile Asp Gly Tyr Arg Thr Asn Ile Ala Ser Ala Ala Pro Asn Gly<br>400 405 410     |     |     | 1296 |
| att gac gct tgc ttg cgt aac gct agc gac cct aac tgg ccg gtg tgc<br>Ile Asp Ala Cys Leu Arg Asn Ala Ser Asp Pro Asn Trp Pro Val Cys<br>415 420 425     |     |     | 1344 |
| caa gac aac tcg aac aca ggc cag tat gcc acc ctg gaa ggt ttt gca<br>Gln Asp Asn Ser Asn Thr Gly Gln Tyr Ala Thr Leu Glu Gly Phe Ala<br>430 435 440     |     |     | 1392 |
| ttg ggg cct ccc gca gac cca aat gcc aac tgg ctg tac aac acg gcg<br>Leu Gly Pro Pro Ala Asp Pro Asn Ala Asn Trp Leu Tyr Asn Thr Ala<br>445 450 455     |     |     | 1440 |
| ccg tat ctc cga tac caa ttc aag gtc ttg aag gag aac ttc aac tac<br>Pro Tyr Leu Arg Tyr Gln Phe Lys Val Leu Lys Glu Asn Phe Asn Tyr<br>460 465 470 475 |     |     | 1488 |
| aag aag atc tac ctg acc gaa ttc ggg ttt gct gag cct ttc tcc tat<br>Lys Lys Ile Tyr Leu Thr Glu Phe Gly Phe Ala Glu Pro Phe Ser Tyr<br>480 485 490     |     |     | 1536 |
| ctg cgc caa gac ctg tat gcg ctt ctc tac gat act gat cga acc gct<br>Leu Arg Gln Asp Leu Tyr Ala Leu Leu Tyr Asp Thr Asp Arg Thr Ala<br>495 500 505     |     |     | 1584 |
| tac tac cag gat tac ctg gcg cag tgc atg ctg gcc atc aag gag gac<br>Tyr Tyr Gln Asp Tyr Leu Ala Gln Cys Met Leu Ala Ile Lys Glu Asp<br>510 515 520     |     |     | 1632 |
| ggc atc cca ttg gcc ggc gtc ttt gct tgg tcc ttc gtt gac aac ttc<br>Gly Ile Pro Leu Ala Gly Val Phe Ala Trp Ser Phe Val Asp Asn Phe<br>525 530 535     |     |     | 1680 |
| gag tgg ggt tcg gga ttg gaa cag cgc ttt ggc atg cag tat gtg aac<br>Glu Trp Gly Ser Gly Leu Glu Gln Arg Phe Gly Met Gln Tyr Val Asn<br>540 545 550 555 |     |     | 1728 |
| tac acc gac ccc gac ttg ccc cgc aca ttc aag ctc tcc ttt ctc gcc<br>Tyr Thr Asp Pro Asp Leu Pro Arg Thr Phe Lys Leu Ser Phe Leu Ala<br>560 565 570     |     |     | 1776 |

tat cgg gac ttc atc aag aac cac aag aag taa  
 Tyr Arg Asp Phe Ile Lys Asn His Lys Lys  
           575                          580

1809

<210> 18  
 <211> 602  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Synthetic Construct

<400> 18

Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
      -20                          -15                          -10

Ala Pro Ala Leu Ala Ala Pro Gln Phe Ser Pro Thr Val Asn Thr Glu  
   -5                          -1  1                          5                          10

Gly Ile Ile Pro Ile Ser Glu Arg Pro Ser Pro Thr Gln Ser Ser Ser  
          15                          20                          25

Ser Ser Gly Pro Val Ile Pro Ala Gly Ser Tyr Val Ser Asp Phe Asp  
      30                          35                          40

Ala Ser Gly Leu Ala Asn Leu Trp Ser Gln Val Glu Val Asp Ile Pro  
   45                          50                          55

Val Glu Ser Pro Arg Ile Ser Ala Val Pro Pro Leu Asn Lys Thr Phe  
  60                          65                          70                          75

Ser Val Pro Lys Thr Pro Val Leu Pro Asn Ser Leu Gln Asp His Leu  
          80                          85                          90

Pro Lys Asp Val Lys Ala Pro Glu Gly Phe Ala Trp Gly Val Ala Ser  
      95                          100                          105

Val Ala Gln Gln Tyr Glu Gly Ala Val Lys Ala Asp Gly Arg Gly Pro  
  110                          115                          120

Ser His Trp Asp Phe Leu Cys His Arg Asn Pro Ser Ser Cys Thr Asn  
  125                          130                          135

Tyr Thr Ser Asp Ile Thr Asp Leu Gly Arg Tyr Tyr Tyr Lys Asn Asp  
 140 145 150 155

Leu Ala Arg Met Ala Ala Met Gly Ile Thr His Tyr Ser Phe Ser Val  
 160 165 170

Ser Trp Thr Arg Val Val Pro Phe Gly Lys Lys Gly Ser Pro Val Ser  
 175 180 185

Asn Glu Gly Leu Asp Tyr Tyr Glu Asp Ile Cys Lys Thr Ala Leu Ser  
 190 195 200

Phe Gly Ile Lys Pro Val Ile Thr Leu Phe His Trp Asp Thr Pro Ala  
 205 210 215

Asn Leu Leu Phe Glu Tyr Gly Gly Phe Leu Asn Gly Thr Ile Val Asp  
 220 225 230 235

Asp Tyr Tyr Tyr Tyr Ala Asp Ile Val Phe Arg Arg Leu Gly Lys Tyr  
 240 245 250

Ala Glu Thr Phe Phe Thr Phe Asn Glu Pro Arg Val Tyr Cys Ser Glu  
 255 260 265

Tyr Thr Gly Pro Pro Phe Asp Ala Tyr Tyr Glu Arg Tyr Gly Leu Asn  
 270 275 280

Ser Ser Thr Ala Pro Tyr Pro Cys Ser Tyr Asn Leu Leu Arg Ala His  
 285 290 295

Gly Ala Ala Val Gly Arg Tyr Arg Ala Leu Val Lys Glu Gly Ser Ile  
 300 305 310 315

Lys Ser Gly Glu Ile Ala Phe Lys Asn Asp Asp Ser Tyr Gln Leu Pro  
 320 325 330

Gln Asn Pro Asp Ser Asp Ala Asp Lys Arg Ala Ala Lys Arg His Phe  
 335 340 345

Asp Phe Tyr Ile Gly Ile Phe Ser Gln Pro Val Tyr Gly Asn Gly Tyr

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 350 |     | 355 |     | 360 |     |     |     |     |     |     |     |     |     |     |     |
| Tyr | Pro | Glu | Thr | Val | Arg | Asn | Thr | Ile | Ser | Glu | Arg | Phe | Leu | Pro | Glu |
|     | 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     |
| Phe | Thr | Ala | Ala | Glu | Arg | Glu | Gln | Ile | Gln | Gly | Ser | Ala | Asp | Phe | Tyr |
| 380 |     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |
| Ala | Ile | Asp | Gly | Tyr | Arg | Thr | Asn | Ile | Ala | Ser | Ala | Ala | Pro | Asn | Gly |
|     |     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |
| Ile | Asp | Ala | Cys | Leu | Arg | Asn | Ala | Ser | Asp | Pro | Asn | Trp | Pro | Val | Cys |
|     |     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |
| Gln | Asp | Asn | Ser | Asn | Thr | Gly | Gln | Tyr | Ala | Thr | Leu | Glu | Gly | Phe | Ala |
|     |     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |
| Leu | Gly | Pro | Pro | Ala | Asp | Pro | Asn | Ala | Asn | Trp | Leu | Tyr | Asn | Thr | Ala |
|     | 445 |     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     |
| Pro | Tyr | Leu | Arg | Tyr | Gln | Phe | Lys | Val | Leu | Lys | Glu | Asn | Phe | Asn | Tyr |
| 460 |     |     |     |     | 465 |     |     |     |     | 470 |     |     |     |     | 475 |
| Lys | Lys | Ile | Tyr | Leu | Thr | Glu | Phe | Gly | Phe | Ala | Glu | Pro | Phe | Ser | Tyr |
|     |     |     |     | 480 |     |     |     |     | 485 |     |     |     |     | 490 |     |
| Leu | Arg | Gln | Asp | Leu | Tyr | Ala | Leu | Leu | Tyr | Asp | Thr | Asp | Arg | Thr | Ala |
|     |     | 495 |     |     |     |     |     | 500 |     |     |     |     | 505 |     |     |
| Tyr | Tyr | Gln | Asp | Tyr | Leu | Ala | Gln | Cys | Met | Leu | Ala | Ile | Lys | Glu | Asp |
|     |     | 510 |     |     |     |     | 515 |     |     |     |     | 520 |     |     |     |
| Gly | Ile | Pro | Leu | Ala | Gly | Val | Phe | Ala | Trp | Ser | Phe | Val | Asp | Asn | Phe |
|     | 525 |     |     |     |     | 530 |     |     |     |     | 535 |     |     |     |     |
| Glu | Trp | Gly | Ser | Gly | Leu | Glu | Gln | Arg | Phe | Gly | Met | Gln | Tyr | Val | Asn |
| 540 |     |     |     |     | 545 |     |     |     |     | 550 |     |     |     |     | 555 |
| Tyr | Thr | Asp | Pro | Asp | Leu | Pro | Arg | Thr | Phe | Lys | Leu | Ser | Phe | Leu | Ala |
|     |     |     |     | 560 |     |     |     |     | 565 |     |     |     |     | 570 |     |

Tyr Arg Asp Phe Ile Lys Asn His Lys Lys  
575 580

<210> 19  
<211> 1785  
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<220>  
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<220>  
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<400> 19  
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Met Leu Val Gly Leu Ala Leu Thr Ala Leu Leu Gly Ala Thr Arg Tyr  
-15 -10 -5  
  
gtt ggc gca atc cct gct ttc cca atc act cca gat ttg gct ggt ggg 96  
Val Gly Ala Ile Pro Ala Phe Pro Ile Thr Pro Asp Leu Ala Gly Gly  
-1 1 5 10  
  
ctg gag tct gtg acc aac act cag acc tcg ctc cct tca gcg agc gct 144  
Leu Glu Ser Val Thr Asn Thr Gln Thr Ser Leu Pro Ser Ala Ser Ala  
15 20 25  
  
gtg tcg tcg ccc tat aat caa gat gca ctc gac aag ctg tgg gct gag 192  
Val Ser Ser Pro Tyr Asn Gln Asp Ala Leu Asp Lys Leu Trp Ala Glu  
30 35 40 45  
  
gtc gaa aaa gac att cca gtc gag aca cca agc atc tcc agc gtt gtt 240  
Val Glu Lys Asp Ile Pro Val Glu Thr Pro Ser Ile Ser Ser Val Val  
50 55 60  
  
cca gta aac aac agc ttt gcg gtc ccc aaa acc cct act ctg ccc cga 288  
Pro Val Asn Asn Ser Phe Ala Val Pro Lys Thr Pro Thr Leu Pro Arg  
65 70 75  
  
tct ctt cag gat cat gct acc agt ggc cgc aaa ttc ccc aaa ggc ttc 336  
Ser Leu Gln Asp His Ala Thr Ser Gly Arg Lys Phe Pro Lys Gly Phe  
80 85 90  
  
aag ttt ggt gtc gcc acc gcc gat cag cag tat gaa ggt gcc gtc aag 384  
Lys Phe Gly Val Ala Thr Ala Asp Gln Gln Tyr Glu Gly Ala Val Lys

| 95                                                                                                                                                    | 100 | 105 |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| gct gat ggc cgt ggc ccc tct cac tgg gat tac ctt tgc cat cgt ctc<br>Ala Asp Gly Arg Gly Pro Ser His Trp Asp Tyr Leu Cys His Arg Leu<br>110 115 120 125 |     |     | 432  |
| cca cag caa tgc aac aac tac acc tca gac atc act gac ctt ggt cgc<br>Pro Gln Gln Cys Asn Asn Tyr Thr Ser Asp Ile Thr Asp Leu Gly Arg<br>130 135 140     |     |     | 480  |
| tac tat tat aag caa gat atc gca cga atc aag gcc atg gga gta aac<br>Tyr Tyr Tyr Lys Gln Asp Ile Ala Arg Ile Lys Ala Met Gly Val Asn<br>145 150 155     |     |     | 528  |
| act gta tca ctc acc ctt tct tgg tca cgt atc aag ccc ttc ggc acg<br>Thr Val Ser Leu Thr Leu Ser Trp Ser Arg Ile Lys Pro Phe Gly Thr<br>160 165 170     |     |     | 576  |
| gcc gat agt cct gtc agc aaa gaa gga ctc caa ttt tac gat gac ttt<br>Ala Asp Ser Pro Val Ser Lys Glu Gly Leu Gln Phe Tyr Asp Asp Phe<br>175 180 185     |     |     | 624  |
| atc aac gag ctc atc gat aat ggc atc gaa cca gtc gtc acc ctg ttc<br>Ile Asn Glu Leu Ile Asp Asn Gly Ile Glu Pro Val Val Thr Leu Phe<br>190 195 200 205 |     |     | 672  |
| cat tgg agt aca cca ctc aat ctg gtg ttc gaa tac ggg gcc ttc ctt<br>His Trp Ser Thr Pro Leu Asn Leu Val Phe Glu Tyr Gly Ala Phe Leu<br>210 215 220     |     |     | 720  |
| aat ggc agc tcg gtt gaa gat ttc gct agc tat gct aag ctt gtt ttt<br>Asn Gly Ser Ser Val Glu Asp Phe Ala Ser Tyr Ala Lys Leu Val Phe<br>225 230 235     |     |     | 768  |
| gag cat ttc ggt gac aga gta acc aca ttc ctt act ttc aac gag cct<br>Glu His Phe Gly Asp Arg Val Thr Thr Phe Leu Thr Phe Asn Glu Pro<br>240 245 250     |     |     | 816  |
| cgt gta tac tgc tcc gaa tac act ggc gag cct ttt aat gat tat tgg<br>Arg Val Tyr Cys Ser Glu Tyr Thr Gly Glu Pro Phe Asn Asp Tyr Trp<br>255 260 265     |     |     | 864  |
| cac ttt gga ggt ccc aac atc aat gcc acg acc gct ccc tat cct tgc<br>His Phe Gly Gly Pro Asn Ile Asn Ala Thr Thr Ala Pro Tyr Pro Cys<br>270 275 280 285 |     |     | 912  |
| acc tat aac att tta aaa gca cac gga cgt gcc gtt caa gaa tac aga<br>Thr Tyr Asn Ile Leu Lys Ala His Gly Arg Ala Val Gln Glu Tyr Arg<br>290 295 300     |     |     | 960  |
| gca ctg gtc aac agt gga aag atc aag aaa ggt gaa gtc gca att aaa<br>Ala Leu Val Asn Ser Gly Lys Ile Lys Lys Gly Glu Val Ala Ile Lys<br>305 310 315     |     |     | 1008 |

|                                                                                                                                                       |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| aac gac gat agt tat ccc gtg cca gtc aac cca gac tcc gaa gcc gat<br>Asn Asp Asp Ser Tyr Pro Val Pro Val Asn Pro Asp Ser Glu Ala Asp<br>320 325 330     | 1056 |
| gta gaa gcg gcc aag cga cac ttc gat ttc tac att ggc att ttc agt<br>Val Glu Ala Ala Lys Arg His Phe Asp Phe Tyr Ile Gly Ile Phe Ser<br>335 340 345     | 1104 |
| cag cct att tac ggt gat gga aag ttc cca gac acc gtt aga aac acc<br>Gln Pro Ile Tyr Gly Asp Gly Lys Phe Pro Asp Thr Val Arg Asn Thr<br>350 355 360 365 | 1152 |
| atc tcc act gaa ttc ctg cca tac ctc acc gat gat gag aaa gcc atg<br>Ile Ser Thr Glu Phe Leu Pro Tyr Leu Thr Asp Asp Glu Lys Ala Met<br>370 375 380     | 1200 |
| att aaa gga agt ggt gac ttt ttc gcc ata gac gca tat cga acc aac<br>Ile Lys Gly Ser Gly Asp Phe Phe Ala Ile Asp Ala Tyr Arg Thr Asn<br>385 390 395     | 1248 |
| ctt gca aga gct gcg ccc aat ggc atc caa gcc tgc gta gct aac atc<br>Leu Ala Arg Ala Ala Pro Asn Gly Ile Gln Ala Cys Val Ala Asn Ile<br>400 405 410     | 1296 |
| tcg gat ccc aat tgg cct gta tgc caa gac aac agc cct gaa gga caa<br>Ser Asp Pro Asn Trp Pro Val Cys Gln Asp Asn Ser Pro Glu Gly Gln<br>415 420 425     | 1344 |
| tac caa acc atg gat ggc ttt gct ttc ggt ccc ccg gca gac ccc aac<br>Tyr Gln Thr Met Asp Gly Phe Ala Phe Gly Pro Pro Ala Asp Pro Asn<br>430 435 440 445 | 1392 |
| gct gca tgg cta tat gac acc agc ttc aag ttg cgc tac cag ctt aag<br>Ala Ala Trp Leu Tyr Asp Thr Ser Phe Lys Leu Arg Tyr Gln Leu Lys<br>450 455 460     | 1440 |
| aca ctc aaa gag gca ttc aac tat gac aag atc tac atc tca gag ttt<br>Thr Leu Lys Glu Ala Phe Asn Tyr Asp Lys Ile Tyr Ile Ser Glu Phe<br>465 470 475     | 1488 |
| gga ttt gct cgg cct tac gaa tac ctc tac cct tac ggc ttc gac gtc<br>Gly Phe Ala Arg Pro Tyr Glu Tyr Leu Tyr Pro Tyr Gly Phe Asp Val<br>480 485 490     | 1536 |
| ctg tac gac aca gac cgt gcc att tac tac caa gac tac atg gct gag<br>Leu Tyr Asp Thr Asp Arg Ala Ile Tyr Tyr Gln Asp Tyr Met Ala Glu<br>495 500 505     | 1584 |
| gcc ttg gat gcc att cat gac gac ggc att cct ctg gct ggt gtc ttt<br>Ala Leu Asp Ala Ile His Asp Asp Gly Ile Pro Leu Ala Gly Val Phe<br>510 515 520 525 | 1632 |
| gct tgg tcc ttc gtt gac aat ttc gaa tgg gct tcc ggt ctt gaa cag<br>Ala Trp Ser Phe Val Asp Asn Phe Glu Trp Ala Ser Gly Leu Glu Gln                    | 1680 |

| 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| cga | ttc | ggc | atg | cag | ttc | gtg | aac | tac | acg | aca | ctg | gaa | aga | gag | tac | 1728 |
| Arg | Phe | Gly | Met | Gln | Phe | Val | Asn | Tyr | Thr | Thr | Leu | Glu | Arg | Glu | Tyr |      |
|     |     |     | 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |      |
| aag | ctc | tcc | ttc | ctg | ctt | tat | cgt | gac | ttc | att | gaa | aac | cac | agt | tgc | 1776 |
| Lys | Leu | Ser | Phe | Leu | Leu | Tyr | Arg | Asp | Phe | Ile | Glu | Asn | His | Ser | Cys |      |
|     |     |     | 560 |     |     |     | 565 |     |     |     |     | 570 |     |     |     |      |
| gaa | gat | taa |     |     |     |     |     |     |     |     |     |     |     |     |     | 1785 |
| Glu | Asp |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|     |     |     | 575 |     |     |     |     |     |     |     |     |     |     |     |     |      |

<210> 20  
 <211> 594  
 <212> PRT  
 <213> Sterigmatomyces elviae

<400> 20

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Val | Gly | Leu | Ala | Leu | Thr | Ala | Leu | Leu | Gly | Ala | Thr | Arg | Tyr |
|     |     |     |     | -15 |     |     |     |     | -10 |     |     |     |     | -5  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Gly | Ala | Ile | Pro | Ala | Phe | Pro | Ile | Thr | Pro | Asp | Leu | Ala | Gly | Gly |
|     | -1  | 1   |     |     |     |     | 5   |     |     |     |     | 10  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Glu | Ser | Val | Thr | Asn | Thr | Gln | Thr | Ser | Leu | Pro | Ser | Ala | Ser | Ala |
| 15  |     |     |     |     |     | 20  |     |     |     |     | 25  |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ser | Ser | Pro | Tyr | Asn | Gln | Asp | Ala | Leu | Asp | Lys | Leu | Trp | Ala | Glu |
| 30  |     |     |     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Glu | Lys | Asp | Ile | Pro | Val | Glu | Thr | Pro | Ser | Ile | Ser | Ser | Val | Val |
|     |     |     |     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Val | Asn | Asn | Ser | Phe | Ala | Val | Pro | Lys | Thr | Pro | Thr | Leu | Pro | Arg |
|     |     |     | 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Leu | Gln | Asp | His | Ala | Thr | Ser | Gly | Arg | Lys | Phe | Pro | Lys | Gly | Phe |
|     |     | 80  |     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Phe | Gly | Val | Ala | Thr | Ala | Asp | Gln | Gln | Tyr | Glu | Gly | Ala | Val | Lys |
|     | 95  |     |     |     |     | 100 |     |     |     |     | 105 |     |     |     |     |

Ala Asp Gly Arg Gly Pro Ser His Trp Asp Tyr Leu Cys His Arg Leu  
110 115 120 125

Pro Gln Gln Cys Asn Asn Tyr Thr Ser Asp Ile Thr Asp Leu Gly Arg  
130 135 140

Tyr Tyr Tyr Lys Gln Asp Ile Ala Arg Ile Lys Ala Met Gly Val Asn  
145 150 155

Thr Val Ser Leu Thr Leu Ser Trp Ser Arg Ile Lys Pro Phe Gly Thr  
160 165 170

Ala Asp Ser Pro Val Ser Lys Glu Gly Leu Gln Phe Tyr Asp Asp Phe  
175 180 185

Ile Asn Glu Leu Ile Asp Asn Gly Ile Glu Pro Val Val Thr Leu Phe  
190 195 200 205

His Trp Ser Thr Pro Leu Asn Leu Val Phe Glu Tyr Gly Ala Phe Leu  
210 215 220

Asn Gly Ser Ser Val Glu Asp Phe Ala Ser Tyr Ala Lys Leu Val Phe  
225 230 235

Glu His Phe Gly Asp Arg Val Thr Thr Phe Leu Thr Phe Asn Glu Pro  
240 245 250

Arg Val Tyr Cys Ser Glu Tyr Thr Gly Glu Pro Phe Asn Asp Tyr Trp  
255 260 265

His Phe Gly Gly Pro Asn Ile Asn Ala Thr Thr Ala Pro Tyr Pro Cys  
270 275 280 285

Thr Tyr Asn Ile Leu Lys Ala His Gly Arg Ala Val Gln Glu Tyr Arg  
290 295 300

Ala Leu Val Asn Ser Gly Lys Ile Lys Lys Gly Glu Val Ala Ile Lys  
305 310 315

Asn Asp Asp Ser Tyr Pro Val Pro Val Asn Pro Asp Ser Glu Ala Asp  
320 325 330

Val Glu Ala Ala Lys Arg His Phe Asp Phe Tyr Ile Gly Ile Phe Ser  
335 340 345

Gln Pro Ile Tyr Gly Asp Gly Lys Phe Pro Asp Thr Val Arg Asn Thr  
350 355 360 365

Ile Ser Thr Glu Phe Leu Pro Tyr Leu Thr Asp Asp Glu Lys Ala Met  
370 375 380

Ile Lys Gly Ser Gly Asp Phe Phe Ala Ile Asp Ala Tyr Arg Thr Asn  
385 390 395

Leu Ala Arg Ala Ala Pro Asn Gly Ile Gln Ala Cys Val Ala Asn Ile  
400 405 410

Ser Asp Pro Asn Trp Pro Val Cys Gln Asp Asn Ser Pro Glu Gly Gln  
415 420 425

Tyr Gln Thr Met Asp Gly Phe Ala Phe Gly Pro Pro Ala Asp Pro Asn  
430 435 440 445

Ala Ala Trp Leu Tyr Asp Thr Ser Phe Lys Leu Arg Tyr Gln Leu Lys  
450 455 460

Thr Leu Lys Glu Ala Phe Asn Tyr Asp Lys Ile Tyr Ile Ser Glu Phe  
465 470 475

Gly Phe Ala Arg Pro Tyr Glu Tyr Leu Tyr Pro Tyr Gly Phe Asp Val  
480 485 490

Leu Tyr Asp Thr Asp Arg Ala Ile Tyr Tyr Gln Asp Tyr Met Ala Glu  
495 500 505

Ala Leu Asp Ala Ile His Asp Asp Gly Ile Pro Leu Ala Gly Val Phe  
510 515 520 525

Ala Trp Ser Phe Val Asp Asn Phe Glu Trp Ala Ser Gly Leu Glu Gln  
530 535 540

Arg Phe Gly Met Gln Phe Val Asn Tyr Thr Thr Leu Glu Arg Glu Tyr  
545 550 555

Lys Leu Ser Phe Leu Leu Tyr Arg Asp Phe Ile Glu Asn His Ser Cys  
560 565 570

Glu Asp  
575

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Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
-20 -15 -10

gca cct gct ttg gct atc cct gct ttc cca atc act cca gat ttg gct 96  
Ala Pro Ala Leu Ala Ile Pro Ala Phe Pro Ile Thr Pro Asp Leu Ala  
-5 -1 1 5 10

ggt ggg ctg gag tct gtg acc aac act cag acc tcg ctc cct tca gcg 144  
Gly Gly Leu Glu Ser Val Thr Asn Thr Gln Thr Ser Leu Pro Ser Ala  
15 20 25

agc gct gtg tcg tcg ccc tat aat caa gat gca ctc gac aag ctg tgg 192  
Ser Ala Val Ser Ser Pro Tyr Asn Gln Asp Ala Leu Asp Lys Leu Trp  
30 35 40

gct gag gtc gaa aaa gac att cca gtc gag aca cca agc atc tcc agc 240  
Ala Glu Val Glu Lys Asp Ile Pro Val Glu Thr Pro Ser Ile Ser Ser  
45 50 55

|                                                                 |     |
|-----------------------------------------------------------------|-----|
| gtt gtt cca gta aac aac agc ttt gcg gtc ccc aaa acc cct act ctg | 288 |
| Val Val Pro Val Asn Asn Ser Phe Ala Val Pro Lys Thr Pro Thr Leu |     |
| 60 65 70 75                                                     |     |
| ccc cga tct ctt cag gat cat gct acc agt ggc cgc aaa ttc ccc aaa | 336 |
| Pro Arg Ser Leu Gln Asp His Ala Thr Ser Gly Arg Lys Phe Pro Lys |     |
| 80 85 90                                                        |     |
| ggc ttc aag ttt ggt gtc gcc acc gcc gat cag cag tat gaa ggt gcc | 384 |
| Gly Phe Lys Phe Gly Val Ala Thr Ala Asp Gln Gln Tyr Glu Gly Ala |     |
| 95 100 105                                                      |     |
| gtc aag gct gat ggc cgt ggc ccc tct cac tgg gat tac ctt tgc cat | 432 |
| Val Lys Ala Asp Gly Arg Gly Pro Ser His Trp Asp Tyr Leu Cys His |     |
| 110 115 120                                                     |     |
| cgt ctc cca cag caa tgc aac aac tac acc tca gac atc act gac ctt | 480 |
| Arg Leu Pro Gln Gln Cys Asn Asn Tyr Thr Ser Asp Ile Thr Asp Leu |     |
| 125 130 135                                                     |     |
| ggc cgc tac tat tat aag caa gat atc gca cga atc aag gcc atg gga | 528 |
| Gly Arg Tyr Tyr Tyr Lys Gln Asp Ile Ala Arg Ile Lys Ala Met Gly |     |
| 140 145 150 155                                                 |     |
| gta aac act gta tca ctc acc ctt tct tgg tca cgt atc aag ccc ttc | 576 |
| Val Asn Thr Val Ser Leu Thr Leu Ser Trp Ser Arg Ile Lys Pro Phe |     |
| 160 165 170                                                     |     |
| ggc acg gcc gat agt cct gtc agc aaa gaa gga ctc caa ttt tac gat | 624 |
| Gly Thr Ala Asp Ser Pro Val Ser Lys Glu Gly Leu Gln Phe Tyr Asp |     |
| 175 180 185                                                     |     |
| gac ttt atc aac gag ctc atc gat aat ggc atc gaa cca gtc gtc acc | 672 |
| Asp Phe Ile Asn Glu Leu Ile Asp Asn Gly Ile Glu Pro Val Val Thr |     |
| 190 195 200                                                     |     |
| ctg ttc cat tgg agt aca cca ctc aat ctg gtg ttc gaa tac ggg gcc | 720 |
| Leu Phe His Trp Ser Thr Pro Leu Asn Leu Val Phe Glu Tyr Gly Ala |     |
| 205 210 215                                                     |     |
| ttc ctt aat ggc agc tcg gtt gaa gat ttc gct agc tat gct aag ctt | 768 |
| Phe Leu Asn Gly Ser Ser Val Glu Asp Phe Ala Ser Tyr Ala Lys Leu |     |
| 220 225 230 235                                                 |     |
| gtt ttt gag cat ttc ggt gac aga gta acc aca ttc ctt act ttc aac | 816 |
| Val Phe Glu His Phe Gly Asp Arg Val Thr Thr Phe Leu Thr Phe Asn |     |
| 240 245 250                                                     |     |
| gag cct cgt gta tac tgc tcc gaa tac act ggc gag cct ttt aat gat | 864 |
| Glu Pro Arg Val Tyr Cys Ser Glu Tyr Thr Gly Glu Pro Phe Asn Asp |     |
| 255 260 265                                                     |     |
| tat tgg cac ttt gga ggt ccc aac atc aat gcc acg acc gct ccc tat | 912 |
| Tyr Trp His Phe Gly Gly Pro Asn Ile Asn Ala Thr Thr Ala Pro Tyr |     |

| 270                                                                                                                                                   | 275 | 280 |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| cct tgc acc tat aac att tta aaa gca cac gga cgt gcc gtt caa gaa<br>Pro Cys Thr Tyr Asn Ile Leu Lys Ala His Gly Arg Ala Val Gln Glu<br>285 290 295     |     |     | 960  |
| tac aga gca ctg gtc aac agt gga aag atc aag aaa ggt gaa gtc gca<br>Tyr Arg Ala Leu Val Asn Ser Gly Lys Ile Lys Lys Gly Glu Val Ala<br>300 305 310 315 |     |     | 1008 |
| att aaa aac gac gat agt tat ccc gtg cca gtc aac cca gac tcc gaa<br>Ile Lys Asn Asp Asp Ser Tyr Pro Val Pro Val Asn Pro Asp Ser Glu<br>320 325 330     |     |     | 1056 |
| gcc gat gta gaa gcg gcc aag cga cac ttc gat ttc tac att ggc att<br>Ala Asp Val Glu Ala Ala Lys Arg His Phe Asp Phe Tyr Ile Gly Ile<br>335 340 345     |     |     | 1104 |
| ttc agt cag cct att tac ggt gat gga aag ttc cca gac acc gtt aga<br>Phe Ser Gln Pro Ile Tyr Gly Asp Gly Lys Phe Pro Asp Thr Val Arg<br>350 355 360     |     |     | 1152 |
| aac acc atc tcc act gaa ttc ctg cca tac ctc acc gat gat gag aaa<br>Asn Thr Ile Ser Thr Glu Phe Leu Pro Tyr Leu Thr Asp Asp Glu Lys<br>365 370 375     |     |     | 1200 |
| gcc atg att aaa gga agt ggt gac ttt ttc gcc ata gac gca tat cga<br>Ala Met Ile Lys Gly Ser Gly Asp Phe Phe Ala Ile Asp Ala Tyr Arg<br>380 385 390 395 |     |     | 1248 |
| acc aac ctt gca aga gct gcg ccc aat ggc atc caa gcc tgc gta gct<br>Thr Asn Leu Ala Arg Ala Ala Pro Asn Gly Ile Gln Ala Cys Val Ala<br>400 405 410     |     |     | 1296 |
| aac atc tcg gat ccc aat tgg cct gta tgc caa gac aac agc cct gaa<br>Asn Ile Ser Asp Pro Asn Trp Pro Val Cys Gln Asp Asn Ser Pro Glu<br>415 420 425     |     |     | 1344 |
| gga caa tac caa acc atg gat ggc ttt gct ttc ggt ccc ccg gca gac<br>Gly Gln Tyr Gln Thr Met Asp Gly Phe Ala Phe Gly Pro Pro Ala Asp<br>430 435 440     |     |     | 1392 |
| ccc aac gct gca tgg cta tat gac acc agc ttc aag ttg cgc tac cag<br>Pro Asn Ala Ala Trp Leu Tyr Asp Thr Ser Phe Lys Leu Arg Tyr Gln<br>445 450 455     |     |     | 1440 |
| ctt aag aca ctc aaa gag gca ttc aac tat gac aag atc tac atc tca<br>Leu Lys Thr Leu Lys Glu Ala Phe Asn Tyr Asp Lys Ile Tyr Ile Ser<br>460 465 470 475 |     |     | 1488 |
| gag ttt gga ttt gct cgg cct tac gaa tac ctc tac cct tac ggc ttc<br>Glu Phe Gly Phe Ala Arg Pro Tyr Glu Tyr Leu Tyr Pro Tyr Gly Phe<br>480 485 490     |     |     | 1536 |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gac gtc ctg tac gac aca gac cgt gcc att tac tac caa gac tac atg | 1584 |
| Asp Val Leu Tyr Asp Thr Asp Arg Ala Ile Tyr Tyr Gln Asp Tyr Met |      |
| 495 500 505                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gct gag gcc ttg gat gcc att cat gac gac ggc att cct ctg gct ggt | 1632 |
| Ala Glu Ala Leu Asp Ala Ile His Asp Asp Gly Ile Pro Leu Ala Gly |      |
| 510 515 520                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gtc ttt gct tgg tcc ttc gtt gac aat ttc gaa tgg gct tcc ggt ctt | 1680 |
| Val Phe Ala Trp Ser Phe Val Asp Asn Phe Glu Trp Ala Ser Gly Leu |      |
| 525 530 535                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gaa cag cga ttc ggc atg cag ttc gtg aac tac acg aca ctg gaa aga | 1728 |
| Glu Gln Arg Phe Gly Met Gln Phe Val Asn Tyr Thr Thr Leu Glu Arg |      |
| 540 545 550 555                                                 |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gag tac aag ctc tcc ttc ctg ctt tat cgt gac ttc att gaa aac cac | 1776 |
| Glu Tyr Lys Leu Ser Phe Leu Leu Tyr Arg Asp Phe Ile Glu Asn His |      |
| 560 565 570                                                     |      |

|                     |      |
|---------------------|------|
| agt tgc gaa gat taa | 1791 |
| Ser Cys Glu Asp     |      |
| 575                 |      |

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

<220>  
 <223> Synthetic Construct

<400> 22

|                                                                 |
|-----------------------------------------------------------------|
| Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala |
| -20 -15 -10                                                     |

|                                                                 |
|-----------------------------------------------------------------|
| Ala Pro Ala Leu Ala Ile Pro Ala Phe Pro Ile Thr Pro Asp Leu Ala |
| -5 -1 1 5 10                                                    |

|                                                                 |
|-----------------------------------------------------------------|
| Gly Gly Leu Glu Ser Val Thr Asn Thr Gln Thr Ser Leu Pro Ser Ala |
| 15 20 25                                                        |

|                                                                 |
|-----------------------------------------------------------------|
| Ser Ala Val Ser Ser Pro Tyr Asn Gln Asp Ala Leu Asp Lys Leu Trp |
| 30 35 40                                                        |

|                                                                 |
|-----------------------------------------------------------------|
| Ala Glu Val Glu Lys Asp Ile Pro Val Glu Thr Pro Ser Ile Ser Ser |
| 45 50 55                                                        |

Val Val Pro Val Asn Asn Ser Phe Ala Val Pro Lys Thr Pro Thr Leu  
60 65 70 75

Pro Arg Ser Leu Gln Asp His Ala Thr Ser Gly Arg Lys Phe Pro Lys  
80 85 90

Gly Phe Lys Phe Gly Val Ala Thr Ala Asp Gln Gln Tyr Glu Gly Ala  
95 100 105

Val Lys Ala Asp Gly Arg Gly Pro Ser His Trp Asp Tyr Leu Cys His  
110 115 120

Arg Leu Pro Gln Gln Cys Asn Asn Tyr Thr Ser Asp Ile Thr Asp Leu  
125 130 135

Gly Arg Tyr Tyr Tyr Lys Gln Asp Ile Ala Arg Ile Lys Ala Met Gly  
140 145 150 155

Val Asn Thr Val Ser Leu Thr Leu Ser Trp Ser Arg Ile Lys Pro Phe  
160 165 170

Gly Thr Ala Asp Ser Pro Val Ser Lys Glu Gly Leu Gln Phe Tyr Asp  
175 180 185

Asp Phe Ile Asn Glu Leu Ile Asp Asn Gly Ile Glu Pro Val Val Thr  
190 195 200

Leu Phe His Trp Ser Thr Pro Leu Asn Leu Val Phe Glu Tyr Gly Ala  
205 210 215

Phe Leu Asn Gly Ser Ser Val Glu Asp Phe Ala Ser Tyr Ala Lys Leu  
220 225 230 235

Val Phe Glu His Phe Gly Asp Arg Val Thr Thr Phe Leu Thr Phe Asn  
240 245 250

Glu Pro Arg Val Tyr Cys Ser Glu Tyr Thr Gly Glu Pro Phe Asn Asp  
255 260 265

Tyr Trp His Phe Gly Gly Pro Asn Ile Asn Ala Thr Thr Ala Pro Tyr

| 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Cys | Thr | Tyr | Asn | Ile | Leu | Lys | Ala | His | Gly | Arg | Ala | Val | Gln | Glu |
|     | 285 |     |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Tyr | Arg | Ala | Leu | Val | Asn | Ser | Gly | Lys | Ile | Lys | Lys | Gly | Glu | Val | Ala |
| 300 |     |     |     |     | 305 |     |     |     |     | 310 |     |     |     |     | 315 |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Ile | Lys | Asn | Asp | Asp | Ser | Tyr | Pro | Val | Pro | Val | Asn | Pro | Asp | Ser | Glu |
|     |     |     |     | 320 |     |     |     |     | 325 |     |     |     |     | 330 |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Ala | Asp | Val | Glu | Ala | Ala | Lys | Arg | His | Phe | Asp | Phe | Tyr | Ile | Gly | Ile |
|     |     |     | 335 |     |     |     |     | 340 |     |     |     |     |     | 345 |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Phe | Ser | Gln | Pro | Ile | Tyr | Gly | Asp | Gly | Lys | Phe | Pro | Asp | Thr | Val | Arg |
|     |     | 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Asn | Thr | Ile | Ser | Thr | Glu | Phe | Leu | Pro | Tyr | Leu | Thr | Asp | Asp | Glu | Lys |
|     | 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Ala | Met | Ile | Lys | Gly | Ser | Gly | Asp | Phe | Phe | Ala | Ile | Asp | Ala | Tyr | Arg |
| 380 |     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Thr | Asn | Leu | Ala | Arg | Ala | Ala | Pro | Asn | Gly | Ile | Gln | Ala | Cys | Val | Ala |
|     |     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Asn | Ile | Ser | Asp | Pro | Asn | Trp | Pro | Val | Cys | Gln | Asp | Asn | Ser | Pro | Glu |
|     |     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Gly | Gln | Tyr | Gln | Thr | Met | Asp | Gly | Phe | Ala | Phe | Gly | Pro | Pro | Ala | Asp |
|     |     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Pro | Asn | Ala | Ala | Trp | Leu | Tyr | Asp | Thr | Ser | Phe | Lys | Leu | Arg | Tyr | Gln |
|     | 445 |     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Leu | Lys | Thr | Leu | Lys | Glu | Ala | Phe | Asn | Tyr | Asp | Lys | Ile | Tyr | Ile | Ser |
| 460 |     |     |     |     | 465 |     |     |     |     | 470 |     |     |     |     | 475 |
|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Glu | Phe | Gly | Phe | Ala | Arg | Pro | Tyr | Glu | Tyr | Leu | Tyr | Pro | Tyr | Gly | Phe |
|     |     |     |     | 480 |     |     |     |     | 485 |     |     |     |     | 490 |     |

Asp Val Leu Tyr Asp Thr Asp Arg Ala Ile Tyr Tyr Gln Asp Tyr Met  
495 500 505

Ala Glu Ala Leu Asp Ala Ile His Asp Asp Gly Ile Pro Leu Ala Gly  
510 515 520

Val Phe Ala Trp Ser Phe Val Asp Asn Phe Glu Trp Ala Ser Gly Leu  
525 530 535

Glu Gln Arg Phe Gly Met Gln Phe Val Asn Tyr Thr Thr Leu Glu Arg  
540 545 550 555

Glu Tyr Lys Leu Ser Phe Leu Leu Tyr Arg Asp Phe Ile Glu Asn His  
560 565 570

Ser Cys Glu Asp  
575

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<212> DNA  
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<220>  
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Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala  
-20 -15 -10

gca cct gct ttg gct att ccc gct ttc cca atc act ccc gat ttg gcc 96  
Ala Pro Ala Leu Ala Ile Pro Ala Phe Pro Ile Thr Pro Asp Leu Ala  
-5 -1 1 5 10

|                                                                                                                                                       |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| gga ggc ctg gaa agc gtc aca aac acc caa acg tcc ctc cca tct gct<br>Gly Gly Leu Glu Ser Val Thr Asn Thr Gln Thr Ser Leu Pro Ser Ala<br>15 20 25        | 144 |
| tcc gct gtt tcc agc ccg tac aac caa gac gct ctt gat aag ctg tgg<br>Ser Ala Val Ser Ser Pro Tyr Asn Gln Asp Ala Leu Asp Lys Leu Trp<br>30 35 40        | 192 |
| gca gag gtt gag aag gat atc ccc gtt gaa aca cca tcc atc agc tct<br>Ala Glu Val Glu Lys Asp Ile Pro Val Glu Thr Pro Ser Ile Ser Ser<br>45 50 55        | 240 |
| gtg gtg ccc gtg aac aac tcc ttc gcc gtg cct aag acg ccg acc ctc<br>Val Val Pro Val Asn Asn Ser Phe Ala Val Pro Lys Thr Pro Thr Leu<br>60 65 70 75     | 288 |
| ccg cgc tcc ctg cag gat cat gct act tcg ggg cgg aag ttc cca aaa<br>Pro Arg Ser Leu Gln Asp His Ala Thr Ser Gly Arg Lys Phe Pro Lys<br>80 85 90        | 336 |
| ggg ttc aag ttc gga gtt gcc act gcg gac cag cag tac gaa ggc gcc<br>Gly Phe Lys Phe Gly Val Ala Thr Ala Asp Gln Gln Tyr Glu Gly Ala<br>95 100 105      | 384 |
| gtc aag gcc gac ggc cgc ggg ccg agc cac tgg gat tac ctg tgc cac<br>Val Lys Ala Asp Gly Arg Gly Pro Ser His Trp Asp Tyr Leu Cys His<br>110 115 120     | 432 |
| cgg ctg cct cag caa tgc aac aac tac acc tct gac atc act gac ttg<br>Arg Leu Pro Gln Gln Cys Asn Asn Tyr Thr Ser Asp Ile Thr Asp Leu<br>125 130 135     | 480 |
| gga cgt tac tac tac aag cag gat atc gcc cgg atc aag gcc atg ggc<br>Gly Arg Tyr Tyr Tyr Lys Gln Asp Ile Ala Arg Ile Lys Ala Met Gly<br>140 145 150 155 | 528 |
| gtg aat act gtc tcg ctt acc ctg agc tgg tcg cgc atc aag ccc ttt<br>Val Asn Thr Val Ser Leu Thr Leu Ser Trp Ser Arg Ile Lys Pro Phe<br>160 165 170     | 576 |
| ggc act gct gac tcg cct gtt tcg aag gag ggt ttg cag ttc tac gat<br>Gly Thr Ala Asp Ser Pro Val Ser Lys Glu Gly Leu Gln Phe Tyr Asp<br>175 180 185     | 624 |
| gac ttc atc aac gaa ctc att gac aat gga atc gag cct gtt gtg aca<br>Asp Phe Ile Asn Glu Leu Ile Asp Asn Gly Ile Glu Pro Val Val Thr<br>190 195 200     | 672 |
| ctc ttc cat tgg tct acc cct ctg aat ctg gtg ttt gag tac ggt gcc<br>Leu Phe His Trp Ser Thr Pro Leu Asn Leu Val Phe Glu Tyr Gly Ala<br>205 210 215     | 720 |
| ttt ctc aac ggc agc agc gtg gaa gac ttt gcg tcc tat gca aag ctg                                                                                       | 768 |

|                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |      |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| Phe<br>220        | Leu               | Asn               | Gly               | Ser               | Ser<br>225        | Val               | Glu               | Asp               | Phe               | Ala<br>230        | Ser               | Tyr               | Ala               | Lys               | Leu<br>235        |      |
| gtc<br>Val        | ttc<br>Phe        | gaa<br>Glu        | cac<br>His        | ttt<br>Phe<br>240 | ggg<br>Gly        | gac<br>Asp        | cgc<br>Arg        | gtg<br>Val<br>245 | aca<br>Thr<br>245 | acc<br>Thr        | ttc<br>Phe        | ctt<br>Leu        | acc<br>Thr        | ttc<br>Phe<br>250 | aac<br>Asn        | 816  |
| gag<br>Glu        | ccg<br>Pro        | cgt<br>Arg<br>255 | gtg<br>Val<br>255 | tac<br>Tyr        | tgc<br>Cys        | agc<br>Ser        | gag<br>Glu<br>260 | tat<br>Tyr<br>260 | acg<br>Thr        | ggc<br>Gly        | gaa<br>Glu        | ccc<br>Pro        | ttc<br>Phe<br>265 | aac<br>Asn        | gac<br>Asp        | 864  |
| tac<br>Tyr        | tgg<br>Trp<br>270 | cat<br>His        | ttc<br>Phe        | ggt<br>Gly        | gga<br>Gly        | ccg<br>Pro        | aac<br>Asn<br>275 | atc<br>Ile        | aac<br>Asn        | gca<br>Ala        | acg<br>Thr        | acc<br>Thr<br>280 | gca<br>Ala        | ccc<br>Pro        | tat<br>Tyr        | 912  |
| cca<br>Pro<br>285 | tgc<br>Cys        | acg<br>Thr        | tac<br>Tyr        | aac<br>Asn        | atc<br>Ile        | ctt<br>Leu<br>290 | aag<br>Lys        | gcg<br>Ala        | cat<br>His        | ggg<br>Gly<br>295 | cga<br>Arg        | gct<br>Ala        | ggt<br>Val        | cag<br>Gln        | gag<br>Glu        | 960  |
| tat<br>Tyr<br>300 | cgg<br>Arg        | gct<br>Ala        | ctg<br>Leu        | gtc<br>Val        | aac<br>Asn<br>305 | tcg<br>Ser        | ggg<br>Gly        | aag<br>Lys        | atc<br>Ile        | aag<br>Lys<br>310 | aag<br>Lys        | ggt<br>Gly        | gaa<br>Glu        | ggt<br>Val        | gca<br>Ala<br>315 | 1008 |
| atc<br>Ile        | aag<br>Lys        | aac<br>Asn        | gat<br>Asp<br>320 | gac<br>Asp        | tcc<br>Ser        | tac<br>Tyr        | cct<br>Pro        | gtg<br>Val        | ccc<br>Pro<br>325 | ggt<br>Val        | aac<br>Asn        | cca<br>Pro        | gac<br>Asp<br>330 | tct<br>Ser        | gaa<br>Glu        | 1056 |
| gca<br>Ala        | gat<br>Asp        | gtt<br>Val        | gaa<br>Glu<br>335 | gct<br>Ala        | gcg<br>Ala        | aaa<br>Lys        | cga<br>Arg        | cat<br>His<br>340 | ttc<br>Phe        | gac<br>Asp        | ttc<br>Phe        | tac<br>Tyr        | atc<br>Ile<br>345 | ggc<br>Gly        | atc<br>Ile        | 1104 |
| ttc<br>Phe        | tcg<br>Ser        | cag<br>Gln<br>350 | ccc<br>Pro        | atc<br>Ile        | tat<br>Tyr        | ggc<br>Gly        | gat<br>Asp<br>355 | ggc<br>Gly        | aag<br>Lys        | ttc<br>Phe        | cct<br>Pro        | gat<br>Asp<br>360 | acc<br>Thr        | gtc<br>Val        | cgc<br>Arg        | 1152 |
| aac<br>Asn<br>365 | aca<br>Thr        | atc<br>Ile        | agc<br>Ser        | aca<br>Thr        | gaa<br>Glu<br>370 | ttc<br>Phe        | ctg<br>Leu        | cct<br>Pro        | tac<br>Tyr        | ctc<br>Leu<br>375 | act<br>Thr        | gat<br>Asp        | gac<br>Asp        | gag<br>Glu        | aag<br>Lys        | 1200 |
| gcc<br>Ala<br>380 | atg<br>Met        | atc<br>Ile        | aag<br>Lys        | ggt<br>Gly        | tcc<br>Ser<br>385 | ggc<br>Gly        | gac<br>Asp        | ttc<br>Phe        | ttc<br>Phe        | gca<br>Ala<br>390 | atc<br>Ile        | gat<br>Asp        | gct<br>Ala        | tac<br>Tyr        | cgc<br>Arg<br>395 | 1248 |
| acc<br>Thr        | aac<br>Asn        | ctt<br>Leu        | gct<br>Ala        | cga<br>Arg<br>400 | gct<br>Ala        | gct<br>Ala        | cca<br>Pro        | aac<br>Asn        | gga<br>Gly<br>405 | atc<br>Ile        | cag<br>Gln        | gcc<br>Ala        | tgt<br>Cys        | ggt<br>Val<br>410 | gcc<br>Ala        | 1296 |
| aac<br>Asn        | atc<br>Ile        | tcg<br>Ser        | gat<br>Asp<br>415 | ccg<br>Pro        | aat<br>Asn        | tgg<br>Trp        | ccg<br>Pro        | gtc<br>Val<br>420 | tgt<br>Cys        | caa<br>Gln        | gac<br>Asp        | aac<br>Asn        | agc<br>Ser        | cct<br>Pro        | gaa<br>Glu        | 1344 |
| ggg<br>Gly        | cag<br>Gln        | tat<br>Tyr<br>430 | cag<br>Gln        | acg<br>Thr        | atg<br>Met        | gat<br>Asp        | ggc<br>Gly<br>435 | ttt<br>Phe        | gcc<br>Ala        | ttt<br>Phe        | ggc<br>Gly<br>440 | cca<br>Pro        | cca<br>Pro        | gcg<br>Ala        | gac<br>Asp        | 1392 |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| cct aac gcg gcg tgg ctc tac gac acg agc ttc aag ctg cgg tat cag | 1440 |
| Pro Asn Ala Ala Trp Leu Tyr Asp Thr Ser Phe Lys Leu Arg Tyr Gln |      |
| 445 450 455                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| ctt aag act ctc aaa gag gcc ttc aac tac gac aag atc tac atc agc | 1488 |
| Leu Lys Thr Leu Lys Glu Ala Phe Asn Tyr Asp Lys Ile Tyr Ile Ser |      |
| 460 465 470 475                                                 |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gaa ttc ggt ttc gcc cga ccc tat gag tat ctg tat ccc tat ggt ttt | 1536 |
| Glu Phe Gly Phe Ala Arg Pro Tyr Glu Tyr Leu Tyr Pro Tyr Gly Phe |      |
| 480 485 490                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gac gtt ctc tat gac aca gac cga gct atc tac tac cag gac tac atg | 1584 |
| Asp Val Leu Tyr Asp Thr Asp Arg Ala Ile Tyr Tyr Gln Asp Tyr Met |      |
| 495 500 505                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gcc gag gca ctg gat gct atc cac gac gat ggt att cca ttg gcg ggt | 1632 |
| Ala Glu Ala Leu Asp Ala Ile His Asp Asp Gly Ile Pro Leu Ala Gly |      |
| 510 515 520                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gtg ttc gct tgg tcc ttc gtc gac aac ttc gaa tgg gcg tcc ggc ctt | 1680 |
| Val Phe Ala Trp Ser Phe Val Asp Asn Phe Glu Trp Ala Ser Gly Leu |      |
| 525 530 535                                                     |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gag caa cgc ttt ggc atg cag ttc gtc aac tac aca acc ctc gag cgc | 1728 |
| Glu Gln Arg Phe Gly Met Gln Phe Val Asn Tyr Thr Thr Leu Glu Arg |      |
| 540 545 550 555                                                 |      |

|                                                                 |      |
|-----------------------------------------------------------------|------|
| gag tac aag ctc tct ttc ctg ctg tat cgt gat ttc atc gag aat cat | 1776 |
| Glu Tyr Lys Leu Ser Phe Leu Leu Tyr Arg Asp Phe Ile Glu Asn His |      |
| 560 565 570                                                     |      |

|                     |      |
|---------------------|------|
| agc tgc gag gat taa | 1791 |
| Ser Cys Glu Asp     |      |
| 575                 |      |

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|                                                                 |
|-----------------------------------------------------------------|
| Met Met Val Ala Trp Trp Ser Leu Phe Leu Tyr Gly Leu Gln Val Ala |
| -20 -15 -10                                                     |

|                                                                 |
|-----------------------------------------------------------------|
| Ala Pro Ala Leu Ala Ile Pro Ala Phe Pro Ile Thr Pro Asp Leu Ala |
| -5 -1 1 5 10                                                    |

Gly Gly Leu Glu Ser Val Thr Asn Thr Gln Thr Ser Leu Pro Ser Ala  
15 20 25

Ser Ala Val Ser Ser Pro Tyr Asn Gln Asp Ala Leu Asp Lys Leu Trp  
30 35 40

Ala Glu Val Glu Lys Asp Ile Pro Val Glu Thr Pro Ser Ile Ser Ser  
45 50 55

Val Val Pro Val Asn Asn Ser Phe Ala Val Pro Lys Thr Pro Thr Leu  
60 65 70 75

Pro Arg Ser Leu Gln Asp His Ala Thr Ser Gly Arg Lys Phe Pro Lys  
80 85 90

Gly Phe Lys Phe Gly Val Ala Thr Ala Asp Gln Gln Tyr Glu Gly Ala  
95 100 105

Val Lys Ala Asp Gly Arg Gly Pro Ser His Trp Asp Tyr Leu Cys His  
110 115 120

Arg Leu Pro Gln Gln Cys Asn Asn Tyr Thr Ser Asp Ile Thr Asp Leu  
125 130 135

Gly Arg Tyr Tyr Tyr Lys Gln Asp Ile Ala Arg Ile Lys Ala Met Gly  
140 145 150 155

Val Asn Thr Val Ser Leu Thr Leu Ser Trp Ser Arg Ile Lys Pro Phe  
160 165 170

Gly Thr Ala Asp Ser Pro Val Ser Lys Glu Gly Leu Gln Phe Tyr Asp  
175 180 185

Asp Phe Ile Asn Glu Leu Ile Asp Asn Gly Ile Glu Pro Val Val Thr  
190 195 200

Leu Phe His Trp Ser Thr Pro Leu Asn Leu Val Phe Glu Tyr Gly Ala  
205 210 215

Phe Leu Asn Gly Ser Ser Val Glu Asp Phe Ala Ser Tyr Ala Lys Leu  
 220 225 230 235

Val Phe Glu His Phe Gly Asp Arg Val Thr Thr Phe Leu Thr Phe Asn  
 240 245 250

Glu Pro Arg Val Tyr Cys Ser Glu Tyr Thr Gly Glu Pro Phe Asn Asp  
 255 260 265

Tyr Trp His Phe Gly Gly Pro Asn Ile Asn Ala Thr Thr Ala Pro Tyr  
 270 275 280

Pro Cys Thr Tyr Asn Ile Leu Lys Ala His Gly Arg Ala Val Gln Glu  
 285 290 295

Tyr Arg Ala Leu Val Asn Ser Gly Lys Ile Lys Lys Gly Glu Val Ala  
 300 305 310 315

Ile Lys Asn Asp Asp Ser Tyr Pro Val Pro Val Asn Pro Asp Ser Glu  
 320 325 330

Ala Asp Val Glu Ala Ala Lys Arg His Phe Asp Phe Tyr Ile Gly Ile  
 335 340 345

Phe Ser Gln Pro Ile Tyr Gly Asp Gly Lys Phe Pro Asp Thr Val Arg  
 350 355 360

Asn Thr Ile Ser Thr Glu Phe Leu Pro Tyr Leu Thr Asp Asp Glu Lys  
 365 370 375

Ala Met Ile Lys Gly Ser Gly Asp Phe Phe Ala Ile Asp Ala Tyr Arg  
 380 385 390 395

Thr Asn Leu Ala Arg Ala Ala Pro Asn Gly Ile Gln Ala Cys Val Ala  
 400 405 410

Asn Ile Ser Asp Pro Asn Trp Pro Val Cys Gln Asp Asn Ser Pro Glu  
 415 420 425

Gly Gln Tyr Gln Thr Met Asp Gly Phe Ala Phe Gly Pro Pro Ala Asp  
 430 435 440

Pro Asn Ala Ala Trp Leu Tyr Asp Thr Ser Phe Lys Leu Arg Tyr Gln  
445 450 455

Leu Lys Thr Leu Lys Glu Ala Phe Asn Tyr Asp Lys Ile Tyr Ile Ser  
460 465 470 475

Glu Phe Gly Phe Ala Arg Pro Tyr Glu Tyr Leu Tyr Pro Tyr Gly Phe  
480 485 490

Asp Val Leu Tyr Asp Thr Asp Arg Ala Ile Tyr Tyr Gln Asp Tyr Met  
495 500 505

Ala Glu Ala Leu Asp Ala Ile His Asp Asp Gly Ile Pro Leu Ala Gly  
510 515 520

Val Phe Ala Trp Ser Phe Val Asp Asn Phe Glu Trp Ala Ser Gly Leu  
525 530 535

Glu Gln Arg Phe Gly Met Gln Phe Val Asn Tyr Thr Thr Leu Glu Arg  
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