

INR-B-0018-PCT1-SEQ\_ST25  
SEQUENCE LISTING

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Claire, Moulis  
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Pierre, Monsan

<120> POLYPEPTIDE AYANT LA CAPACITE DE FORMER DES BRANCHEMENTS D'UNITES  
GLUCOSYLES EN ALPHA-1,3 SUR UN ACCEPTEUR

<130> INR-B-0018-PCT1

<150> FR13/01402  
<151> 2013-06-17

<160> 24

<170> PatentIn version 3.5

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<223> enzymatic domain

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Ala Asp Xaa Val Ala Asn Gln  
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His Xaa Ser Ile Val Glu Ala Xaa Xaa Xaa Xaa  
 1 5 10

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 <222> (14)..(14)  
 <223> X= I or S

<220>  
 <221> MISC\_FEATURE  
 <222> (15)..(15)  
 <223> X= H or N

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Ile Val His Ala His Asp Lys Asp Ile Gln Asp Xaa Val Xaa Xaa  
 1 5 10 15

<210> 5  
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<220>

<223> structural domain

<400> 5

Asn Pro Val Val Gln Ala Glu Gln Leu Asn Trp Leu Tyr Tyr Leu Met  
1 5 10 15

Asn Phe Gly Gln Ile Thr Ala Asn Asp Ser Asn Ala Asn Phe Asp Ser  
20 25 30

Met Arg Ile Asp Ala Ile Ser Phe Val Asp Pro Gln Ile Ala Lys Lys  
35 40 45

Ala Tyr Asp Leu Leu Asp Lys Met Tyr Gly Leu Thr Asp Asn Glu Ala  
50 55 60

Val Ala Asn Gln His Ile Ser Ile Val Glu Ala Pro Lys Gly Glu Thr  
65 70 75 80

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

Asp Arg Met Lys Gln Ser Leu Ser Lys Asn Ala Thr Leu Asp Lys Leu  
100 105 110

Asp Pro Asp Pro Ala Ile Asn Ser Leu Glu Lys Leu Val Ala Asp Asp  
115 120 125

Leu Val Asn Arg Ser Gln Ser Ser Asp Lys Asp Ser Ser Thr Ile Pro  
130 135 140

Asn Tyr Ser Ile Val His Ala His Asp Lys Asp Ile Gln Asp Thr Val  
145 150 155 160

Ile His Ile Met Lys Ile Val Asn Asn Asn Pro Asn Ile Ser Met Ser  
165 170 175

Asp Phe Thr Met Gln Gln Leu Gln Asn Gly Leu Lys Ala Phe Tyr Glu  
180 185 190

Asp Gln His Gln Ser Val Lys Lys Tyr Asn Gln Tyr Asn Ile Pro Ser  
195 200 205

Ala Tyr Ala Leu Leu Leu Thr Asn Lys Asp Thr Val Pro Arg Val Phe  
210 215 220

Tyr Gly Asp Met Tyr Gln Asp Tyr Gly Asp Asp Leu Asp Gly Gly Gln  
225 230 235 240

Tyr Met Ala Thr Lys Ser Ile Tyr Tyr Asn Ala Ile Glu Gln Met Met  
245 250 255

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Lys Ala Arg Leu Lys Tyr Val Ala Gly Gly Gln Ile Met Ala Val Thr  
260 265 270

Lys Ile Lys Asn Asp Gly Ile Asn Lys Asp Gly Thr Asn Lys Ser Gly  
275 280 285

Glu Val Leu Thr Ser Val Arg Phe Gly Lys Asp Ile Met Asp Ala Gln  
290 295 300

Gly Gln Gly Thr Ala Glu Ser Arg Asn Gln Gly Ile Gly Val Ile Val  
305 310 315 320

Ser Asn Ser Ser Gly Leu Glu Leu Lys Asn Ser Asp Ser Ile Thr Leu  
325 330 335

His Met Gly Ile Ala His Lys Asn Gln Ala Tyr Arg Ala Leu Met Leu  
340 345 350

Thr Asn Asp Lys Gly Ile Val Asn Tyr Asp Gln Asp Asn Asn Ala Pro  
355 360 365

Ile Ala Trp Thr Asn Asp His Gly Asp Leu Ile Phe Thr Asn Gln Met  
370 375 380

Ile Asn Gly Gln Ser Asp Thr Ala Val Lys Gly Tyr Leu Asn Pro Glu  
385 390 395 400

Val Ala Gly Tyr Leu Ala Val Trp Val Pro Val Gly Ala Asn Asp Asn  
405 410 415

Gln Asp Ala Arg Thr Val Thr Thr Asn Gln Lys Asn Thr Asp Gly Lys  
420 425 430

Val Leu His Thr Asn Ala Ala Leu Asp Ser Lys Leu Met Tyr Glu Gly  
435 440 445

Phe Ser Asn Phe Gln Lys Met Pro Thr Arg Gly Asn Gln Tyr Ala Asn  
450 455 460

Val Val Ile Thr Lys Asn Ile Asp Leu Phe Lys Ser Trp Gly Ile Thr  
465 470 475 480

Asp Phe Glu Leu Ala Pro Gln Tyr Arg Ser Ser Asp Gly Lys Asp Ile  
485 490 495

Thr Asp Arg Phe Leu Asp Ser Ile Val Gln Asn Gly Tyr Gly Leu Ser  
500 505 510

Asp Arg Tyr Asp Leu Gly Phe Lys Thr Pro Thr Lys Tyr Gly Thr Asp  
515 520 525

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Gln Asp Leu Arg Lys Ala Ile Glu Arg Leu His Gln Ala Gly Met Ser  
530 535 540

Val Met Ala Asp Phe Val Ala Asn Gln Ile Tyr Gly Leu His Ala Asp  
545 550 555 560

Lys Glu Val Val Ser Ala Gln His Val Asn Ile Asn Gly Asp Thr Lys  
565 570 575

Leu Val Val Asp Pro Arg Tyr Gly Thr Gln Met Thr Val Val Asn Ser  
580 585 590

Val Gly Gly Gly Asp Tyr Gln Ala Lys Tyr Gly Gly Glu Tyr Leu Asp  
595 600 605

Thr Ile Ser Lys Leu Tyr Pro Gly Leu Leu Leu Asp Ser Asn Gly Gln  
610 615 620

Lys Ile Asp Leu Ser Thr Lys Ile Lys Glu Trp  
625 630 635

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<212> PRT  
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<223> structural domain

<400> 6

Asn Val Asp Ser Glu Tyr Pro Gly Gly Trp Phe Gln Gly Gly Tyr Leu  
1 5 10 15

Ala Tyr Gln Asn Ser Asp Leu Thr Pro Tyr Ala Asn Thr Asn Pro Asp  
20 25 30

Tyr Arg Thr His Asn Gly Leu Glu Phe Leu Leu Ala Asn Asp Val Asp  
35 40 45

Asn Ser Asn Pro Val Val Gln Ala Glu Gln Leu Asn Trp Leu Tyr Tyr  
50 55 60

Leu Met Asn Phe Gly Gln Ile Thr Ala Asn Asp Ser Asn Ala Asn Phe  
65 70 75 80

Asp Ser Met Arg Ile Asp Ala Ile Ser Phe Val Asp Pro Gln Ile Ala  
85 90 95

Lys Lys Ala Tyr Asp Leu Leu Asp Lys Met Tyr Gly Leu Thr Asp Asn  
100 105 110

Glu Ala Val Ala Asn Gln His Ile Ser Ile Val Glu Ala Pro Lys Gly

115

Glu Thr Pro Ile Thr Val Glu Lys Gln Ser Ala Leu Val Glu Ser Asn  
130 135 140

Trp Arg Asp Arg Met Lys Gln Ser Leu Ser Lys Asn Ala Thr Leu Asp  
145 150 155 160

Lys Leu Asp Pro Asp Pro Ala Ile Asn Ser Leu Glu Lys Leu Val Ala  
165 170 175

Asp Asp Leu Val Asn Arg Ser Gln Ser Ser Asp Lys Asp Ser Ser Thr  
180 185 190

Ile Pro Asn Tyr Ser Ile Val His Ala His Asp Lys Asp Ile Gln Asp  
195 200 205

Thr Val Ile His Ile Met Lys Ile Val Asn Asn Asn Pro Asn Ile Ser  
210 215 220

Met Ser Asp Phe Thr Met Gln Gln Leu Gln Asn Gly Leu Lys Ala Phe  
225 230 235 240

Tyr Glu Asp Gln His Gln Ser Val Lys Lys Tyr Asn Gln Tyr Asn Ile  
245 250 255

Pro Ser Ala Tyr Ala Leu Leu Leu Thr Asn Lys Asp Thr Val Pro Arg  
260 265 270

Val Phe Tyr Gly Asp Met Tyr Gln Asp Tyr Gly Asp Asp Leu Asp Gly  
275 280 285

Gly Gln Tyr Met Ala Thr Lys Ser Ile Tyr Tyr Asn Ala Ile Glu Gln  
290 295 300

Met Met Lys Ala Arg Leu Lys Tyr Val Ala Gly Gly Gln Ile Met Ala  
305 310 315 320

Val Thr Lys Ile Lys Asn Asp Gly Ile Asn Lys Asp Gly Thr Asn Lys  
325 330 335

Ser Gly Glu Val Leu Thr Ser Val Arg Phe Gly Lys Asp Ile Met Asp  
340 345 350

Ala Gln Gly Gln Gly Thr Ala Glu Ser Arg Asn Gln Gly Ile Gly Val  
355 360 365

Ile Val Ser Asn Ser Ser Gly Leu Glu Leu Lys Asn Ser Asp Ser Ile  
370 375 380

Thr Leu His Met Gly Ile Ala His Lys Asn Gln Ala Tyr Arg Ala Leu

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385 390 395 400

Met Leu Thr Asn Asp Lys Gly Ile Val Asn Tyr Asp Gln Asp Asn Asn  
405 410 415

Ala Pro Ile Ala Trp Thr Asn Asp His Gly Asp Leu Ile Phe Thr Asn  
420 425 430

Gln Met Ile Asn Gly Gln Ser Asp Thr Ala Val Lys Gly Tyr Leu Asn  
435 440 445

Pro Glu Val Ala Gly Tyr Leu Ala Val Trp Val Pro Val Gly Ala Asn  
450 455 460

Asp 465 Asn 466 Gln 467 Asp 468 Ala 469 Arg 470 Thr 471 Val 472 Thr 473 Thr 474 Asn 475 Gln 476 Lys 477 Asn 478 Thr 479 Asp 480

Gly Lys Val Leu His Thr Asn Ala Ala Leu Asp Ser Lys Leu Met Tyr  
485 490 495

Glu Gly Phe Ser Asn Phe Gln Lys Met Pro Thr Arg Gly Asn Gln Tyr  
500 505 510

Ala Asn Val Val Ile Thr Lys Asn Ile Asp Leu Phe Lys Ser Trp Gly  
515 520 525

Ile Thr Asp Phe Glu Leu Ala Pro Gln Tyr Arg Ser Ser Asp Gly Lys  
530 535 540

Asp Ile Thr Asp Arg Phe Leu Asp Ser Ile Val Gln Asn Gly Tyr Gly  
545 550 555 560

Leu Ser Asp Arg Tyr Asp Leu Gly Phe Lys Thr Pro Thr Lys Tyr Gly  
565 570 575

Thr Asp Gln Asp Leu Arg Lys Ala Ile Glu Arg Leu His Gln Ala Gly  
580 585 590

Met Ser Val Met Ala Asp Phe Val Ala Asn Gln Ile Tyr Gly Leu His  
595 600 605Ala Asp Lys Glu Val Val Ser Ala Gln His Val Asn Ile Asn Gly Asp  
610 615 620

Thr Lys Leu Val Val Asp Pro Arg Tyr Gly Thr Gln Met Thr Val Val  
625 630 635 640

Asn Ser Val Gly Gly Gly Asp Tyr Gln Ala Lys Tyr Gly Gly Glu Tyr  
645 650 655

Leu Asp Thr Ile Ser Lys Leu Tyr Pro Gly Leu Leu Leu Asp Ser Asn

660

665

670

Gly Gln Lys Ile Asp Leu Ser Thr Lys Ile Lys Glu Trp Ser Ala Lys  
675 680 685

Tyr Leu Asn Gly Ser Asn Ile Pro Gln Val Gly  
690 695

<210> 7

<211> 911

<212> PRT

<213> Artificial Sequence

<220>

<223> structural domain

<400> 7

Val Lys Asp Val Tyr Ser Gln His Asn Ala Val Asn Asn Leu Ser Ala  
1 5 10 15

Asn Asn Phe Lys Asn Leu Val Asp Gly Phe Leu Thr Ala Glu Thr Trp  
20 25 30

Tyr Arg Pro Ala Gln Ile Leu Ser His Gly Thr Asp Trp Val Ala Ser  
35 40 45

Thr Asp Lys Asp Phe Arg Pro Leu Ile Thr Val Trp Trp Pro Asn Lys  
50 55 60

Asp Ile Gln Val Asn Tyr Leu Lys Leu Met Gln Gln Ile Gly Ile Leu  
65 70 75 80

Asp Asn Ser Val Val Phe Asp Thr Asn Asn Asp Gln Leu Val Leu Asn  
85 90 95

Lys Gly Ala Glu Ser Ala Gln Ile Gly Ile Glu Lys Lys Val Ser Glu  
100 105 110

Thr Gly Asn Thr Asp Trp Leu Asn Glu Leu Leu Phe Ala Pro Asn Gly  
115 120 125

Asn Gln Pro Ser Phe Ile Lys Gln Gln Tyr Leu Trp Asn Val Asp Ser  
130 135 140

Glu Tyr Pro Gly Gly Trp Phe Gln Gly Gly Tyr Leu Ala Tyr Gln Asn  
145 150 155 160

Ser Asp Leu Thr Pro Tyr Ala Asn Thr Asn Pro Asp Tyr Arg Thr His  
165 170 175

Asn Gly Leu Glu Phe Leu Leu Ala Asn Asp Val Asp Asn Ser Asn Pro  
180 185 190



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Val Val Gln Ala Glu Gln Leu Asn Trp Leu Tyr Tyr Leu Met Asn Phe  
           195                                  200                                  205  
  
 Gly Gln Ile Thr Ala Asn Asp Ser Asn Ala Asn Phe Asp Ser Met Arg  
       210                                  215                                  220  
  
 Ile Asp Ala Ile Ser Phe Val Asp Pro Gln Ile Ala Lys Lys Ala Tyr  
 225                                  230                                  235                                  240  
  
 Asp Leu Leu Asp Lys Met Tyr Gly Leu Thr Asp Asn Glu Ala Val Ala  
                                   245                                  250                                  255  
  
 Asn Gln His Ile Ser Ile Val Glu Ala Pro Lys Gly Glu Thr Pro Ile  
                                   260                                  265                                  270  
  
 Thr Val Glu Lys Gln Ser Ala Leu Val Glu Ser Asn Trp Arg Asp Arg  
           275                                  280                                  285  
  
 Met Lys Gln Ser Leu Ser Lys Asn Ala Thr Leu Asp Lys Leu Asp Pro  
       290                                  295                                  300  
  
 Asp Pro Ala Ile Asn Ser Leu Glu Lys Leu Val Ala Asp Asp Leu Val  
 305                                  310                                  315                                  320  
  
 Asn Arg Ser Gln Ser Ser Asp Lys Asp Ser Ser Thr Ile Pro Asn Tyr  
                                   325                                  330                                  335  
  
 Ser Ile Val His Ala His Asp Lys Asp Ile Gln Asp Thr Val Ile His  
                                   340                                  345                                  350  
  
 Ile Met Lys Ile Val Asn Asn Asn Pro Asn Ile Ser Met Ser Asp Phe  
       355                                  360                                  365  
  
 Thr Met Gln Gln Leu Gln Asn Gly Leu Lys Ala Phe Tyr Glu Asp Gln  
       370                                  375                                  380  
  
 His Gln Ser Val Lys Lys Tyr Asn Gln Tyr Asn Ile Pro Ser Ala Tyr  
 385                                  390                                  395                                  400  
  
 Ala Leu Leu Leu Thr Asn Lys Asp Thr Val Pro Arg Val Phe Tyr Gly  
                                   405                                  410                                  415  
  
 Asp Met Tyr Gln Asp Tyr Gly Asp Asp Leu Asp Gly Gly Gln Tyr Met  
       420                                  425                                  430  
  
 Ala Thr Lys Ser Ile Tyr Tyr Asn Ala Ile Glu Gln Met Met Lys Ala  
       435                                  440                                  445  
  
 Arg Leu Lys Tyr Val Ala Gly Gly Gln Ile Met Ala Val Thr Lys Ile  
       450                                  455                                  460

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

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Ala Asp Phe Val Ala Asn Gln Ile Tyr Gly Leu His Ala Asp Lys Glu  
740 745 750

Val Val Ser Ala Gln His Val Asn Ile Asn Gly Asp Thr Lys Leu Val  
755 760 765

Val Asp Pro Arg Tyr Gly Thr Gln Met Thr Val Val Asn Ser Val Gly  
770 775 780

Gly Gly Asp Tyr Gln Ala Lys Tyr Gly Gly Glu Tyr Leu Asp Thr Ile  
785 790 795 800

Ser Lys Leu Tyr Pro Gly Leu Leu Leu Asp Ser Asn Gly Gln Lys Ile  
805 810 815

Asp Leu Ser Thr Lys Ile Lys Glu Trp Ser Ala Lys Tyr Leu Asn Gly  
820 825 830

Ser Asn Ile Pro Gln Val Gly Met Gly Tyr Val Leu Lys Asp Trp Asn  
835 840 845

Asn Gly Gln Tyr Phe His Ile Leu Asp Lys Glu Gly Gln Tyr Ser Leu  
850 855 860

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

Val Asn Tyr Lys Tyr Phe Ile Gly Asn Ser Asp Ala Thr Tyr Asn Met  
885 890 895

Tyr His Asn Leu Pro Asn Thr Val Ser Leu Ile Asn Ser Gln Glu  
900 905 910

<210> 8

<211> 1204

<212> PRT

<213> Artificial Sequence

<220>

<223> structural domain

<400> 8

Leu Asn Tyr Phe Asp Leu Ala Thr Gly Ile Gln Leu Lys Gly Gln Ala  
1 5 10 15

Lys Asn Ile Asp Gly Ile Gly Tyr Tyr Phe Asp Gln Asn Asn Gly Asn  
20 25 30

Gly Glu Tyr Arg Tyr Ser Leu Thr Gly Pro Val Val Lys Asp Val Tyr  
35 40 45

Ser Gln His Asn Ala Val Asn Asn Leu Ser Ala Asn Asn Phe Lys Asn

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50

55

60

Leu Val Asp Gly Phe Leu Thr Ala Glu Thr Trp Tyr Arg Pro Ala Gln  
65 70 75 80

Ile Leu Ser His Gly Thr Asp Trp Val Ala Ser Thr Asp Lys Asp Phe  
85 90 95

Arg Pro Leu Ile Thr Val Trp Trp Pro Asn Lys Asp Ile Gln Val Asn  
100 105 110

Tyr Leu Lys Leu Met Gln Gln Ile Gly Ile Leu Asp Asn Ser Val Val  
115 120 125

Phe Asp Thr Asn Asn Asp Gln Leu Val Leu Asn Lys Gly Ala Glu Ser  
130 135 140

Ala Gln Ile Gly Ile Glu Lys Lys Val Ser Glu Thr Gly Asn Thr Asp  
145 150 155 160

Trp Leu Asn Glu Leu Leu Phe Ala Pro Asn Gly Asn Gln Pro Ser Phe  
165 170 175

Ile Lys Gln Gln Tyr Leu Trp Asn Val Asp Ser Glu Tyr Pro Gly Gly  
180 185 190

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

Tyr Ala Asn Thr Asn Pro Asp Tyr Arg Thr His Asn Gly Leu Glu Phe  
210 215 220

Leu Leu Ala Asn Asp Val Asp Asn Ser Asn Pro Val Val Gln Ala Glu  
225 230 235 240

Gln Leu Asn Trp Leu Tyr Tyr Leu Met Asn Phe Gly Gln Ile Thr Ala  
245 250 255

Asn Asp Ser Asn Ala Asn Phe Asp Ser Met Arg Ile Asp Ala Ile Ser  
260 265 270

Phe Val Asp Pro Gln Ile Ala Lys Lys Ala Tyr Asp Leu Leu Asp Lys  
275 280 285

Met Tyr Gly Leu Thr Asp Asn Glu Ala Val Ala Asn Gln His Ile Ser  
290 295 300

Ile Val Glu Ala Pro Lys Gly Glu Thr Pro Ile Thr Val Glu Lys Gln  
305 310 315 320

Ser Ala Leu Val Glu Ser Asn Trp Arg Asp Arg Met Lys Gln Ser Leu

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325

330

335

Ser Lys Asn Ala Thr Leu Asp Lys Leu Asp Pro Asp Pro Ala Ile Asn  
340 345 350

Ser Leu Glu Lys Leu Val Ala Asp Asp Leu Val Asn Arg Ser Gln Ser  
355 360 365

Ser Asp Lys Asp Ser Ser Thr Ile Pro Asn Tyr Ser Ile Val His Ala  
370 375 380

His Asp Lys Asp Ile Gln Asp Thr Val Ile His Ile Met Lys Ile Val  
385 390 395 400

Asn Asn Asn Pro Asn Ile Ser Met Ser Asp Phe Thr Met Gln Gln Leu  
405 410 415

Gln Asn Gly Leu Lys Ala Phe Tyr Glu Asp Gln His Gln Ser Val Lys  
420 425 430

Lys Tyr Asn Gln Tyr Asn Ile Pro Ser Ala Tyr Ala Leu Leu Leu Thr  
435 440 445

Asn Lys Asp Thr Val Pro Arg Val Phe Tyr Gly Asp Met Tyr Gln Asp  
450 455 460

Tyr Gly Asp Asp Leu Asp Gly Gly Gln Tyr Met Ala Thr Lys Ser Ile  
465 470 475 480

Tyr Tyr Asn Ala Ile Glu Gln Met Met Lys Ala Arg Leu Lys Tyr Val  
485 490 495

Ala Gly Gly Gln Ile Met Ala Val Thr Lys Ile Lys Asn Asp Gly Ile  
500 505 510

Asn Lys Asp Gly Thr Asn Lys Ser Gly Glu Val Leu Thr Ser Val Arg  
515 520 525

Phe Gly Lys Asp Ile Met Asp Ala Gln Gly Gln Gly Thr Ala Glu Ser  
530 535 540

Arg Asn Gln Gly Ile Gly Val Ile Val Ser Asn Ser Ser Gly Leu Glu  
545 550 555 560

Leu Lys Asn Ser Asp Ser Ile Thr Leu His Met Gly Ile Ala His Lys  
565 570 575

Asn Gln Ala Tyr Arg Ala Leu Met Leu Thr Asn Asp Lys Gly Ile Val  
580 585 590

Asn Tyr Asp Gln Asp Asn Asn Ala Pro Ile Ala Trp Thr Asn Asp His

595

Gly Asp Leu Ile Phe Thr Asn Gln Met Ile Asn Gly Gln Ser Asp Thr  
610 615 620

Ala Val Lys Gly Tyr Leu Asn Pro Glu Val Ala Gly Tyr Leu Ala Val  
625 630 635 640

Trp Val Pro Val Gly Ala Asn Asp Asn Gln Asp Ala Arg Thr Val Thr  
645 650 655

Thr Asn Gln Lys Asn Thr Asp Gly Lys Val Leu His Thr Asn Ala Ala  
660 665 670

Leu Asp Ser Lys Leu Met Tyr Glu Gly Phe Ser Asn Phe Gln Lys Met  
675 680 685

Pro Thr Arg Gly Asn Gln Tyr Ala Asn Val Val Ile Thr Lys Asn Ile  
690 695 700

Asp Leu Phe Lys Ser Trp Gly Ile Thr Asp Phe Glu Leu Ala Pro Gln  
705 710 715 720

Tyr Arg Ser Ser Asp Gly Lys Asp Ile Thr Asp Arg Phe Leu Asp Ser  
725 730 735

Ile Val Gln Asn Gly Tyr Gly Leu Ser Asp Arg Tyr Asp Leu Gly Phe  
740 745 750

Lys Thr Pro Thr Lys Tyr Gly Thr Asp Gln Asp Leu Arg Lys Ala Ile  
755 760 765

Glu Arg Leu His Gln Ala Gly Met Ser Val Met Ala Asp Phe Val Ala  
770 775 780

Asn Gln Ile Tyr Gly Leu His Ala Asp Lys Glu Val Val Ser Ala Gln  
785 790 795 800

His Val Asn Ile Asn Gly Asp Thr Lys Leu Val Val Asp Pro Arg Tyr  
805 810 815

Gly Thr Gln Met Thr Val Val Asn Ser Val Gly Gly Gly Asp Tyr Gln  
820 825 830

Ala Lys Tyr Gly Gly Glu Tyr Leu Asp Thr Ile Ser Lys Leu Tyr Pro  
835 840 845

Gly Leu Leu Leu Asp Ser Asn Gly Gln Lys Ile Asp Leu Ser Thr Lys  
850 855 860

Ile Lys Glu Trp Ser Ala Lys Tyr Leu Asn Gly Ser Asn Ile Pro Gln



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1130

1135

1140

Asp Gln Gly Thr Val Trp Ser Glu Val Val Leu Gly Gly Gln Thr  
1145 1150 1155

Val Trp Val Asp Asn His Ala Leu Ala Gln Met Gln Val Ser Asp  
1160 1165 1170

Thr Ser Gln Gln Leu Tyr Val Asn Ser Asn Gly Arg Asn Asp Gly  
1175 1180 1185

Leu Phe Leu Asn Ala Pro Tyr Arg Gly Gln Gly Ser Gln Leu Ile  
1190 1195 1200

Gly

<210> 9  
<211> 1888  
<212> PRT  
<213> Leuconostoc citreum  
<400> 9

Met Glu Met Lys Glu Thr Ile Thr Arg Lys Lys Leu Tyr Lys Ser Gly  
1 5 10 15

Lys Ser Trp Val Ala Ala Ala Thr Ala Phe Ala Val Met Gly Val Ser  
20 25 30

Ala Val Thr Thr Val Ser Ala Asp Thr Gln Thr Pro Val Gly Thr Thr  
35 40 45

Gln Ser Gln Gln Asp Leu Thr Gly Gln Thr Gly Gln Asp Lys Pro Thr  
50 55 60

Thr Lys Glu Val Ile Asp Lys Lys Glu Pro Val Pro Gln Val Ser Ala  
65 70 75 80

Gln Asn Val Gly Asp Leu Ser Ala Asp Ala Lys Thr Pro Lys Ala Asp  
85 90 95

Asp Lys Gln Asp Thr Gln Pro Thr Asn Ala Gln Leu Pro Asp Gln Gly  
100 105 110

Asn Lys Gln Thr Asn Ser Asn Ser Asp Lys Gly Val Lys Glu Ser Thr  
115 120 125

Thr Ala Pro Val Lys Thr Thr Asp Val Pro Ser Lys Ser Val Ala Pro  
130 135 140

Glu Thr Asn Thr Ser Ile Asn Gly Gly Gln Tyr Val Glu Lys Asp Gly  
145 150 155 160



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Gln Phe Val Tyr Ile Asp Gln Ser Gly Lys Gln Val Ser Gly Leu Gln  
165 170 175

Asn Ile Glu Gly His Thr Gln Tyr Phe Asp Pro Lys Thr Gly Tyr Gln  
180 185 190

Thr Lys Gly Glu Leu Lys Asn Ile Asp Asp Asn Ala Tyr Tyr Phe Asp  
195 200 205

Lys Asn Ser Gly Asn Gly Arg Thr Phe Thr Lys Ile Ser Asn Gly Ser  
210 215 220

Tyr Ser Glu Lys Asp Gly Met Trp Gln Tyr Val Asp Ser His Asp Lys  
225 230 235 240

Gln Pro Val Lys Gly Leu Tyr Asp Val Glu Gly Asn Leu Gln Tyr Phe  
245 250 255

Asp Leu Ser Thr Gly Asn Gln Ala Lys His Gln Ile Arg Ser Val Asp  
260 265 270

Gly Val Thr Tyr Tyr Phe Asp Ala Asp Ser Gly Asn Ala Thr Ala Phe  
275 280 285

Lys Ala Val Thr Asn Gly Arg Tyr Ala Glu Gln Thr Thr Lys Asp Lys  
290 295 300

Asp Gly Asn Glu Thr Ser Tyr Trp Ala Tyr Leu Asp Asn Gln Gly Asn  
305 310 315 320

Ala Ile Lys Gly Leu Asn Asp Val Asn Gly Glu Ile Gln Tyr Phe Asp  
325 330 335

Glu His Thr Gly Glu Gln Leu Lys Gly His Thr Ala Thr Val Asp Gly  
340 345 350

Thr Thr Tyr Tyr Phe Glu Gly Asn Lys Gly Asn Leu Val Ser Val Val  
355 360 365

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

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Ile Asp Asp Asn Ala<sub>165</sub> Tyr Tyr Phe Asp Lys<sub>170</sub> Asn Ser Gly Asn Gly<sub>175</sub> Arg

Thr Phe Thr Lys<sub>180</sub> Ile Ser Asn Gly Ser<sub>185</sub> Tyr Ser Glu Lys Asp<sub>190</sub> Gly Met

Trp Gln Tyr<sub>195</sub> Val Asp Ser His Asp<sub>200</sub> Lys Gln Pro Val Lys<sub>205</sub> Gly Leu Tyr

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Ala Asp Ser Gly Asn<sub>245</sub> Ala Thr Ala Phe Lys<sub>250</sub> Ala Val Thr Asn Gly<sub>255</sub> Arg

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Trp Ala Tyr<sub>275</sub> Leu Asp Asn Gln Gly<sub>280</sub> Asn Ala Ile Lys Gly<sub>285</sub> Leu Asn Asp

Val Asn Gly Glu Ile Gln Tyr<sub>295</sub> Phe Asp Glu His Thr<sub>300</sub> Gly Glu Gln Leu

Lys<sub>305</sub> Gly His Thr Ala Thr<sub>310</sub> Val Asp Gly Thr Thr<sub>315</sub> Tyr Tyr Phe Glu Gly<sub>320</sub>

Asn Lys Gly Asn Leu<sub>325</sub> Val Ser Val Val Asn<sub>330</sub> Thr Ala Pro Thr Gly<sub>335</sub> Gln

Tyr Lys Ile Asn<sub>340</sub> Gly Asp Asn Val Tyr<sub>345</sub> Tyr Leu Asp Asn Asn<sub>350</sub> Asn Glu

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Val Asn Asn Leu Ser Ala Asn Asn Phe Lys Asn Leu Val Asp Gly Phe  
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Leu Thr Ala Glu Thr Trp Tyr Arg Pro Ala Gln Ile Leu Ser His Gly  
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Gln Gln Ile Gly Ile Leu Asp Asn Ser Val Val Phe Asp Thr Asn Asn  
485 490 495

Asp Gln Leu Val Leu Asn Lys Gly Ala Glu Ser Ala Gln Ile Gly Ile  
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Glu Lys Lys Val Ser Glu Thr Gly Asn Thr Asp Trp Leu Asn Glu Leu  
515 520 525

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



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



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

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610

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

Ile Ser Ile Val Glu Ala Pro Lys Gly Glu Thr Pro Ile Thr Val Glu  
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Lys Gln Ser Ala Leu Val Glu Ser Asn Trp Arg Asp Arg Met Lys Gln  
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Ser Leu Ser Lys Asn Ala Thr Leu Asp Lys Leu Asp Pro Asp Pro Ala  
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Ile Asn Ser Leu Glu Lys Leu Val Ala Asp Asp Leu Val Asn Arg Ser  
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Gln Ser Ser Asp Lys Asp Ser Ser Thr Ile Pro Asn Tyr Ser Ile Val  
770 775 780

His Ala His Asp Lys Asp Ile Gln Asp Thr Val Ile His Ile Met Lys  
785 790 795 800

Ile Val Asn Asn Asn Pro Asn Ile Ser Met Ser Asp Phe Thr Met Gln  
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Gln Leu Gln Asn Gly Leu Lys Ala Phe Tyr Glu Asp Gln His Gln Ser  
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Val Lys Lys Tyr Asn Gln Tyr Asn Ile Pro Ser Ala Tyr Ala Leu Leu  
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Leu Thr Asn Lys Asp Thr Val Pro Arg Val Phe Tyr Gly Asp Met Tyr  
850 855 860

Gln Asp Tyr Gly Asp Asp Leu Asp Gly Gly Gln Tyr Met Ala Thr Lys  
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Ser Ile Tyr Tyr Asn Ala Ile Glu Gln Met Met Lys Ala Arg Leu Lys

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Tyr Val Ala Gly Gly Gln Ile Met Ala Val Thr Lys Ile Lys Asn Asp  
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Gly Ile Asn Lys Asp Gly Thr Asn Lys Ser Gly Glu Val Leu Thr Ser  
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Val Arg Phe Gly Lys Asp Ile Met Asp Ala Gln Gly Gln Gly Thr Ala  
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Glu Ser Arg Asn Gln Gly Ile Gly Val Ile Val Ser Asn Ser Ser Gly  
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Leu Glu Leu Lys Asn Ser Asp Ser Ile Thr Leu His Met Gly Ile Ala  
965 970 975

His Lys Asn Gln Ala Tyr Arg Ala Leu Met Leu Thr Asn Asp Lys Gly  
980 985 990

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

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His Gln Ala Gly Met Ser Val Met Ala Asp Phe Val Ala Asn Gln  
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Ile Tyr Gly Leu His Ala Asp Lys Glu Val Val Ser Ala Gln His  
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Val Asn Ile Asn Gly Asp Thr Lys Leu Val Val Asp Pro Arg Tyr  
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Gly Thr Gln Met Thr Val Val Asn Ser Val Gly Gly Gly Asp Tyr  
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Gln Ala Lys Tyr Gly Gly Glu Tyr Leu Asp Thr Ile Ser Lys Leu  
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Tyr Pro Gly Leu Leu Leu Asp Ser Asn Gly Gln Lys Ile Asp Leu  
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Ser Thr Lys Ile Lys Glu Trp Ser Ala Lys Tyr Leu Asn Gly Ser  
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Asn Ile Pro Gln Val Gly Met Gly Tyr Val Leu Lys Asp Trp Asn  
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Asn Gly Gln Tyr Phe His Ile Leu Asp Lys Glu Gly Gln Tyr Ser  
1295 1300 1305

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



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Thr Pro Phe Lys Thr Met Asn Gln Ile Ser Phe Ile Ser Tyr Ala  
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Asn Arg Asn Asp Gly Leu Phe Leu Asn Ala Pro Tyr Gln Val Lys  
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Gly Tyr Gln Leu Ala Gly Met Ser Asn Gln Tyr Lys Gly Gln Gln  
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Val Thr Ile Ala Gly Val Ala Asn Val Ser Gly Lys Asp Trp Ser  
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Leu Ile Ser Phe Asn Gly Thr Gln Tyr Trp Ile Asp Ser Gln Ala  
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Asn Thr Thr Ser Asn Leu Asp Gly Leu Phe Leu Asn Ala Pro Tyr  
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Arg Gln Pro Gly Tyr Lys Leu Ala Gly Leu Ala Lys Asn Tyr Asn  
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Gln Leu Tyr Val Asn Ser Asn Gly Arg Asn Asp Gly Leu Phe Leu  
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Ala Asp Tyr  
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 35 40 45

Lys Asp Thr Val Val Val Thr Ala Asp Lys Asn Thr Thr Asp Lys Asp  
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Lys Glu Pro Ile Lys Thr Ala Gly Ala Asn Val Val Asp Lys Gly Val  
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Ala Gln Thr Thr Asp<sub>85</sub> Thr Asn Thr Thr Asp<sub>90</sub> Lys Lys Thr Ile Glu Val<sub>95</sub>

Gly Lys Ser Val<sub>100</sub> Asp Met Ser Ala Thr<sub>105</sub> Asp Lys Lys Val<sub>110</sub> Thr Glu Thr

Val Lys Ser<sub>115</sub> Val Asp Thr Ser Ala<sub>120</sub> Thr Asp Lys Lys Thr<sub>125</sub> Thr Glu Ala

Val Lys<sub>130</sub> Pro Val Asp Thr Asn<sub>135</sub> Ala Thr Asp Lys Lys<sub>140</sub> Ala Thr Glu Ala

Val<sub>145</sub> Lys Pro Val Asp Thr<sub>150</sub> Asn Ala Thr Asp Lys<sub>155</sub> Lys Thr Thr Glu Ala<sub>160</sub>

Val Lys Pro Val Asp<sub>165</sub> Thr Asn Thr Thr Asp<sub>170</sub> Lys Lys Val Thr Glu Ala<sub>175</sub>

Ile Lys Pro Val<sub>180</sub> Asn Thr Asn Ala Asp<sub>185</sub> Asp Lys Thr Ala Glu Pro Val<sub>190</sub>

Lys Thr Ile<sub>195</sub> Ser Ala Thr Lys Asp<sub>200</sub> Thr Val Lys Thr Ile<sub>205</sub> Ala Asn Lys

Gln Lys<sub>210</sub> Gly Ala Thr Glu Glu<sub>215</sub> Gln Ala Val Ile Thr<sub>220</sub> Glu Gly His Tyr

Glu Ala Gln Gly Asp Gly<sub>230</sub> Phe Val Tyr Ile Thr<sub>235</sub> Lys Asp Gly Lys Gln<sub>240</sub>

Leu Thr Gly Leu Gln<sub>245</sub> Asn Ile Asn Gly Asn<sub>250</sub> Thr Gln Tyr Phe Asp Pro<sub>255</sub>

Ala Thr Gly Gln<sub>260</sub> Gln Leu Lys Gly Asp<sub>265</sub> Ile Lys Ala Val Ala Gly Thr<sub>270</sub>

Val Tyr Tyr<sub>275</sub> Phe Asp Lys Asn Ser<sub>280</sub> Gly Asn Ala Arg Val<sub>285</sub> Tyr Gln Lys

Val Ala Asp Gly Thr Tyr Ser<sub>295</sub> Glu Asn Asn Glu His<sub>300</sub> Trp Gln Tyr Ile

Ser Lys Val Asp Asn Lys<sub>310</sub> Pro Val Glu Gly Leu Tyr Asn Val Gln Gly<sub>320</sub>

Asn Leu Gln Tyr Phe<sub>325</sub> Asp Met Ser Thr Gly<sub>330</sub> Asn Gln Val Lys Asn Asp<sub>335</sub>

Ile Arg Ser Val<sub>340</sub> Asp Gly Val Thr Tyr<sub>345</sub> Tyr Phe Asp Lys Asp<sub>350</sub> Ser Gly

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 Leu Asn Gln Ala Ala Gln Thr Val Gln Val Asn Ile Glu Lys Arg Ile  
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 660 665 670  
 Arg Asn Ser Asp Leu Thr Pro Tyr Ala Asn Ser Ser Tyr Arg His Tyr  
 675 680 685  
 Thr Gly Met Glu Phe Leu Leu Ala Asn Asp Val Asp Asn Ser Asn Pro  
 690 695 700  
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 Gly Thr Glu Thr Gly Asn Asp Pro Gln Ala Asn Phe Asp Ser Ile Arg  
 725 730 735  
 Ile Asp Ala Ile Ser Phe Val Asp Lys Gln Val Ala Lys Lys Ala Tyr  
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 Thr Thr Glu Asn His Asp Ala Leu Ile Glu Ser Tyr Trp Arg Asp Thr  
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 Met Lys Asn Ser Leu Ser Lys Asp Ala Ser Ile Asp Ser Ser Ala Gly  
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 Ser Thr Thr Glu Ser Ser Ile Phe Pro Asn Tyr Thr Ile Val His Ala  
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 His Asp Lys Asp Ile Gln Asp Ala Val Ser Asn Val Met Lys Ile Val  
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 Asn Asn Asp Pro Ser Ile Ser Leu Asp Gly Phe Thr Met Glu Gln Leu  
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 Glu Lys Gly Leu Ser Ala Phe Tyr Ala Asp Gln Arg Ser Ala Val Lys  
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930 935 940

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945 950 955 960

Ser Val Thr Lys Ile Asn Asn Ala Asn Ser Gln Lys Ser Gly Glu Val  
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Pro Gln Val Ala Gly Tyr Leu Ala Val Trp Val Pro Thr Gly Ala  
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1145 1150 1155



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Phe Lys Ser Trp Gly Ile Thr Asn Phe Glu Leu Ala Pro Gln Tyr  
 1160 1165 1170  
 Arg Ser Ser Asp Gly Lys Asn Ile Asn Asp Arg Phe Ile Asp Ser  
 1175 1180 1185  
 Leu Val Gln Asn Gly Tyr Gly Leu Ser Asp Arg Tyr Asp Leu Gly  
 1190 1195 1200  
 Phe Glu Thr Pro Thr Lys Tyr Gly Thr Asp Gln Asp Leu Arg Thr  
 1205 1210 1215  
 Ala Ile Lys Thr Leu His Gln Ala Gly Met Thr Val Met Ala Asp  
 1220 1225 1230  
 Tyr Val Ala Asn Gln Ile Tyr Gly Leu Asn Thr Ser Gln Glu Val  
 1235 1240 1245  
 Val Asp Ala Gln Arg Val Asn Ser Asp Asn Asn Ala Val Glu Val  
 1250 1255 1260  
 Arg Tyr Gly Gln His Leu Asn Val Val Asn Ser Ile Gly Gly Gly  
 1265 1270 1275  
 Glu Tyr Gln Asn Leu Tyr Gly Gly Lys Tyr Leu Glu Ile Leu Asn  
 1280 1285 1290  
 Lys Leu Tyr Pro Asp Leu Leu Val Asp Glu Asn Gly Asn Lys Ile  
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 Asp Ile Asp Thr Lys Ile Lys Gln Trp Ser Ala Lys Tyr Leu Asn  
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 Gly Ser Asn Val Thr Gly Leu Gly Met Gly Tyr Val Leu Lys Asp  
 1325 1330 1335  
 Trp Ser Asn Gly Gln Tyr Phe Asn Ile Ser Asn Thr Asp Gly Lys  
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 Val Met Leu Pro Glu Gln Leu Val Lys His Met Pro Ala Val Glu  
 1355 1360 1365  
 Ile Gly Thr Gln Thr Asn Tyr Thr Ala Tyr Ile Ser Ser Thr Ile  
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 Arg Arg Asp Gly Leu Tyr Asn Asn Met Pro Trp Gly Val Thr Ala  
 1385 1390 1395  
 Thr Gly Gln Asp Gly Asn Glu Ile Lys Trp Glu Arg Gln Gly Ser  
 1400 1405 1410

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Thr	Ser	Asp	Tyr	Asn	His	Gln	Lys	Val	Gln	Val	Asn	Arg	Gln	Tyr
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Val	Asp	Lys	Gln	Gly	Val	Val	Trp	Asn	Leu	Ile	Asn	Phe	Asp	Asp
	1430					1435					1440			
Lys	Asp	Leu	Trp	Val	Asp	Ser	Asn	Ala	Leu	Val	Thr	Val	Asn	Phe
	1445					1450					1455			
Thr	Ser	Gln	Lys	Pro	Thr	Lys	His	Phe	Val	Gln	Phe	Gly	Met	Arg
	1460					1465					1470			
Gln	Gly	Lys	Tyr	Asp	Gly	Phe	Tyr	Leu	Ser	Ala	Pro	Tyr	Lys	Gln
	1475					1480					1485			
Thr	Glu	Ser	Lys	Trp	Val	Ala	Ser	Thr	Arg	Thr	His	Gln	Gly	Gln
	1490					1495					1500			
Leu	Leu	Glu	Val	Val	Gly	Gln	Tyr	Thr	Thr	Gly	Ser	Gly	Ser	Arg
	1505					1510					1515			
Lys	Val	Thr	Trp	Tyr	Leu	Val	Gly	Leu	Asp	Gly	Lys	Gln	Val	Trp
	1520					1525					1530			
Val	Asp	Ser	Arg	Ala	Val	Gly	Thr	Asn	Phe	Ser	His	Lys	Thr	Asn
	1535					1540					1545			
Ile	Asn	Leu	Leu	Ile	Asn	Ser	Ala	Thr	Arg	Asn	Asp	Gly	Met	Tyr
	1550					1555					1560			
Leu	Asn	Ala	Pro	Tyr	Gly	Gln	Lys	Gly	Tyr	Lys	Arg	Glu	Thr	Ser
	1565					1570					1575			
Ser	Arg	Phe	Tyr	Asn	Glu	Lys	Leu	Val	Thr	Val	Ser	Gln	Gln	Tyr
	1580					1585					1590			
Tyr	Asp	Asn	Lys	Gly	Val	Ile	Trp	Asn	Leu	Ile	Thr	Leu	Asn	Gly
	1595					1600					1605			
Lys	Lys	Leu	Trp	Val	Asp	Ser	Arg	Ala	Phe	Ala	Thr	Val	Ile	Asp
	1610					1615					1620			
Lys	Lys	Val	Asn	Gln	Ser	Leu	Tyr	Ile	Asn	Ser	Arg	Asn	Asp	Gly
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Met	Tyr	Leu	Asn	Ala	Pro	Tyr	Arg	Ala	Gln	Gly	Ala	Lys	Arg	Tyr
	1640					1645					1650			
Ala	Ser	Thr	Lys	Thr	Tyr	Thr	Gly	Gln	Arg	Val	Gln	Val	Thr	Leu
	1655					1660					1665			

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Gln Arg Lys Asp Thr His Gly Val Thr Trp Tyr Leu Thr Lys Val  
 1670 1675 1680  
 Asp Ser Lys Gln Leu Trp Val Asp Ser His Ala Phe Ala Pro Thr  
 1685 1690 1695  
 Phe Thr Arg Asn Val Ser Leu Asn Val Lys Val Asn Ser Ser Lys  
 1700 1705 1710  
 Arg Asn Asp Gly Ile Tyr Leu Asn Ala Pro Tyr Gly Asn Lys Lys  
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 Ala Lys Arg Ile Ala Ser Thr Lys Ala Tyr Asn Gly Lys Arg Val  
 1730 1735 1740  
 Lys Ala Ser Lys Glu Tyr Lys Asp Ala Lys Gly Val Thr Trp Tyr  
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Phe

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