

# SEQUENCE LISTING

<110> INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE  
 INSTITUT FRANCAIS DU PETROLE - ENERGIE NOUVELLE  
 AGRO INDUSTRIES RECHERCHES ET DEVELOPPEMENTS  
 SIGOILLLOT, Jean-Claude  
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<120> COMPOSITIONS COMPRISING CELLOBIOSE DEHYDROGENASE FROM PYCNOPORUS  
 CINNABARINUS AND THEIR USE FOR THE DEGRADATION OF LIGNOCELLULOSIC  
 BIOMASS

<130> INR-B-0006 PCT

<150> US61/504,426  
 <151> 2011-07-05

<160> 14

<170> PatentIn version 3.5

<210> 1  
 <211> 769  
 <212> PRT  
 <213> Pycnopus cinnabarinus

<400> 1

Met Lys Leu Gln His Leu Leu Leu Ser Leu Leu Pro Leu Ala Ser Ser  
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Val Tyr Ala Gln Val Ala Ala Pro Tyr Val Asp Ser Gly Asn Gly Phe  
 20 25 30

Val Phe Asp Gly Ile Thr Asp Pro Val Tyr His Val Ser Tyr Gly Ile  
 35 40 45

Val Leu Pro Gln Ala Thr Thr Ser Ser Glu Phe Ile Gly Glu Ile Val  
 50 55 60

Ala Pro Leu Asp Ala Lys Trp Ile Gly Leu Ala Leu Gly Gly Ala Met  
 65 70 75 80

Ile Gly Asp Leu Leu Ile Val Ala Trp Pro Asn Gly Asn Glu Ile Val  
 85 90 95

Ser Ser Thr Arg Tyr Ala Thr Ala Tyr Gln Leu Pro Asp Val Tyr Ala  
 100 105 110

Gly Pro Thr Ile Thr Thr Leu Pro Ser Ser Leu Val Asn Ser Thr His  
 115 120 125

Trp Lys Phe Val Phe Arg Cys Gln Asn Cys Thr Ser Trp Glu Gly Gly  
 130 135 140

Gly Gly Ile Asp Pro Thr Gly Thr Gly Val Phe Ala Trp Ala Tyr Ser  
 145 150 155 160

Ser Val Gly Val Asp Asp Pro Ser Asp Pro Asn Thr Thr Phe Gln Glu  
165 170 175

His Thr Asp Phe Gly Phe Phe Gly Ile Asn Phe Pro Asp Ala Gln Asn  
180 185 190

Ser Asn Tyr Gln Asn Tyr Leu Gln Gly Asn Ala Gly Thr Pro Pro Pro  
195 200 205

Thr Ser Thr Pro Ser Gly Pro Thr Thr Thr Ser Lys Pro Thr Gly Pro  
210 215 220

Thr Ala Ser Ala Thr Pro Tyr Asp Tyr Ile Ile Val Gly Ala Gly Pro  
225 230 235 240

Gly Gly Ile Ile Ala Ala Asp Arg Leu Ser Glu Ala Gly Lys Lys Val  
245 250 255

Ile Leu Leu Glu Arg Gly Gly Pro Ser Thr Ala Glu Thr Gly Gly Thr  
260 265 270

Tyr Tyr Ala Pro Trp Ala Lys Ser Gln Asn Leu Thr Lys Phe Asp Ile  
275 280 285

Pro Gly Leu Phe Glu Ser Met Phe Thr Asp Pro Asn Pro Trp Trp Trp  
290 295 300

Cys Lys Asp Thr Asn Phe Phe Ala Gly Cys Leu Leu Gly Gly Gly Thr  
305 310 315 320

Ser Val Asn Gly Ala Leu Tyr Trp Leu Pro Ser Asp Ala Asp Phe Ser  
325 330 335

Thr Ala Asn Gly Trp Pro Thr Asn Trp Gly Asn His Ala Pro Tyr Thr  
340 345 350

Ser Lys Leu Lys Gln Arg Leu Pro Ser Thr Asp His Pro Ser Ala Asp  
355 360 365

Gly Asn Arg Tyr Leu Glu Gln Ser Ala Thr Val Val Ser Gln Leu Leu  
370 375 380

Gln Gly Gln Gly Tyr Gln Gln Ile Thr Ile Asn Asp Asn Pro Asp Tyr  
385 390 395 400

Lys Asp His Val Phe Gly Tyr Ser Ala Phe Asp Phe Ile Asn Gly Gln  
405 410 415

Arg Ala Gly Pro Val Ala Thr Tyr Phe Gln Thr Ala Ser Ala Arg Ser  
420 425 430

Asn Phe Val Tyr Lys Asp Tyr Thr Leu Val Ser Gln Val Leu Arg Asn

| 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Ser | Thr | Ile | Thr | Gly | Val | Arg | Thr | Asn | Asn | Thr | Ala | Leu | Gly | Pro |
| 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |     |
| Asp | Gly | Ile | Val | Pro | Leu | Asn | Pro | Asn | Gly | Arg | Val | Ile | Leu | Ala | Ala |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Gly | Ser | Phe | Gly | Thr | Pro | Arg | Ile | Leu | Phe | Gln | Ser | Gly | Ile | Gly | Pro |
|     |     |     | 485 |     |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Thr | Asp | Met | Ile | Gln | Thr | Val | Gln | Ser | Asn | Pro | Thr | Ala | Ala | Ala | Asn |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Leu | Pro | Pro | Gln | Ser | Glu | Trp | Ile | Asn | Leu | Pro | Val | Gly | Gln | Gly | Val |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |
| Ser | Asp | Asn | Pro | Ser | Ile | Asn | Leu | Val | Phe | Thr | His | Pro | Ser | Ile | Asp |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Ala | Tyr | Glu | Asn | Trp | Ala | Asp | Val | Trp | Ser | Asn | Pro | Arg | Pro | Ala | Asp |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Ala | Gln | Gln | Tyr | Leu | Gln | Ser | Arg | Ser | Gly | Val | Phe | Ala | Gly | Ala | Ser |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Pro | Lys | Leu | Asn | Phe | Trp | Arg | Ala | Tyr | Gly | Gly | Ser | Asp | Gly | Lys | Thr |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |
| Arg | Tyr | Ala | Gln | Gly | Thr | Val | Arg | Pro | Gly | Ala | Ala | Ser | Val | Asn | Thr |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |
| Ser | Val | Ala | Tyr | Asn | Ala | Ser | Gln | Ile | Phe | Thr | Ile | Thr | Val | Tyr | Leu |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |
| Ser | Glu | Gly | Ile | Thr | Ser | Arg | Gly | Arg | Leu | Gly | Val | Asp | Ala | Ala | Leu |
| 625 |     |     |     |     | 630 |     |     |     |     | 635 |     |     |     |     | 640 |
| Asn | Met | Lys | Ala | Ile | Thr | Thr | Pro | Trp | Leu | Thr | Asp | Pro | Val | Asp | Lys |
|     |     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |
| Thr | Ile | Leu | Leu | Gln | Ala | Leu | His | Asp | Val | Val | Ser | Asn | Ile | Asn | Asn |
|     |     |     | 660 |     |     |     |     | 665 |     |     |     |     | 670 |     |     |
| Val | Pro | Gly | Leu | Thr | Leu | Ile | Thr | Pro | Asp | His | Thr | Gln | Thr | Leu | Glu |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |
| Gln | Tyr | Val | Ala | Ala | Tyr | Asp | Pro | Ala | Thr | Met | Cys | Ser | Asn | His | Trp |
|     | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |
| Val | Gly | Ala | Ala | Lys | Ile | Gly | Ser | Ser | Pro | Ser | Thr | Ala | Val | Val | Asp |
| 705 |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     | 720 |

Glu Asn Thr Lys Val Phe Asn Thr Asp Asn Leu Phe Ile Val Asp Ala  
725 730 735

Ser Ile Ile Pro Ser Leu Pro Val Gly Asn Pro His Gly Ala Leu Met  
740 745 750

Ser Ala Ala Glu Gln Ala Ala Ala Lys Ile Leu Ala Leu Ala Gly Gly  
755 760 765

Pro

<210> 2  
<211> 750  
<212> PRT  
<213> Pycnoporos cinnabarinus

<400> 2

Gln Val Ala Ala Pro Tyr Val Asp Ser Gly Asn Gly Phe Val Phe Asp  
1 5 10 15

Gly Ile Thr Asp Pro Val Tyr His Val Ser Tyr Gly Ile Val Leu Pro  
20 25 30

Gln Ala Thr Thr Ser Ser Glu Phe Ile Gly Glu Ile Val Ala Pro Leu  
35 40 45

Asp Ala Lys Trp Ile Gly Leu Ala Leu Gly Gly Ala Met Ile Gly Asp  
50 55 60

Leu Leu Ile Val Ala Trp Pro Asn Gly Asn Glu Ile Val Ser Ser Thr  
65 70 75 80

Arg Tyr Ala Thr Ala Tyr Gln Leu Pro Asp Val Tyr Glu Gly Pro Thr  
85 90 95

Ile Thr Thr Leu Pro Ser Ser Leu Val Asn Ser Thr His Trp Lys Phe  
100 105 110

Val Phe Arg Cys Gln Asn Cys Thr Ser Trp Glu Gly Gly Gly Gly Ile  
115 120 125

Asp Pro Thr Gly Thr Gly Val Phe Ala Trp Ala Tyr Ser Ser Val Gly  
130 135 140

Val Asp Asp Pro Ser Asp Pro Asn Thr Thr Phe Gln Glu His Thr Asp  
145 150 155 160

Phe Gly Phe Phe Gly Ile Asn Phe Pro Asp Ala Gln Asn Ser Asn Tyr  
165 170 175

Gln Asn Tyr Leu Gln Gly Asn Ala Gly Thr Pro Pro Pro Thr Ser Thr  
180 185 190

Pro Ser Gly Pro Thr Thr Thr Ser Lys Pro Thr Gly Pro Thr Ala Ser  
195 200 205

Ala Thr Pro Tyr Asp Tyr Ile Ile Val Gly Ala Gly Pro Gly Gly Ile  
210 215 220

Ile Ala Ala Asp Arg Leu Ser Glu Ala Gly Lys Lys Val Ile Leu Leu  
225 230 235 240

Glu Arg Gly Gly Pro Ser Thr Ala Glu Thr Gly Gly Thr Tyr Tyr Ala  
245 250 255

Pro Trp Ala Lys Ser Gln Asn Leu Thr Lys Phe Asp Ile Pro Gly Leu  
260 265 270

Phe Glu Ser Met Phe Thr Asp Pro Asn Pro Trp Trp Trp Cys Lys Asp  
275 280 285

Thr Asn Phe Phe Ala Gly Cys Leu Leu Gly Gly Gly Thr Ser Val Asn  
290 295 300

Gly Ala Leu Tyr Trp Leu Pro Ser Asp Ala Asp Phe Ser Thr Ala Asn  
305 310 315 320

Gly Trp Pro Thr Ser Trp Gly Asn His Ala Pro Tyr Thr Ser Lys Leu  
325 330 335

Lys Gln Arg Leu Pro Ser Thr Asp His Pro Ser Thr Asp Gly Lys Arg  
340 345 350

Tyr Leu Glu Gln Ser Ala Thr Val Val Ser Gln Leu Leu Gln Gly Gln  
355 360 365

Gly Tyr Gln Gln Ile Thr Ile Asn Asp Asn Pro Asp Ser Lys Asp His  
370 375 380

Val Phe Gly Tyr Ser Ala Phe Asp Phe Ile Asn Gly Gln Arg Ala Gly  
385 390 395 400

Pro Val Ala Thr Tyr Phe Gln Thr Ala Ser Ala Arg Ser Asn Phe Val  
405 410 415

Tyr Lys Asp Phe Thr Leu Val Ser Gln Val Leu Arg Asn Gly Ser Thr  
420 425 430

Ile Thr Gly Val Arg Thr Asn Asn Thr Ala Leu Gly Pro Asp Gly Ile  
435 440 445

Val Pro Leu Asn Pro Asn Gly Arg Val Ile Leu Ala Ala Gly Ser Phe

| 450        |            |            |            |            | 455        |            |            |            |            | 460        |            |            |            |            |            |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Gly<br>465 | Thr        | Pro        | Arg        | Ile        | Leu<br>470 | Phe        | Gln        | Ser        | Gly        | Ile<br>475 | Gly        | Pro        | Thr        | Asp        | Met<br>480 |
| Ile        | Gln        | Thr        | Val        | Gln<br>485 | Ser        | Asn        | Pro        | Thr        | Ala<br>490 | Ala        | Ala        | Asn        | Leu        | Pro<br>495 | Pro        |
| Glu        | Ser        | Glu        | Trp<br>500 | Ile        | Asn        | Leu        | Pro        | Val<br>505 | Gly        | Gln        | Gly        | Val        | Ser<br>510 | Asp        | Asn        |
| Pro        | Ser        | Ile<br>515 | Asn        | Leu        | Val        | Phe        | Thr<br>520 | His        | Pro        | Ser        | Ile        | Asp<br>525 | Ala        | Tyr        | Glu        |
| Asn        | Trp<br>530 | Ala        | Asp        | Val        | Trp        | Ser<br>535 | Asn        | Pro        | Arg        | Pro        | Ala<br>540 | Asp        | Ala        | Gln        | Gln        |
| Tyr<br>545 | Leu        | Gln        | Ser        | Arg        | Ser<br>550 | Gly        | Val        | Phe        | Ala        | Gly<br>555 | Ala        | Ser        | Pro        | Lys        | Leu<br>560 |
| Asn        | Phe        | Trp        | Arg        | Ala<br>565 | Tyr        | Gly        | Gly        | Ser        | Asp<br>570 | Gly        | Lys        | Thr        | Arg        | Tyr<br>575 | Ala        |
| Gln        | Gly        | Thr        | Val<br>580 | Arg        | Pro        | Gly        | Ala        | Ala<br>585 | Ser        | Val        | Asn        | Thr        | Ser<br>590 | Val        | Ala        |
| Tyr        | Asn<br>595 | Ala        | Ser        | Gln        | Ile        | Phe        | Thr<br>600 | Ile        | Thr        | Val        | Tyr        | Leu<br>605 | Ser        | Glu        | Gly        |
| Ile<br>610 | Thr        | Ser        | Arg        | Gly        | Arg        | Leu<br>615 | Gly        | Val        | Asp        | Ala        | Ala<br>620 | Leu        | Asn        | Met        | Lys        |
| Ala<br>625 | Ile        | Thr        | Thr        | Pro        | Trp<br>630 | Leu        | Thr        | Asp        | Pro        | Val<br>635 | Asp        | Lys        | Thr        | Ile        | Leu<br>640 |
| Leu        | Gln        | Ala        | Leu        | His<br>645 | Asp        | Val        | Val        | Ser        | Asn<br>650 | Ile        | Asn        | Asn        | Val        | Pro<br>655 | Gly        |
| Leu        | Thr        | Leu        | Ile<br>660 | Thr        | Pro        | Asp        | His        | Thr<br>665 | Gln        | Thr        | Leu        | Glu        | Gln<br>670 | Tyr        | Val        |
| Ala        | Ala        | Tyr<br>675 | Asp        | Pro        | Ala        | Thr        | Met<br>680 | Cys        | Ser        | Asn        | His        | Trp<br>685 | Val        | Gly        | Ala        |
| Ala        | Lys<br>690 | Ile        | Gly        | Ser        | Ser        | Pro<br>695 | Ser        | Thr        | Ala        | Val        | Val<br>700 | Asp        | Glu        | Asn        | Thr        |
| Lys<br>705 | Val        | Phe        | Asn        | Thr        | Asp<br>710 | Asn        | Leu        | Phe        | Ile        | Val<br>715 | Asp        | Ala        | Ser        | Ile        | Ile<br>720 |
| Pro        | Ser        | Leu        | Pro        | Val<br>725 | Gly        | Asn        | Pro        | His        | Gly<br>730 | Ala        | Leu        | Met        | Ser        | Ala<br>735 | Ala        |

Glu Gln Ala Ala Ala Lys Ile Leu Ala Leu Ala Gly Gly Pro  
740 745 750

<210> 3  
<211> 26  
<212> DNA  
<213> Artificial sequence

<220>  
<223> forward primer cdhF designed from P. cinnabarinus I-937 cdh gene  
(NCBI AF081574)

<400> 3  
tagaatccca agtggcagcg ccatac 26

<210> 4  
<211> 28  
<212> DNA  
<213> Artificial sequence

<220>  
<223> reverse primer cdhR designed from P. cinnabarinus I-937 cdh gene  
(NCBI AF081574)

<400> 4  
tatctagacc aggacctccc gcaagggc 28

<210> 5  
<211> 19  
<212> DNA  
<213> Artificial sequence

<220>  
<223> cdhint primer

<400> 5  
cgacgcccag aactcgaac 19

<210> 6  
<211> 41  
<212> DNA  
<213> Artificial sequence

<220>  
<223> forward primer PaGH61BF designed from P. anserina S mat+ GH61B  
gene (NCBI gene id: CAP68375.1)

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<210> 7  
<211> 36  
<212> DNA  
<213> Artificial sequence

<220>  
<223> reverse primer PaGH61B R designed from P. anserina S mat+ GH61B  
gene (NCBI gene id: CAP68375.1)

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<210> 8  
 <211> 38  
 <212> DNA  
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 <220>  
 <223> forward primer PaGH61A F designed from P. anserina S mat+ gh61A  
 gene (GenBank: CAP73254.1)  
  
 <400> 8  
 aggggtatct ctcgagaaaa gacacggcca cgtctccc 38

<210> 9  
 <211> 38  
 <212> DNA  
 <213> Artificial sequence  
  
 <220>  
 <223> Reverse primer PaGH61A R designed from P. anserina S mat+ gh61A  
 gene (GenBank: CAP73254.1)  
  
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 gagtttttgt tctagaccga tgcactggct gtagtaag 38

<210> 10  
 <211> 43  
 <212> DNA  
 <213> Artificial sequence  
  
 <220>  
 <223> forward primer PaGH61E F designed from P. anserina S mat+ GH61E  
 gene (GenBank: CAP61476.1)  
  
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<210> 11  
 <211> 33  
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 <223> Reverse primer PaGH61E R designed from P. anserina S mat+ GH61E  
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<210> 12  
 <211> 351  
 <212> PRT  
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Met Ser Asn Lys Ala Ala Thr Leu Leu Ala Ala Leu Ser Gly Ala Ala  
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Leu Val Ala Ala His Gly His Val Ser His Ile Ile Val Asn Gly Val  
 20 25 30

Tyr Tyr Gln Asn Tyr Asp Pro Thr Thr His Phe Tyr Gln Pro Asn Pro





Gly Gln Cys Gly Gly Asn Gly Trp Thr Gly Pro Thr Val Cys Ala Ser  
325 330 335

Gly Ser Thr Cys Thr Val Leu Asn Pro Tyr Tyr Ser Gln Cys Ile  
340 345 350

<210> 13  
<211> 327  
<212> PRT  
<213> Podospira anserina

<400> 13

Met Lys Ser Phe Thr Ala Thr Ala Leu Ala Ala Leu Leu Ala Gln Gln  
1 5 10 15

Ala Ala Ala His Ser Thr Phe Gln Gln Leu Trp Val Asp Gly Thr Asp  
20 25 30

Phe Gly Ser Gln Cys Ala Arg Leu Pro Gln Ser Asn Ser Pro Ile Thr  
35 40 45

Asn Tyr Asn Ser Asn Asp Met Arg Cys Asn Ile Ile Gly Thr Arg Pro  
50 55 60

Gln Val Lys Cys Pro Val Arg Ala Gly Gly Thr Val Thr Val Glu Met  
65 70 75 80

His Ala Gln Asn Gly Asp Arg Ser Cys Ser Gln Glu Ala Ile Gly Gly  
85 90 95

Ala His His Gly Pro Val Ser Val Tyr Leu Thr Lys Val Ser Asp Ala  
100 105 110

Leu Thr Ala Asp Gly Ser Thr Gly Trp Phe Lys Ile Phe Asp Asp Gly  
115 120 125

Trp Arg Lys Asn Pro Ser Gly Arg Val Gly Asp Asp Asp Phe Trp Gly  
130 135 140

Thr Lys Asp Leu Asn Ala Cys Cys Gly Lys Met Asn Val Lys Ile Pro  
145 150 155 160

Ser Asp Ile Pro Ser Gly Asp Tyr Leu Leu Arg Ala Glu Ala Ile Ala  
165 170 175

Leu His Ala Ala Gly Gly Ala Gly Gly Ala Gln Pro Tyr Met Thr Cys  
180 185 190

Tyr Gln Ile Thr Val Ser Gly Gly Gly Ser Ala Ser Pro Pro Thr Val  
195 200 205

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

Ile His Gly Ala Met Thr Asn Tyr Val Ile Pro Gly Pro Ala Val Tyr  
225 230 235 240

Ala Gly Gly Ser Thr Lys Val Ala Gly Ser Ala Cys Ser Gly Cys Glu  
245 250 255

Ala Thr Cys Ala Val Gly Ser Ser Pro Thr Thr Ser Leu Thr Pro Pro  
260 265 270

Val Ser Thr Ser Thr Pro Ala Pro Gly Asn Gly Gly Gly Gly Ser Pro  
275 280 285

Gly Gly Cys Thr Val Gln Lys Tyr Gly Gln Cys Gly Gly Gln Gly Tyr  
290 295 300

Thr Gly Cys Thr Thr Cys Ala Ala Gly Ser Thr Cys Asn Thr Thr Asn  
305 310 315 320

Gln Trp Tyr His Gln Cys Val  
325

<210> 14  
<211> 370  
<212> PRT  
<213> Podospora anserina  
<400> 14

Met Lys Ala Phe Thr Leu Val Ser Leu Ala Ala Ser Val Ser Ala His  
1 5 10 15

Ser Ile Phe Gln Lys Val Ser Val Asn Gly Val Asp Gln Gly Gln Leu  
20 25 30

Lys Gly Val Arg Ala Pro Tyr Ser Asn Phe Pro Ile Glu Asn Val Asn  
35 40 45

His Pro Asp Phe Ala Cys Asn Thr Asn Ile Gln Leu Arg Asp Asn Thr  
50 55 60

Val Ile Lys Val Pro Ala Gly Ala Arg Val Gly Ala Trp Trp Gly His  
65 70 75 80

Glu Ile Gly Gly Ala Ala Gly Pro Asn Asp Pro Asp His Pro Ile Ala  
85 90 95

Ala Ser His Lys Gly Pro Ile Gln Val Tyr Leu Ala Lys Val Asn Asn  
100 105 110

Ala Ala Asn Ala Gly Thr Ser Gly Leu Gln Trp Phe Lys Val Ala Glu  
115 120 125

Gln Gly Leu Asn Asn Gly Val Trp Ala Val Asp Asn Met Ile Ser Asn  
130 135 140

Gly Gly Trp His Tyr Phe Asp Met Pro Ser Cys Val Ala Pro Gly His  
145 150 155 160

Tyr Leu Met Arg Val Glu Leu Leu Ala Leu His Ser Ala Ser Val Arg  
165 170 175

Gly Ala Ala Gln Phe Tyr Met Glu Cys Ala Gln Ile Glu Ile Thr Gly  
180 185 190

Ser Gly Thr Asn Thr Gly Ser Asn Phe Val Ser Phe Pro Gly Ala Tyr  
195 200 205

Thr Ala Asp His Pro Gly Ile Leu Val Ser Ile Tyr Asp Leu Gln Gly  
210 215 220

Arg Pro Thr Asn Gly Gly Arg Pro Tyr Thr Ile Pro Gly Pro Ala Pro  
225 230 235 240

Leu Thr Cys Ser Gly Gly Ser Asn Pro Asn Pro Gln Pro Gln Pro Thr  
245 250 255

Ser Ala Ala Pro Asn Pro Gln Pro Thr Gly Gly Asn Gly Gly Gly Ala  
260 265 270

Gly Ala Pro Leu Tyr Gly Gln Cys Gly Gly Gln Gly Tyr Thr Gly Pro  
275 280 285

Thr Thr Cys Ala Gln Gly Thr Cys Val Ala Ser Asn Gln Trp Tyr Ser  
290 295 300

Met Leu Ser Pro Leu Ser Phe Phe Ala Ser His Met Leu Thr Cys Leu  
305 310 315 320

Ser Ser Arg Pro Val Pro Pro Ile Asn Val Ser Met Arg Leu Gly Lys  
325 330 335

Gly His Glu His Glu Arg Arg Arg Ile Asn Thr Asn Lys His Leu Ile  
340 345 350

Phe Thr Cys Ile Tyr Phe Ser Ile Leu Pro Pro Asp Ile Pro Gly Gly  
355 360 365

Ser Thr  
370