

SEQUENCE LISTING

<110> Roquette Frères

<120> Procédé d'obtention de fibres solubles par voie enzymatique

<130> B2121027FR and B2121028FR

<160> 2

<170> PatentIn version 3.5

<210> 1

<211> 881

<212> PRT

<213> lactobacillus mucosae

<400> 1

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

Asn	Gly	Asn	Thr	Val	Leu	Lys	Thr	Leu	Gly	Pro	Gly	Thr	Trp	Glu	Asn
			20					25					30		

Met	Ala	Phe	Ala	Gln	Asp	Ser	Ser	Ala	Ile	Asn	Asn	Ile	Asn	Gly	Tyr
		35					40					45			

Leu	Ser	Tyr	Thr	Gly	Trp	Tyr	Arg	Pro	Tyr	Gly	Thr	Ser	Gln	Asp	Gly
	50					55					60				

Lys	Thr	Trp	Tyr	Gln	Thr	Thr	Ala	Met	Asp	Trp	Arg	Pro	Leu	Leu	Met
65					70					75					80

Tyr	Thr	Trp	Pro	Ser	Lys	Asp	Val	Gln	Ala	Gln	Phe	Ile	Lys	Tyr	Phe
				85					90					95	

Val	Asn	His	Gly	Tyr	Glu	Asn	Ala	Asn	Tyr	Gly	Leu	Thr	Lys	Val	Ser
			100					105					110		

Val	Ala	Asn	Leu	Asn	Lys	Asp	Thr	Asp	Ala	Thr	Val	Leu	Asn	Thr	Ala
		115					120					125			

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

Gly Thr Gly Lys Leu Ala Asn Asp Ile Asn Gly Phe Ala Ala Thr Val
145 150 155 160

Pro Glu Leu Ser Ala Ser Ser Glu Leu Ser Leu Gln Ser Met Pro Asn
165 170 175

Tyr Lys Pro Asp Glu Ser Gly Thr Val Asp Ser Asp Gln Val Ile Phe
180 185 190

Val Asn Asn Asp Ser Lys Asp Gln Arg Arg Gly Asn Thr Ser Tyr Ala
195 200 205

Asp Ser Lys Tyr Arg Leu Met Asn Arg Thr Ile Asn Asn Gln Thr Gly
210 215 220

Asn Asp Asn Ser Asp Asn Ser Pro Glu Leu Leu Val Gly Asn Asp Ile
225 230 235 240

Asp Asn Ser Asn Pro Val Val Gln Ala Glu Asn Leu Asn Trp Glu Tyr
245 250 255

Phe Leu Leu Asn Tyr Gly Lys Leu Met Gly Tyr Asn Gln Asp Gly Asn
260 265 270

Phe Asp Gly Phe Arg Ile Asp Ala Ala Asp Asn Ile Asn Ala Asp Val
275 280 285

Leu Asp Gln Met Gly Gln Leu Met Asn Asp Met Tyr His Met Lys Gly
290 295 300

Asn Pro Gln Asn Ala Asn Asn His Leu Ser Tyr Asn Glu Gly Tyr His
305 310 315 320

Ser Gly Ala Ala Gln Met Leu Asn Glu Lys Gly Asn Pro Gln Leu Tyr
325 330 335

Met Asp Ser Gly Glu Phe Tyr Thr Leu Glu Asn Val Leu Gly Arg Ala
340 345 350

Asn Asn Arg Asp Asn Ile Ser Asp Leu Val Thr Asn Ser Ile Val Asn

355

360

365

Arg Gln Asn Asp Val Thr Glu Asn Glu Ala Thr Pro Asn Trp Ser Phe
 370 375 380

Val Thr Asn His Asp Gln Arg Lys Asn Leu Ile Asn Arg Leu Ile Ile
 385 390 395 400

Lys Asp His Pro Gly Ile Ala Tyr Ile Met Gly Ser Ala Tyr Lys Ala
 405 410 415

Glu Tyr Ala Asn Gln Ala Trp Gln Glu Phe Tyr Ala Asp Gln Lys Lys
 420 425 430

Thr Asp Lys Gln Tyr Ala Gln Tyr Asn Val Pro Ala Gln Tyr Ala Ile
 435 440 445

Leu Leu Ser Asn Lys Asp Thr Val Pro Gln Ile Tyr Tyr Gly Asp Leu
 450 455 460

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

Ala Ile Thr Thr Leu Met Lys Ala Arg Lys Gln Phe Val Ser Gly Gly
 485 490 495

Gln Thr Met Thr Lys Leu Ser Asp Asn Leu Ile Ala Ser Val Arg Tyr
 500 505 510

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

Arg Thr Ser Gly Met Ala Val Ile Val Gly Asn Asn Pro Gln Met Ala
 530 535 540

Glu Gln Thr Ile Ser Ile Asn Met Gly Arg Ala His Ala Asn Glu Gln
 545 550 555 560

Tyr Arg Asn Leu Leu Asp Thr Thr Asp Asn Gly Leu Thr Tyr Asn Ala
 565 570 575

Asp Gly Ala Glu Asn Pro Glu Thr Leu Thr Thr Asp Asp Asn Gly Ile
580 585 590

Leu Lys Val Thr Val Lys Gly Tyr Ser Asn Pro Tyr Val Ser Gly Tyr
595 600 605

Leu Gly Val Trp Val Pro Val Val Ser Gly Asn Gln Asp Val Thr Thr
610 615 620

Asn Ala Ala Thr Val Ser Ala Asp Ser Asn Lys Ile Phe Glu Ser Asn
625 630 635 640

Ala Ala Leu Asp Ser His Met Ile Tyr Glu Asp Phe Ser Leu Tyr Gln
645 650 655

Pro Glu Pro Thr Ser Thr Glu Asn His Ala Tyr Asn Ile Ile Ala Gln
660 665 670

Asn Ala Glu Leu Phe Asn Asn Leu Gly Ile Thr Asp Phe Trp Met Ala
675 680 685

Pro Ala Tyr Thr Pro Phe Gly Met Ser Arg Tyr Asn Glu Gly Tyr Ser
690 695 700

Met Thr Asp Arg Tyr Asn Leu Gly Thr Asn Ala Asn Pro Thr Lys Tyr
705 710 715 720

Gly Ser Gly Glu Glu Leu Ala Asn Ala Ile Ala Ala Leu His Ser Ala
725 730 735

Gly Leu Lys Val Gln Glu Asp Ile Val Met Asn Gln Met Ile Gly Phe
740 745 750

Ser Gly Gln Glu Ala Val Thr Val Thr Arg Thr Asp Asp Arg Gly Met
755 760 765

Gln Ile Tyr Val Asn Gly Lys Thr Tyr Ala Asn Gln Ile Tyr Phe Ala
770 775 780

Tyr Thr Thr Gly Gly Gly Asn Gly Gln Glu Thr Tyr Gly Gly Lys Tyr

785 790 795 800

Leu Ser Glu Leu Gln Ser Lys Tyr Pro Asp Leu Phe Thr Thr Lys Ala
805 810 815

Ile Ser Thr Gly Val Ala Pro Asp Pro Thr Thr His Ile Thr Lys Trp
820 825 830

Ser Ala Lys Tyr Glu Asn Gly Thr Ser Leu Gln Asn Ile Gly Ile Gly
835 840 845

Leu Ala Val Lys Leu Pro Asn Gly Glu Tyr Ala Tyr Leu Arg Ser Ser
850 855 860

Asp Asn Lys Ser Phe Asn Thr Leu Leu Pro Ser Glu Ile Ser Val Lys
865 870 875 880

Leu

 $\langle 210 \rangle$ 2

<211> 1593

<212> PRT

<213> Lactobacillus fermentum

<400> 2

Met Glu Phe Lys Lys His Phe Lys Leu Tyr Lys Ser Gly Lys Gln Trp
1 5 10 15

Cys Ile Ala Ala Val Val Thr Phe Thr Ala Thr Leu Gly Leu Val Ala
20 25 30

Gly Asn Thr Thr Val Asn Ala Asp Thr Leu Thr Thr Gly Gly Ser Thr
35 40 45

Pro Gln Ala Gln Val Asn Gln Glu Lys Gly Ile Thr Asn Thr Ser Gln
50 55 60

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

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

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

Glu Lys Gly Ile Thr Asn Thr Ser Gln Pro Ala Ser Asp Gln Gly Lys
115 120 125

Thr Ser Asn Thr Gly Asp Val Arg Asn Thr Val Pro Gln Pro Asn Asn
130 135 140

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

Ala Gly Asn Asp Asn Gly Ser Thr Gly Asn Asn Asp Gln Asn Lys Gly
165 170 175

Gln Gln Thr Thr Asp Trp Gln Lys Asn Ala Asn Asn Gln Trp Val Tyr
180 185 190

Asn Gly Lys Thr Asp Gln Asp Leu Lys Gly Thr Gln Tyr Val Gln Leu
195 200 205

Pro Thr Ile Pro Asp Thr Asn Val Gln Gly Asn Thr Asn Trp Tyr Phe
210 215 220

Val Lys Asp Gly Ile Ala Gln Ser Gly Val Gln Gln Trp Ala Gly Thr
225 230 235 240

Tyr Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu Arg Val Asp Asn Asp Tyr
245 250 255

Arg Gln Ser Gln Trp Gly Asp Trp Tyr Leu Phe Gly Asn Asp Gly Arg
260 265 270

Ile Leu Ser Gly Val Gln Gln Trp Ala Gly Thr Tyr Tyr Tyr Phe Asp
275 280 285

Pro Thr Thr Tyr Leu Arg Val Asp Asp Asp Tyr Val Thr Ser Gln Trp
290 295 300

Gly Leu Lys Tyr Met Phe Gly Lys Asp Gly Arg Ile Ala Thr Gly Leu
305 310 315 320

Tyr Lys Trp Asp Lys Asn Asn Gln Trp Tyr Tyr Phe Asn Pro Thr Thr
325 330 335

Tyr Leu Ala Val Thr Asn Asn Tyr Ile Gln Ala Asn Asp Gly His Trp
340 345 350

Tyr Leu Phe Thr Ala Asp Gly Thr Ala Ala Ser Arg Val Ala Lys Trp
355 360 365

Ala Gly Thr Tyr Tyr Tyr Phe Asp Pro Gln Thr His Leu Arg Val Asp
370 375 380

Asp Asn Tyr Val Gln Ser Gln Trp Gly Asp Trp Tyr Met Phe Gly Lys
385 390 395 400

Asp Gly Arg Ile Ala Thr Gly Leu Tyr Lys Trp Asp Lys Asn Asn Gln
405 410 415

Trp Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu Ala Val Thr Asn Asn Tyr
420 425 430

Ile Gln Ala Asn Asp Gly His Trp Tyr Leu Phe Thr Ala Asp Gly Thr
435 440 445

Ala Ala Ser Arg Val Ala Lys Trp Ala Gly Thr Tyr Tyr Tyr Phe Asp
450 455 460

Pro Val Thr His Leu Arg Val Asp Asn Asn Tyr Val Gln Ser Gln Trp
465 470 475 480

Gly Asp Trp Tyr Leu Phe Gly Asn Asp Gly Arg Ile Leu Ser Gly Val
485 490 495

Gln Gln Trp Ala Gly Thr Tyr Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu
500 505 510

Arg Val Asp Asp Asp Tyr Val Thr Ser Gln Trp Gly Leu Lys Tyr Met
515 520 525

Phe Gly Lys Asp Gly Arg Ile Ala Thr Gly Leu Tyr Lys Trp Asp Lys
530 535 540

Asn Asn Gln Trp Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu Ala Val Thr
545 550 555 560

Asn Asn Tyr Ile Gln Ala Asn Asp Gly His Trp Tyr Leu Phe Thr Ala
565 570 575

Asp Gly Thr Ala Ala Ser Arg Val Ala Lys Trp Ala Gly Thr Tyr Tyr
580 585 590

Tyr Phe Asp Pro Gln Thr His Leu Arg Val Asp Asp Asn Tyr Val Gln
595 600 605

Ser Gln Trp Gly Asp Trp Tyr Met Phe Gly Lys Asp Gly Arg Ile Ala
610 615 620

Thr Gly Leu Tyr Lys Trp Asp Lys Asn Asn Gln Trp Tyr Tyr Phe Asp
625 630 635 640

Pro Val Thr Tyr Leu Lys Val Thr Asn Lys Trp Val Asp Gly Asn Tyr
645 650 655

Tyr Asp Glu Asp Gly Ala Gln Ala Ile Ser Lys Leu Val Thr Ile Asn
660 665 670

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

Phe Arg Thr Ile His Gly Asp Lys Tyr Tyr Phe Gly Asn Asp Ser Ala
690 695 700

Ala Val Thr Gly Gln Gln Thr Ile Asp Gly Lys Val Tyr Lys Phe Ser
705 710 715 720

Asn Tyr Gly Tyr Leu Leu Gly Asn Arg Tyr Gly Lys Ile Glu Asn Gly
725 730 735

Lys Leu Asn Ile Tyr Ser Leu Ala Asp His Ser Leu Ile Lys Thr Val
740 745 750

Glu Ala Gly Pro Trp Glu Asn Met Ala Tyr Ser Met Asp Ser Asn Ser
755 760 765

Ile Asn Asn Ile Asp Gly Tyr Ile Ser Tyr Thr Gly Trp Tyr Arg Pro
770 775 780

Tyr Gly Thr Ser Gln Asp Gly Lys Thr Trp Tyr Pro Thr Thr Val Ala
785 790 795 800

Asp Trp Arg Pro Ile Leu Met Tyr Val Trp Pro Ser Lys Asp Val Gln
805 810 815

Val Lys Phe Ile Gln Tyr Phe Val Asn His Gly Tyr Glu Asn Ser Asn
820 825 830

Tyr Gly Leu Thr Ala Gly Ser Val Lys Asp Leu Ser Glu Asn Thr Ala
835 840 845

Ser Ile Asn Leu Asn Glu Val Ala Gln Asn Leu Arg Tyr Val Ile Glu
850 855 860

Gln His Ile Val Ala Ala Lys Ser Thr Ser Gln Leu Ala Asn Asp Ile
865 870 875 880

Asn Asn Phe Ile Thr Thr Ile Pro Glu Leu Ser Ala Ser Ser Glu Leu
885 890 895

Pro Asp Glu Ser Gly Ser Gly Gln Val Ile Phe Val Asn Asn Asp Asn
900 905 910

Thr Ser Tyr Ala Asp Ser Lys Tyr Arg Leu Met Asn Arg Thr Val Asn
915 920 925

Asn Gln Thr Gly Asn Asp Asn Ser Asp Tyr Cys Pro Glu Phe Val Val
930 935 940

Gly Asn Asp Ile Asp Asn Ser Asn Pro Val Val Gln Ala Glu Asn Leu
945 950 955 960

Asn Trp Glu Tyr Phe Leu Leu Asn Tyr Gly Lys Leu Met Gly Tyr Asn
965 970 975

Gln Asp Gly Asn Phe Asp Gly Phe Arg Ile Asp Ala Ala Asp Asp Met
980 985 990

Asp Ala Asp Val Leu Asp Gln Ile Gly Gln Leu Met Asn Asp Met Tyr
995 1000 1005

His Met Lys Gly Asn Pro Gln Asn Ala Asn Asn His Leu Ser Tyr
1010 1015 1020

Asn Glu Gly Tyr Gly Pro Gly Ala Ala Arg Met Leu Asn Lys Lys
1025 1030 1035

Gly Asn Pro Gln Leu Phe Met Asp Ala Arg Glu Cys Asn Thr Leu
1040 1045 1050

Glu Asn Val Leu Gly Arg Ala Asn Asn Arg Asp Thr Ile Ser His
1055 1060 1065

Leu Val Thr Asp Ser Ile Val Asn Arg Gln Asn Asp Val Thr Glu
1070 1075 1080

Asn Glu Ala Thr Pro Asn Trp Ser Tyr Val Thr Asn His Asp Ile
1085 1090 1095

Arg Asn Asn Leu Ile Asn Gly Leu Ile Ile Lys Asp His Pro Gly
1100 1105 1110

Met Gly Ser Ala Tyr Lys Ala Glu Tyr Ala Asn Gln Ala Trp Gln
1115 1120 1125

Glu Phe Tyr Ala Asp Gln Lys Lys Thr Asp Lys Gln Tyr Ala Gln
1130 1135 1140

Tyr Asn Val Pro Ala Gln Tyr Ala Ile Leu Leu Ser Asn Lys Asp
1145 1150 1155

Thr	Val	Pro	Gln	Ile	Tyr	Tyr	Gly	Asp	Leu	Tyr	Asn	Glu	Thr	Ala
1160						1165					1170			
Gln	Tyr	Met	Gln	Glu	Lys	Ser	Ile	Tyr	Tyr	Asp	Ala	Ile	Thr	Thr
1175						1180					1185			
Leu	Met	Lys	Ala	Arg	Lys	Gln	Phe	Val	Ser	Gly	Gly	Gln	Thr	Met
1190						1195					1200			
Thr	Lys	Leu	Ser	Asp	Asn	Leu	Ile	Ala	Ser	Val	Arg	Tyr	Gly	Lys
1205						1210					1215			
Gly	Val	Ala	Asn	Ala	Asn	Ser	Glu	Gly	Thr	Asp	Ser	Leu	Ser	Arg
1220						1225					1230			
Thr	Ser	Gly	Met	Ala	Val	Ile	Val	Gly	Asn	Asn	Pro	Gln	Met	Ala
1235						1240					1245			
Glu	Gln	Thr	Ile	Ser	Ile	Asn	Met	Gly	Arg	Ala	His	Ala	Asn	Glu
1250						1255					1260			
Gln	Tyr	Arg	Asn	Leu	Leu	Asp	Thr	Thr	Asp	Asn	Gly	Leu	Thr	Tyr
1265						1270					1275			
Asn	Ala	Asp	Gly	Ala	Glu	Asn	Pro	Glu	Thr	Leu	Thr	Thr	Asp	Asp
1280						1285					1290			
Asn	Gly	Ile	Leu	Lys	Val	Thr	Val	Lys	Gly	Tyr	Ser	Asn	Pro	Tyr
1295						1300					1305			
Val	Ser	Gly	Tyr	Leu	Gly	Val	Trp	Val	Pro	Val	Ala	Ser	Gly	Asn
1310						1315					1320			
Gln	Asp	Val	Thr	Thr	Asn	Ala	Ala	Thr	Val	Ser	Ala	Asp	Ser	Asn
1325						1330					1335			
Lys	Ile	Phe	Glu	Ser	Asn	Ala	Ala	Leu	Asp	Ser	His	Met	Ile	Tyr
1340						1345					1350			

Glu Asp Phe Ser Met Tyr Gln Pro Lys Pro Thr Ser Thr Glu Asn
1355 1360 1365

His Ala Tyr Asn Ile Ile Ala Gln Asn Ala Glu Leu Phe Asn Asn
1370 1375 1380

Leu Gly Ile Thr Asp Phe Trp Met Ala Pro Ala Tyr Thr Gln Ala
1385 1390 1395

Gly Thr Ser Arg Tyr Asn Glu Gly Tyr Ser Val Ala Asp Arg Tyr
1400 1405 1410

Asn Leu Gly Thr Asn Ala Asn Pro Thr Lys Tyr Gly Ser Gly Glu
1415 1420 1425

Glu Leu Ala Asn Ala Ile Ala Ala Leu His Ser Ala Gly Leu Lys
1430 1435 1440

Val Gln Glu Asp Ile Val Met Asn Gln Met Ile Gly Leu Pro Gly
1445 1450 1455

Gln Glu Ala Val Thr Val Thr Arg Ala Asp Asn Arg Gly Met Gln
1460 1465 1470

Thr Tyr Val Asn Gly Lys Thr Tyr Ala Asn Gln Met Tyr Phe Ala
1475 1480 1485

Tyr Thr Thr Gly Gly Gly Asn Gly Gln Glu Thr Tyr Gly Gly Lys
1490 1495 1500

Tyr Leu Ser Glu Leu Gln Ser Lys Tyr Pro Asp Leu Phe Thr Thr
1505 1510 1515

Arg Ala Ile Ser Thr Gly Val Ala Pro Asp Pro Thr Thr His Ile
1520 1525 1530

Thr Lys Trp Ser Ala Lys Tyr Glu Asn Gly Thr Ser Leu Gln Asn
1535 1540 1545

Ile Gly Ile Gly Leu Ala Val Lys Leu Ala Asn Gly Asp Tyr Ala
1550 1555 1560

Tyr	Leu	Asn	Asp	Ser	Asn	Asn	Lys	Ala	Phe	Asn	Thr	Thr	Leu	Pro
1565						1570					1575			

Glu	Thr	Met	Ser	Ser	Thr	Asp	Tyr	Tyr	Ala	Asn	Ile	Glu	Asp	Asn
1580						1585					1590			

LISTADO DE SECUENCIAS

<110> Roquette Frères

<120> Método para la producción enzimática de fibras solubles

<130> B2121027FR y B2121028FR

<160> 2

<170> PatentIn version 3.5

 $\langle 210 \rangle \quad 1$

<211> 881

<212> PRT

<213> Lactobacillus mucosae

 $\langle 400 \rangle \quad 1$

Met Lys Asn Leu Val Ala Lys Pro Gln Gly Asn Gln Leu Asn Ile Tyr

1 5 10 15

Asn Gly Asn Thr Val Leu Lys Thr Leu Gly Pro Gly Thr Trp Glu Asn

20 25 30

Met Ala Phe Ala Gln Asp Ser Ser Ala Ile Asn Asn Ile Asn Gly Tyr

35 40 45

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

50

55

60

Lys Thr Trp Tyr Gln Thr Thr Ala Met Asp Trp Arg Pro Leu Leu Met

65

70

75

80

Tyr Thr Trp Pro Ser Lys Asp Val Gln Ala Gln Phe Ile Lys Tyr Phe

85

90

95

Val Asn His Gly Tyr Glu Asn Ala Asn Tyr Gly Leu Thr Lys Val Ser

100

105

110

Val Ala Asn Leu Asn Lys Asp Thr Asp Ala Thr Val Leu Asn Thr Ala

115

120

125

Ala Gln Asn Leu Arg Tyr Val Ile Glu Gln Ser Ile Ala Thr Asn Lys

130

135

140

Gly Thr Gly Lys Leu Ala Asn Asp Ile Asn Gly Phe Ala Ala Thr Val

145

150

155

160

Pro Glu Leu Ser Ala Ser Ser Glu Leu Ser Leu Gln Ser Met Pro Asn
165 170 175

Tyr Lys Pro Asp Glu Ser Gly Thr Val Asp Ser Asp Gln Val Ile Phe
180 185 190

Val Asn Asn Asp Ser Lys Asp Gln Arg Arg Gly Asn Thr Ser Tyr Ala
195 200 205

Asp Ser Lys Tyr Arg Leu Met Asn Arg Thr Ile Asn Asn Gln Thr Gly
210 215 220

Asn Asp Asn Ser Asp Asn Ser Pro Glu Leu Leu Val Gly Asn Asp Ile
225 230 235 240

Asp Asn Ser Asn Pro Val Val Gln Ala Glu Asn Leu Asn Trp Glu Tyr
245 250 255

Phe Leu Leu Asn Tyr Gly Lys Leu Met Gly Tyr Asn Gln Asp Gly Asn
260 265 270

Phe Asp Gly Phe Arg Ile Asp Ala Ala Asp Asn Ile Asn Ala Asp Val
275 280 285

Leu Asp Gln Met Gly Gln Leu Met Asn Asp Met Tyr His Met Lys Gly
290 295 300

Asn Pro Gln Asn Ala Asn Asn His Leu Ser Tyr Asn Glu Gly Tyr His
305 310 315 320

Ser Gly Ala Ala Gln Met Leu Asn Glu Lys Gly Asn Pro Gln Leu Tyr
325 330 335

Met Asp Ser Gly Glu Phe Tyr Thr Leu Glu Asn Val Leu Gly Arg Ala
340 345 350

Asn Asn Arg Asp Asn Ile Ser Asp Leu Val Thr Asn Ser Ile Val Asn
355 360 365

Arg Gln Asn Asp Val Thr Glu Asn Glu Ala Thr Pro Asn Trp Ser Phe
370 375 380

Val Thr Asn His Asp Gln Arg Lys Asn Leu Ile Asn Arg Leu Ile Ile

385					390					395						400
Lys	Asp	His	Pro	Gly	Ile	Ala	Tyr	Ile	Met	Gly	Ser	Ala	Tyr	Lys	Ala	
				405					410					415		
Glu	Tyr	Ala	Asn	Gln	Ala	Trp	Gln	Glu	Phe	Tyr	Ala	Asp	Gln	Lys	Lys	
			420					425					430			
Thr	Asp	Lys	Gln	Tyr	Ala	Gln	Tyr	Asn	Val	Pro	Ala	Gln	Tyr	Ala	Ile	
		435					440					445				
Leu	Leu	Ser	Asn	Lys	Asp	Thr	Val	Pro	Gln	Ile	Tyr	Tyr	Gly	Asp	Leu	
	450					455					460					
Tyr	Asn	Glu	Thr	Ala	Gln	Tyr	Met	Gln	Gly	Lys	Ser	Ile	Tyr	Tyr	Asp	
465					470					475					480	
Ala	Ile	Thr	Thr	Leu	Met	Lys	Ala	Arg	Lys	Gln	Phe	Val	Ser	Gly	Gly	
				485					490					495		
Gln	Thr	Met	Thr	Lys	Leu	Ser	Asp	Asn	Leu	Ile	Ala	Ser	Val	Arg	Tyr	
				500				505					510			

Gly Lys Gly Val Ala Asn Ala Asn Ser Glu Gly Thr Asp Ser Leu Ser

515

520

525

Arg Thr Ser Gly Met Ala Val Ile Val Gly Asn Asn Pro Gln Met Ala

530

535

540

Glu Gln Thr Ile Ser Ile Asn Met Gly Arg Ala His Ala Asn Glu Gln

545

550

555

560

Tyr Arg Asn Leu Leu Asp Thr Thr Asp Asn Gly Leu Thr Tyr Asn Ala

565

570

575

Asp Gly Ala Glu Asn Pro Glu Thr Leu Thr Thr Asp Asp Asn Gly Ile

580

585

590

Leu Lys Val Thr Val Lys Gly Tyr Ser Asn Pro Tyr Val Ser Gly Tyr

595

600

605

Leu Gly Val Trp Val Pro Val Val Ser Gly Asn Gln Asp Val Thr Thr

610

615

620

Asn Ala Ala Thr Val Ser Ala Asp Ser Asn Lys Ile Phe Glu Ser Asn
625 630 635 640

Ala Ala Leu Asp Ser His Met Ile Tyr Glu Asp Phe Ser Leu Tyr Gln
645 650 655

Pro Glu Pro Thr Ser Thr Glu Asn His Ala Tyr Asn Ile Ile Ala Gln
660 665 670

Asn Ala Glu Leu Phe Asn Asn Leu Gly Ile Thr Asp Phe Trp Met Ala
675 680 685

Pro Ala Tyr Thr Pro Phe Gly Met Ser Arg Tyr Asn Glu Gly Tyr Ser
690 695 700

Met Thr Asp Arg Tyr Asn Leu Gly Thr Asn Ala Asn Pro Thr Lys Tyr
705 710 715 720

Gly Ser Gly Glu Glu Leu Ala Asn Ala Ile Ala Ala Leu His Ser Ala
725 730 735

Gly Leu Lys Val Gln Glu Asp Ile Val Met Asn Gln Met Ile Gly Phe
740 745 750

Ser Gly Gln Glu Ala Val Thr Val Thr Arg Thr Asp Asp Arg Gly Met
755 760 765

Gln Ile Tyr Val Asn Gly Lys Thr Tyr Ala Asn Gln Ile Tyr Phe Ala
770 775 780

Tyr Thr Thr Gly Gly Gly Asn Gly Gln Glu Thr Tyr Gly Gly Lys Tyr
785 790 795 800

Leu Ser Glu Leu Gln Ser Lys Tyr Pro Asp Leu Phe Thr Thr Lys Ala
805 810 815

Ile Ser Thr Gly Val Ala Pro Asp Pro Thr Thr His Ile Thr Lys Trp
820 825 830

Ser Ala Lys Tyr Glu Asn Gly Thr Ser Leu Gln Asn Ile Gly Ile Gly
835 840 845

Leu Ala Val Lys Leu Pro Asn Gly Glu Tyr Ala Tyr Leu Arg Ser Ser

850

855

860

Asp Asn Lys Ser Phe Asn Thr Leu Leu Pro Ser Glu Ile Ser Val Lys

865

870

875

880

Leu

<210> 2

<211> 1593

<212> PRT

<213> Lactobacillus fermentum

<400> 2

Met Glu Phe Lys Lys His Phe Lys Leu Tyr Lys Ser Gly Lys Gln Trp

1

5

10

15

Cys Ile Ala Ala Val Val Thr Phe Thr Ala Thr Leu Gly Leu Val Ala

20

25

30

Gly Asn Thr Thr Val Asn Ala Asp Thr Leu Thr Thr Gly Gly Ser Thr

35

40

45

Pro Gln Ala Gln Val Asn Gln Glu Lys Gly Ile Thr Asn Thr Ser Gln
50 55 60

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

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

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

Glu Lys Gly Ile Thr Asn Thr Ser Gln Pro Ala Ser Asp Gln Gly Lys
115 120 125

Thr Ser Asn Thr Gly Asp Val Arg Asn Thr Val Pro Gln Pro Asn Asn
130 135 140

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

Ala Gly Asn Asp Asn Gly Ser Thr Gly Asn Asn Asp Gln Asn Lys Gly
165 170 175

Gln Gln Thr Thr Asp Trp Gln Lys Asn Ala Asn Asn Gln Trp Val Tyr
180 185 190

Asn Gly Lys Thr Asp Gln Asp Leu Lys Gly Thr Gln Tyr Val Gln Leu
195 200 205

Pro Thr Ile Pro Asp Thr Asn Val Gln Gly Asn Thr Asn Trp Tyr Phe
210 215 220

Val Lys Asp Gly Ile Ala Gln Ser Gly Val Gln Gln Trp Ala Gly Thr
225 230 235 240

Tyr Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu Arg Val Asp Asn Asp Tyr
245 250 255

Arg Gln Ser Gln Trp Gly Asp Trp Tyr Leu Phe Gly Asn Asp Gly Arg
260 265 270

Ile Leu Ser Gly Val Gln Gln Trp Ala Gly Thr Tyr Tyr Tyr Phe Asp

275		280		285
Pro	Thr	Thr	Tyr	Leu
		Arg	Val	Asp
		Asp	Asp	Asp
		Tyr	Val	Thr
		Ser	Gln	Trp
290		295		300
Gly	Leu	Lys	Tyr	Met
		Phe	Gly	Lys
		Asp	Gly	Arg
		Ile	Ala	Thr
		Gly	Leu	
305		310		315
				320
Tyr	Lys	Trp	Asp	Lys
		Asn	Asn	Gln
		Trp	Tyr	Tyr
		Phe	Asn	Pro
		Thr	Thr	
		325		330
				335
Tyr	Leu	Ala	Val	Thr
		Asn	Asn	Tyr
		Ile	Gln	Ala
		Asn	Asp	Gly
		His	Trp	
		340		345
				350
Tyr	Leu	Phe	Thr	Ala
		Asp	Gly	Thr
		Ala	Ala	Ser
		Arg	Val	Ala
		Lys	Trp	
		355		360
				365
Ala	Gly	Thr	Tyr	Tyr
		Tyr	Phe	Asp
		Pro	Gln	Thr
		His	Leu	Arg
		Val	Asp	
		370		375
				380
Asp	Asn	Tyr	Val	Gln
		Ser	Gln	Trp
		Gly	Asp	Trp
		Tyr	Met	Phe
		Gly	Lys	
		385		390
				395
				400

Asp Gly Arg Ile Ala Thr Gly Leu Tyr Lys Trp Asp Lys Asn Asn Gln

405

410

415

Trp Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu Ala Val Thr Asn Asn Tyr

420

425

430

Ile Gln Ala Asn Asp Gly His Trp Tyr Leu Phe Thr Ala Asp Gly Thr

435

440

445

Ala Ala Ser Arg Val Ala Lys Trp Ala Gly Thr Tyr Tyr Tyr Phe Asp

450

455

460

Pro Val Thr His Leu Arg Val Asp Asn Asn Tyr Val Gln Ser Gln Trp

465

470

475

480

Gly Asp Trp Tyr Leu Phe Gly Asn Asp Gly Arg Ile Leu Ser Gly Val

485

490

495

Gln Gln Trp Ala Gly Thr Tyr Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu

500

505

510

Arg Val Asp Asp Asp Tyr Val Thr Ser Gln Trp Gly Leu Lys Tyr Met
515 520 525

Phe Gly Lys Asp Gly Arg Ile Ala Thr Gly Leu Tyr Lys Trp Asp Lys
530 535 540

Asn Asn Gln Trp Tyr Tyr Phe Asp Pro Thr Thr Tyr Leu Ala Val Thr
545 550 555 560

Asn Asn Tyr Ile Gln Ala Asn Asp Gly His Trp Tyr Leu Phe Thr Ala
565 570 575

Asp Gly Thr Ala Ala Ser Arg Val Ala Lys Trp Ala Gly Thr Tyr Tyr
580 585 590

Tyr Phe Asp Pro Gln Thr His Leu Arg Val Asp Asp Asn Tyr Val Gln
595 600 605

Ser Gln Trp Gly Asp Trp Tyr Met Phe Gly Lys Asp Gly Arg Ile Ala
610 615 620

Thr Gly Leu Tyr Lys Trp Asp Lys Asn Asn Gln Trp Tyr Tyr Phe Asp
625 630 635 640

Pro Val Thr Tyr Leu Lys Val Thr Asn Lys Trp Val Asp Gly Asn Tyr
645 650 655

Tyr Asp Glu Asp Gly Ala Gln Ala Ile Ser Lys Leu Val Thr Ile Asn
660 665 670

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

Phe Arg Thr Ile His Gly Asp Lys Tyr Tyr Phe Gly Asn Asp Ser Ala
690 695 700

Ala Val Thr Gly Gln Gln Thr Ile Asp Gly Lys Val Tyr Lys Phe Ser
705 710 715 720

Asn Tyr Gly Tyr Leu Leu Gly Asn Arg Tyr Gly Lys Ile Glu Asn Gly
725 730 735

Lys Leu Asn Ile Tyr Ser Leu Ala Asp His Ser Leu Ile Lys Thr Val

740

745

750

Glu Ala Gly Pro Trp Glu Asn Met Ala Tyr Ser Met Asp Ser Asn Ser

755

760

765

Ile Asn Asn Ile Asp Gly Tyr Ile Ser Tyr Thr Gly Trp Tyr Arg Pro

770

775

780

Tyr Gly Thr Ser Gln Asp Gly Lys Thr Trp Tyr Pro Thr Thr Val Ala

785

790

795

800

Asp Trp Arg Pro Ile Leu Met Tyr Val Trp Pro Ser Lys Asp Val Gln

805

810

815

Val Lys Phe Ile Gln Tyr Phe Val Asn His Gly Tyr Glu Asn Ser Asn

820

825

830

Tyr Gly Leu Thr Ala Gly Ser Val Lys Asp Leu Ser Glu Asn Thr Ala

835

840

845

Ser Ile Asn Leu Asn Glu Val Ala Gln Asn Leu Arg Tyr Val Ile Glu

850

855

860

Gln His Ile Val Ala Ala Lys Ser Thr Ser Gln Leu Ala Asn Asp Ile
865 870 875 880

Asn Asn Phe Ile Thr Thr Ile Pro Glu Leu Ser Ala Ser Ser Glu Leu
885 890 895

Pro Asp Glu Ser Gly Ser Gly Gln Val Ile Phe Val Asn Asn Asp Asn
900 905 910

Thr Ser Tyr Ala Asp Ser Lys Tyr Arg Leu Met Asn Arg Thr Val Asn
915 920 925

Asn Gln Thr Gly Asn Asp Asn Ser Asp Tyr Cys Pro Glu Phe Val Val
930 935 940

Gly Asn Asp Ile Asp Asn Ser Asn Pro Val Val Gln Ala Glu Asn Leu
945 950 955 960

Asn Trp Glu Tyr Phe Leu Leu Asn Tyr Gly Lys Leu Met Gly Tyr Asn
965 970 975

Gln Asp Gly Asn Phe Asp Gly Phe Arg Ile Asp Ala Ala Asp Asp Met
980 985 990

Asp Ala Asp Val Leu Asp Gln Ile Gly Gln Leu Met Asn Asp Met Tyr
995 1000 1005

His Met Lys Gly Asn Pro Gln Asn Ala Asn Asn His Leu Ser Tyr
1010 1015 1020

Asn Glu Gly Tyr Gly Pro Gly Ala Ala Arg Met Leu Asn Lys Lys
1025 1030 1035

Gly Asn Pro Gln Leu Phe Met Asp Ala Arg Glu Cys Asn Thr Leu
1040 1045 1050

Glu Asn Val Leu Gly Arg Ala Asn Asn Arg Asp Thr Ile Ser His
1055 1060 1065

Leu Val Thr Asp Ser Ile Val Asn Arg Gln Asn Asp Val Thr Glu
1070 1075 1080

Asn Glu Ala Thr Pro Asn Trp Ser Tyr Val Thr Asn His Asp Ile
1085 1090 1095

Arg Asn Asn Leu Ile Asn Gly Leu Ile Ile Lys Asp His Pro Gly
1100 1105 1110

Met Gly Ser Ala Tyr Lys Ala Glu Tyr Ala Asn Gln Ala Trp Gln
1115 1120 1125

Glu Phe Tyr Ala Asp Gln Lys Lys Thr Asp Lys Gln Tyr Ala Gln
1130 1135 1140

Tyr Asn Val Pro Ala Gln Tyr Ala Ile Leu Leu Ser Asn Lys Asp
1145 1150 1155

Thr Val Pro Gln Ile Tyr Tyr Gly Asp Leu Tyr Asn Glu Thr Ala
1160 1165 1170

Gln Tyr Met Gln Glu Lys Ser Ile Tyr Tyr Asp Ala Ile Thr Thr
1175 1180 1185

Leu Met Lys Ala Arg Lys Gln Phe Val Ser Gly Gly Gln Thr Met

1190		1195		1200
Thr Lys Leu Ser Asp Asn Leu Ile Ala Ser Val Arg Tyr Gly Lys				
1205		1210		1215
Gly Val Ala Asn Ala Asn Ser Glu Gly Thr Asp Ser Leu Ser Arg				
1220		1225		1230
Thr Ser Gly Met Ala Val Ile Val Gly Asn Asn Pro Gln Met Ala				
1235		1240		1245
Glu Gln Thr Ile Ser Ile Asn Met Gly Arg Ala His Ala Asn Glu				
1250		1255		1260
Gln Tyr Arg Asn Leu Leu Asp Thr Thr Asp Asn Gly Leu Thr Tyr				
1265		1270		1275
Asn Ala Asp Gly Ala Glu Asn Pro Glu Thr Leu Thr Thr Asp Asp				
1280		1285		1290
Asn Gly Ile Leu Lys Val Thr Val Lys Gly Tyr Ser Asn Pro Tyr				
1295		1300		1305

Val Ser Gly Tyr Leu Gly Val Trp Val Pro Val Ala Ser Gly Asn

1310

1315

1320

Gln Asp Val Thr Thr Asn Ala Ala Thr Val Ser Ala Asp Ser Asn

1325

1330

1335

Lys Ile Phe Glu Ser Asn Ala Ala Leu Asp Ser His Met Ile Tyr

1340

1345

1350

Glu Asp Phe Ser Met Tyr Gln Pro Lys Pro Thr Ser Thr Glu Asn

1355

1360

1365

His Ala Tyr Asn Ile Ile Ala Gln Asn Ala Glu Leu Phe Asn Asn

1370

1375

1380

Leu Gly Ile Thr Asp Phe Trp Met Ala Pro Ala Tyr Thr Gln Ala

1385

1390

1395

Gly Thr Ser Arg Tyr Asn Glu Gly Tyr Ser Val Ala Asp Arg Tyr

1400

1405

1410

Asn Leu Gly Thr Asn Ala Asn Pro Thr Lys Tyr Gly Ser Gly Glu
1415 1420 1425

Glu Leu Ala Asn Ala Ile Ala Ala Leu His Ser Ala Gly Leu Lys
1430 1435 1440

Val Gln Glu Asp Ile Val Met Asn Gln Met Ile Gly Leu Pro Gly
1445 1450 1455

Gln Glu Ala Val Thr Val Thr Arg Ala Asp Asn Arg Gly Met Gln
1460 1465 1470

Thr Tyr Val Asn Gly Lys Thr Tyr Ala Asn Gln Met Tyr Phe Ala
1475 1480 1485

Tyr Thr Thr Gly Gly Gly Asn Gly Gln Glu Thr Tyr Gly Gly Lys
1490 1495 1500

Tyr Leu Ser Glu Leu Gln Ser Lys Tyr Pro Asp Leu Phe Thr Thr
1505 1510 1515

Arg Ala Ile Ser Thr Gly Val Ala Pro Asp Pro Thr Thr His Ile
1520 1525 1530

Thr Lys Trp Ser Ala Lys Tyr Glu Asn Gly Thr Ser Leu Gln Asn
1535 1540 1545

Ile Gly Ile Gly Leu Ala Val Lys Leu Ala Asn Gly Asp Tyr Ala
1550 1555 1560

Tyr Leu Asn Asp Ser Asn Asn Lys Ala Phe Asn Thr Thr Leu Pro
1565 1570 1575

Glu Thr Met Ser Ser Thr Asp Tyr Tyr Ala Asn Ile Glu Asp Asn
1580 1585 1590