

SEQUENCE LISTING

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<120> ENGINEERED MICROORGANISMS AND METHODS FOR IMPROVED ALDEHYDE
DEHYDROGENASE ACTIVITY

<130> GNO0099/WO

<150> 62/837,888

<151> 2019-04-24

<160> 190

<170> PatentIn version 3.5

<210> 1

<211> 453

<212> PRT

<213> Clostridium kluyveri DSM555

<400> 1

Met Ser Asn Glu Val Ser Ile Lys Glu Leu Ile Glu Lys Ala Lys Val
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Ala Gln Lys Lys Leu Glu Ala Tyr Ser Gln Glu Gln Val Asp Val Leu
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Val Lys Ala Leu Gly Lys Val Val Tyr Asp Asn Ala Glu Met Phe Ala
35 40 45

Lys Glu Ala Val Glu Glu Thr Glu Met Gly Val Tyr Glu Asp Lys Val
50 55 60

Ala Lys Cys His Leu Lys Ser Gly Ala Ile Trp Asn His Ile Lys Asp
65 70 75 80

Lys Lys Thr Val Gly Ile Ile Lys Glu Glu Pro Glu Arg Ala Leu Val
85 90 95

Tyr Val Ala Lys Pro Lys Gly Val Val Ala Ala Thr Thr Pro Ile Thr
100 105 110

Asn Pro Val Val Thr Pro Met Cys Asn Ala Met Ala Ala Ile Lys Gly

115

120

125

Arg Asn Thr Ile Ile Val Ala Pro His Pro Lys Ala Lys Lys Val Ser
 130 135 140

Ala His Thr Val Glu Leu Met Asn Ala Glu Leu Lys Lys Leu Gly Ala
 145 150 155 160

Pro Glu Asn Ile Ile Gln Ile Val Glu Ala Pro Ser Arg Glu Ala Ala
 165 170 175

Lys Glu Leu Met Glu Ser Ala Asp Val Val Ile Ala Thr Gly Gly Ala
 180 185 190

Gly Arg Val Lys Ala Ala Tyr Ser Ser Gly Arg Pro Ala Tyr Gly Val
 195 200 205

Gly Pro Gly Asn Ser Gln Val Ile Val Asp Lys Gly Tyr Asp Tyr Asn
 210 215 220

Lys Ala Ala Gln Asp Ile Ile Thr Gly Arg Lys Tyr Asp Asn Gly Ile
 225 230 235 240

Ile Cys Ser Ser Glu Gln Ser Val Ile Ala Pro Ala Glu Asp Tyr Asp
 245 250 255

Lys Val Ile Ala Ala Phe Val Glu Asn Gly Ala Phe Tyr Val Glu Asp
 260 265 270

Glu Glu Thr Val Glu Lys Phe Arg Ser Thr Leu Phe Lys Asp Gly Lys
 275 280 285

Ile Asn Ser Lys Ile Ile Gly Lys Ser Val Gln Ile Ile Ala Asp Leu
 290 295 300

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

Lys Gly Ala Gly Glu Lys Asp Val Leu Cys Lys Glu Lys Met Cys Pro
 325 330 335

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

Ala Met Ala Asn Tyr Met Tyr Glu Gly Ala Gly His Thr Ala Gly Ile
355 360 365

His Ser Asp Asn Asp Glu Asn Ile Arg Tyr Ala Gly Thr Val Leu Pro
370 375 380

Ile Ser Arg Leu Val Val Asn Gln Pro Ala Thr Thr Ala Gly Gly Ser
385 390 395 400

Phe Asn Asn Gly Phe Asn Pro Thr Thr Thr Leu Gly Cys Gly Ser Trp
405 410 415

Gly Arg Asn Ser Ile Ser Glu Asn Leu Thr Tyr Glu His Leu Ile Asn
420 425 430

Val Ser Arg Ile Gly Tyr Phe Asn Lys Glu Ala Lys Val Pro Ser Tyr
435 440 445

Glu Glu Ile Trp Gly
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<211> 451
<212> PRT
<213> Porphyromonas gingivalis W83

<400> 2

Met Glu Ile Lys Glu Met Val Ser Leu Ala Arg Lys Ala Gln Lys Glu
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Tyr Gln Ala Thr His Asn Gln Glu Ala Val Asp Asn Ile Cys Arg Ala
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Ala Ala Lys Val Ile Tyr Glu Asn Ala Ala Ile Leu Ala Arg Glu Ala
35 40 45

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

Gln Gly Lys Ser Lys Gly Val Trp Tyr Asn Leu His Asn Lys Lys Ser
65 70 75 80

Ile Gly Ile Leu Asn Ile Asp Glu Arg Thr Gly Met Ile Glu Ile Ala
85 90 95

Lys Pro Ile Gly Val Val Gly Ala Val Thr Pro Thr Thr Asn Pro Ile
100 105 110

Val Thr Pro Met Ser Asn Ile Ile Phe Ala Leu Lys Thr Cys Asn Ala
115 120 125

Ile Ile Ile Ala Pro His Pro Arg Ser Lys Lys Cys Ser Ala His Ala
130 135 140

Val Arg Leu Ile Lys Glu Ala Ile Ala Pro Phe Asn Val Pro Glu Gly
145 150 155 160

Met Val Gln Ile Ile Glu Glu Pro Ser Ile Glu Lys Thr Gln Glu Leu
165 170 175

Met Gly Ala Val Asp Val Val Val Ala Thr Gly Gly Met Gly Met Val
180 185 190

Lys Ser Ala Tyr Ser Ser Gly Lys Pro Ser Phe Gly Val Gly Ala Gly
195 200 205

Asn Val Gln Val Ile Val Asp Ser Asn Ile Asp Phe Glu Ala Ala Ala
210 215 220

Glu Lys Ile Ile Thr Gly Arg Ala Phe Asp Asn Gly Ile Ile Cys Ser
225 230 235 240

Gly Glu Gln Ser Ile Ile Tyr Asn Glu Ala Asp Lys Glu Ala Val Phe
245 250 255

Thr Ala Phe Arg Asn His Gly Ala Tyr Phe Cys Asp Glu Ala Glu Gly
260 265 270

Asp Arg Ala Arg Ala Ala Ile Phe Glu Asn Gly Ala Ile Ala Lys Asp
275 280 285

Val Val Gly Gln Ser Val Ala Phe Ile Ala Lys Lys Ala Asn Ile Asn
290 295 300

Ile Pro Glu Gly Thr Arg Ile Leu Val Val Glu Ala Arg Gly Val Gly
305 310 315 320

Ala Glu Asp Val Ile Cys Lys Glu Lys Met Cys Pro Val Met Cys Ala
325 330 335

Leu Ser Tyr Lys His Phe Glu Glu Gly Val Glu Ile Ala Arg Thr Asn
340 345 350

Leu Ala Asn Glu Gly Asn Gly His Thr Cys Ala Ile His Ser Asn Asn
355 360 365

Gln Ala His Ile Ile Leu Ala Gly Ser Glu Leu Thr Val Ser Arg Ile
370 375 380

Val Val Asn Ala Pro Ser Ala Thr Thr Ala Gly Gly His Ile Gln Asn
385 390 395 400

Gly Leu Ala Val Thr Asn Thr Leu Gly Cys Gly Ser Trp Gly Asn Asn
405 410 415

Ser Ile Ser Glu Asn Phe Thr Tyr Lys His Leu Leu Asn Ile Ser Arg
420 425 430

Ile Ala Pro Leu Asn Ser Ser Ile His Ile Pro Asp Asp Lys Glu Ile
435 440 445

Trp Glu Leu
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<211> 463

<212> PRT

<213> Clostridium difficile 630

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Met Glu Lys Ala Val Glu Asn Phe Glu Asp Leu Ser Lys Glu Tyr Ile
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Asn Gly Tyr Ile Glu Arg Ala Arg Lys Ala Gln Arg Glu Phe Glu Cys
20 25 30

Tyr Thr Gln Glu Gln Val Asp Lys Ile Val Lys Ile Val Gly Lys Val
35 40 45

Val Tyr Tyr Asn Ala Glu Tyr Leu Ala Lys Leu Ala Val Glu Glu Thr
50 55 60

Gly Met Gly Val Tyr Glu Asp Lys Val Ala Lys Asn Lys Ser Lys Ala
65 70 75 80

Lys Val Ile Tyr Asn Asn Leu Lys Asp Lys Lys Ser Val Gly Ile Ile
85 90 95

Asp Ile Asp Arg Glu Thr Gly Ile Thr Lys Val Ala Lys Pro Val Gly
100 105 110

Val Val Ala Ala Ile Thr Pro Cys Thr Asn Pro Ile Val Thr Pro Met
115 120 125

Ser Asn Ala Met Phe Ala Leu Lys Gly Arg Asn Ala Ile Ile Ile Thr
130 135 140

Pro His His Lys Ala Ile Gly Cys Ser Thr Lys Thr Val Glu Met Ile
145 150 155 160

Asn Glu Glu Leu Glu Lys Ile Gly Ala Pro Glu Asn Leu Ile Gln Ile
165 170 175

Leu Asp Gln Gln Ser Arg Glu Asn Thr Arg Asn Leu Ile Ser Ser Ala
180 185 190

Asp Val Val Ile Ala Thr Gly Gly Met Gly Met Val Lys Ala Ala Tyr
195 200 205

Ser Ser Gly Lys Pro Ala Leu Gly Val Gly Ala Gly Asn Val Gln Cys

210

215

220

Ile Ile Asp Arg Asp Val Asp Ile Lys Glu Ala Val Pro Lys Ile Ile
 225 230 235 240

Ala Gly Arg Ile Phe Asp Asn Gly Ile Ile Cys Ser Gly Glu Gln Ser
 245 250 255

Val Ile Val Ala Glu Glu Met Phe Asp Lys Ile Met Asp Glu Phe Lys
 260 265 270

Asn Asn Lys Gly Phe Ile Val Arg Asp Lys Val Gln Lys Glu Ala Phe
 275 280 285

Arg Asn Ala Met Phe Val Asn Lys Ser Met Asn Lys Asp Ala Val Gly
 290 295 300

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

Asp Thr Lys Ile Ile Val Ile Glu Ala Asp Gly Pro Gly Glu Glu Asp
 325 330 335

Ile Ile Ala Lys Glu Lys Met Cys Pro Val Ile Ser Ala Tyr Lys Tyr
 340 345 350

Lys Ser Phe Glu Glu Gly Val Ala Ile Ala Lys Ala Asn Leu Asn Val
 355 360 365

Glu Gly Lys Gly His Ser Val Ser Ile His Ser Asn Thr Val Lys Asn
 370 375 380

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

Gln Cys Cys Ala Thr Ser Ala Gly Gly Ser Phe Phe Asn Gly Leu Ala
 405 410 415

Pro Thr Asn Thr Leu Gly Cys Gly Ser Trp Gly Asn Asn Ser Ile Ser
 420 425 430

Glu Asn Leu Asp Tyr Lys His Leu Ile Asn Ile Ser Arg Ile Ala Tyr
435 440 445

Tyr Met Pro Glu Asn Glu Val Pro Thr Asp Glu Glu Leu Trp Gly
450 455 460

<210> 4

<211> 463

<212> PRT

<213> Kluyvera intestini

<400> 4

Met Asn Thr Thr Glu Leu Glu Thr Leu Ile Arg Thr Ile Leu Ser Glu
1 5 10 15

Gln Leu Thr Pro Thr Gln Glu Lys Lys Glu Ser Cys Thr Lys Gly Val
20 25 30

Phe Ala Thr Pro Ala Glu Ala Ile Asp Ala Ala His Gln Ala Phe Leu
35 40 45

Arg Tyr Gln Gln Cys Pro Leu Lys Thr Arg Gly Ala Ile Ile Gly Gly
50 55 60

Ile Arg Asp Glu Leu Ala Pro Tyr Leu Ala Glu Leu Ala Asp Glu Ser
65 70 75 80

Ala Thr Glu Thr Gly Met Gly Asn Lys Glu Asp Lys Phe Leu Lys Asn
85 90 95

Lys Ala Ala Leu Glu Asn Thr Pro Gly Ile Glu Asp Leu Thr Thr Thr
100 105 110

Ala Leu Thr Gly Asp Gly Gly Met Val Leu Phe Glu Tyr Ser Pro Phe
115 120 125

Gly Val Ile Gly Ser Val Ala Pro Ser Thr Asn Pro Thr Glu Thr Ile
130 135 140

Ile Asn Asn Ser Ile Ser Met Leu Ala Ala Gly Asn Thr Ile Tyr Phe
145 150 155 160

Ser Pro His Pro Gly Ala Lys Lys Val Ser Leu Lys Leu Ile Arg Ile
165 170 175

Ile Glu Asp Ile Ala Phe Arg His Thr Gly Ile Arg Asn Leu Val Val
180 185 190

Thr Val Ala Glu Pro Thr Phe Glu Ala Thr Gln Gln Met Met Ala His
195 200 205

Pro Lys Ile Ala Leu Leu Ala Ile Thr Gly Gly Pro Gly Ile Val Leu
210 215 220

Met Gly Leu Lys Ser Gly Lys Lys Val Ile Gly Ala Gly Ala Gly Asn
225 230 235 240

Pro Pro Cys Ile Val Asp Glu Thr Ala Asp Leu Val Lys Ala Ala Glu
245 250 255

Asp Ile Ile Asn Gly Ala Ser Phe Asp Tyr Asn Leu Pro Cys Ile Ala
260 265 270

Glu Lys Ser Leu Ile Val Val Asp Cys Val Ala Asp Arg Leu Met Gln
275 280 285

Gln Met Gln Ala Phe Gly Ala Leu Arg Ile Thr Gly Ala Asp Ile Asp
290 295 300

Lys Leu Arg Ala Val Cys Ile Gln Asp Gly Val Ala Asn Lys Lys Leu
305 310 315 320

Val Gly Lys Ser Pro Ser His Ile Leu Gln Ala Ala Gly Leu Ser Val
325 330 335

Pro Pro Lys Ala Pro Arg Leu Leu Ile Ala Glu Val Gln Gly Asn Asp
340 345 350

Pro Leu Val Thr Ala Glu Gln Leu Met Pro Val Leu Pro Val Val Arg
355 360 365

Val Asn Asp Phe Asp Ala Ala Leu Ala Leu Ala Leu Val Val Glu Glu
370 375 380

Gly Leu His His Thr Ala Val Met His Ser Gln Asn Val Ser Arg Leu
385 390 395 400

Asn Leu Ala Ala Arg Ser Leu Gln Thr Ser Ile Phe Val Lys Asn Gly
405 410 415

Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Phe Thr Thr Phe
420 425 430

Thr Ile Ala Thr Pro Thr Gly Glu Gly Thr Thr Ser Ala Lys Thr Phe
435 440 445

Ala Arg Ser Arg Arg Cys Val Leu Thr Asn Gly Phe Ser Ile Arg
450 455 460

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<210> 6

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<212> PRT

<213> Peptostreptococcaceae bacterium oral

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Thr Ala Gln Thr Glu Phe Glu Thr Tyr Ser Gln Glu Arg Val Asp Lys
20 25 30

Ala Val Arg Ala Ile Gly Lys Ser Ile Tyr Asp His Gly Asp Glu Leu
35 40 45

Ala Lys Met Gly Ala Glu Glu Ser Gly Met Gly Arg Tyr Glu Asp Lys

50

55

60

Ile Val Lys Asn Gln Gly Lys Ser Lys Met Thr Trp Trp Arg Leu Lys
65 70 75 80

Gly Val Lys Ser Arg Gly Ile Ile Asn Ile Asp Arg Glu Lys Gln Ile
85 90 95

Tyr Glu Ile Ala Lys Pro Ile Gly Val Leu Gly Val Val Thr Pro Ala
100 105 110

Thr Asn Pro Thr Met Thr Pro Val His Asn Ala Met Ile Ala Leu Lys
115 120 125

Gly Ala Asn Ala Val Ile Ile Cys Pro His Pro Lys Thr Arg Lys Thr
130 135 140

Thr Ser Lys Thr Val Glu Tyr Met Arg Leu Ala Leu Lys Asp Ile Ser
145 150 155 160

Val Pro Glu Asp Leu Ile Gln Ile Val Asp Asp Pro Ser Ile Glu Val
165 170 175

Ser Gln Ala Leu Met Ala Phe Cys Asp Thr Thr Ile Ser Thr Gly Gly
180 185 190

Pro Gly Met Val Lys Ser Ala Tyr Ser Ser Gly Lys Pro Ala Ile Gly
195 200 205

Val Gly Pro Gly Asn Val Gln Cys Leu Val Gly Asp Asp Ala Asp Ile
210 215 220

Asp Ala Ile Val Pro Lys Ile Met Lys Gly Arg Thr Tyr Asp Asn Gly
225 230 235 240

Val Leu Cys Thr Cys Glu Gln Ser Ile Ile Cys Ala Glu Asn Leu Tyr
245 250 255

Asp Arg Leu Val Lys Gly Leu Val Asp Asn Gly Ala Tyr Phe Val Lys
260 265 270

Glu Asp Glu Val Glu Lys Leu Arg Asn Gly Phe Phe Pro Gly Gly Val
275 280 285

Met Asn Lys Asn Leu Val Gly Ser Ser Pro Phe Glu Ile Ala Lys Ala
290 295 300

Ser Gly Phe Glu Val Gln Glu Glu Ser Lys Ile Leu Leu Val Pro Val
305 310 315 320

Ser Lys Thr Gly Lys Asp Glu Phe Leu Ala Lys Glu Lys Leu Ala Pro
325 330 335

Ile Leu Ala Leu Tyr Lys Tyr Ser Glu Trp Lys Glu Ala Val Asp Ile
340 345 350

Ala Leu Lys Asn Leu Leu Asn Glu Gly Arg Gly His Ser Val Val Ile
355 360 365

His Ser Ala Asn Lys Thr Asn Ile Glu Tyr Ala Ala Asn Ile Leu Pro
370 375 380

Val Ser Arg Val Gly Val Gly Met Val Gly Ser Ser Gly Leu Gly Gly
385 390 395 400

Gly Phe Asp Asn Gly Phe Met Pro Thr Ala Thr Leu Gly Cys Gly Ser
405 410 415

Trp Gly Asn Asn Ser Ile Ala Gly Asn Val Trp Trp Asn His Leu Val
420 425 430

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

Asp Glu Glu Ile Trp Ala Glu
450 455

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<400> 9
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<400> 10
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<211> 452

<212> PRT

<213> Anaerocolumna jejuensis

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Gln Ile Leu Tyr Thr Tyr Asn Gln Glu Lys Thr Asp Glu Ile Val Glu
20 25 30

Met Phe Ala Ser Val Val Phe Asn His Ala Glu Pro Leu Ala Arg Met
35 40 45

Ala Val Glu Glu Ser Arg Met Gly Val Tyr Glu Asp Lys Ile Thr Lys
50 55 60

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

Ser Ile Gly Ile Ile Gly Arg Glu Glu Glu Ala Gly Leu Ile Glu Ile
85 90 95

Ala Lys Pro Met Gly Val Ile Ala Ala Ala Met Pro Cys Thr Asn Pro
100 105 110

Ile Ile Thr Pro Met Cys Asn Ala Met Phe Ala Val Lys Cys Gln Asn
115 120 125

Thr Ile Ile Val Ala Pro His Pro Arg Gly Lys Lys Cys Ala Met Ala
130 135 140

Leu Ala Glu Leu Tyr Tyr Lys Glu Leu Asp Gly Met Gly Val Pro Arg

145		150		155		160									
Asp	Ile	Phe	Leu	Val	Val	Glu	Glu	Pro	Thr	Ile	Asp	Leu	Thr	Thr	Glu
			165						170					175	
Leu	Met	Ser	Ala	Cys	Asp	Thr	Val	Ile	Ala	Thr	Gly	Gly	Met	Gly	Val
			180					185					190		
Val	Lys	Ser	Ala	Tyr	Ser	Ser	Gly	Lys	Pro	Ser	Tyr	Gly	Val	Gly	Pro
		195					200					205			
Gly	Asn	Val	Gln	Gly	Leu	Ile	Asp	Glu	Gly	Ile	Asp	Tyr	Arg	Ala	Ala
	210					215					220				
Ala	Gly	Arg	Met	Ile	Ala	Ser	Arg	Ile	Phe	Asp	Asn	Gly	Ile	Leu	Cys
225					230					235					240
Thr	Ser	Thr	Gln	Ser	Ile	Ile	Ala	Pro	Glu	Lys	Asp	Tyr	Glu	Ser	Val
			245						250					255	
Ile	Lys	Glu	Phe	Val	Ala	Gln	Gly	Ala	Tyr	Tyr	Ile	Asp	Asp	Pro	Ala
		260						265					270		
Val	Ile	Ala	Ser	Leu	Ser	Glu	Val	Val	Phe	Pro	Gly	Gly	Val	Ile	Asn
	275						280					285			
Lys	Asn	Val	Val	Gly	Gln	Ser	Val	Lys	Thr	Ile	Ala	Gly	Leu	Ala	Gly
	290					295					300				
Ile	Ser	Ile	Pro	Glu	Gly	Thr	Lys	Val	Ile	Ile	Val	Lys	Pro	Glu	Arg
305					310					315					320
His	Gly	Ala	Gly	Val	Val	Trp	Ser	Arg	Glu	Lys	Met	Cys	Pro	Met	Met
			325						330					335	
Thr	Ala	Tyr	Ser	Tyr	Lys	Thr	Trp	Glu	Glu	Ala	Val	Gln	Ile	Ala	Tyr
			340					345					350		
Asp	Asn	Leu	Leu	Val	Glu	Gly	Glu	Gly	His	Thr	Ala	Asp	Ile	Gln	Ser
	355						360					365			

Asp Asn Gln Ala His Ile Glu Tyr Ala Gly Val Lys Leu Pro Val Ser
370 375 380

Arg Val Val Val Asn Gln Ser Cys Ser Val Met Ala Gly Gly Ala Phe
385 390 395 400

Gly Asn Ala Leu Asn Pro Ser Ala Thr Leu Gly Cys Gly Ser Trp Gly
405 410 415

Asn Asn Ala Ile Ser Glu Asn Leu Phe Tyr Thr His Leu Met Asn Lys
420 425 430

Ser Arg Ile Ala Phe Val Arg Lys Asn Trp Lys Gln Pro Ser Asp Glu
435 440 445

Glu Ile Phe Ala
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<210> 13

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<210> 14

<400> 14
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<211> 475

<212> PRT

<213> Bacillus soli

<400> 15

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Lys Gln Leu Gly Glu Ser Gln Pro Ala Ser Ala Pro Ala Ala Ser Leu
20 25 30

Lys Asp Val Ser Tyr Gly Asp Gly Val Phe Ala Thr Val Asp Glu Ala
35 40 45

Ala Glu Ala Ala Arg Leu Ala Trp Glu Lys Leu Arg Lys Leu Pro Leu
50 55 60

Ala Ala Arg Arg Gln Met Ile Glu Asn Met Arg Glu Val Ser Arg Gln
65 70 75 80

His Val Asn Glu Leu Ala Thr Leu Ala Val Glu Glu Thr Lys Leu Gly
85 90 95

Arg Val Glu Asp Lys Val Ala Lys Ile Leu Leu Ala Val Asn Lys Thr
100 105 110

Pro Gly Val Glu Asp Leu Val Ser Thr Ala Phe Ser Gly Asp Asp Gly
115 120 125

Leu Thr Leu Val Glu Tyr Ala Pro Ile Gly Val Phe Gly Ser Ile Thr
130 135 140

Pro Ser Thr Asn Pro Ala Ala Thr Ile Ile Asn Asn Ser Ile Ser Leu
145 150 155 160

Val Ala Ala Gly Asn Thr Val Val Tyr Asn Pro His Pro Ser Ala Lys
165 170 175

Arg Val Ser Ile Lys Thr Leu Gln Leu Leu Asn Gln Ala Ile Val Ala
180 185 190

Ala Gly Gly Pro Glu Asn Thr Leu Thr Ser Val Ala Ala Pro Asn Leu
195 200 205

Glu Thr Ser Ala Gln Val Met Asn His Pro Lys Val His Ala Leu Val
210 215 220

Val Thr Gly Gly Gly Pro Val Val Lys Ala Ala Met Ala Val Gly Lys
225 230 235 240

Lys Val Ile Ala Ala Gly Pro Gly Asn Pro Pro Val Val Val Asp Glu

245

250

255

Thr Ala Ile Ile Ser Lys Ala Ala Ala Asp Ile Val Gln Gly Ala Ser
 260 265 270

Phe Asp Asn Asn Val Leu Cys Thr Ala Glu Lys Glu Val Phe Val Val
 275 280 285

Asp Lys Val Ala Asn Ala Leu Lys Ala Glu Met Val Lys Ser Gly Ala
 290 295 300

Met Glu Leu Lys Gly Phe Gln Leu Glu Lys Leu Leu Glu Lys Val Leu
 305 310 315 320

Val Lys Lys Asn Asp Lys Phe Tyr Pro Asn Arg Asp Leu Ile Gly Lys
 325 330 335

Asp Ala Ala Val Ile Leu Gln Ala Ala Gly Ile Gln Ala Ser Pro Ser
 340 345 350

Val Lys Leu Ile Ile Ala Glu Thr Thr Lys Asp His Pro Leu Val Met
 355 360 365

Thr Glu Met Leu Met Pro Ile Leu Pro Ile Val Arg Val Ser Asn Val
 370 375 380

Asp Gln Ala Ile Glu Leu Ala Val Ile Ala Glu Lys Gly Asn Arg His
 385 390 395 400

Thr Ala Val Met His Ser Gln Asn Ile Thr Asn Leu Thr Lys Met Ala
 405 410 415

Gln Glu Ile Gln Ala Thr Ile Phe Val Lys Asn Gly Pro Ser Val Ala
 420 425 430

Gly Leu Gly Phe Glu Ser Glu Gly Phe Thr Thr Leu Thr Ile Ala Gly
 435 440 445

Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys Thr Phe Thr Arg Gln Arg
 450 455 460

Arg Cys Val Leu Val Asp Gly Leu Arg Ile Ile
465 470 475

<210> 16

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<211> 496
<212> PRT
<213> Desnuesiella massiliensis

<400> 17

Met Asn Ile Thr Glu Asn Asp Ile Glu Lys Ile Ile Gln Gln Val Leu
1 5 10 15

Val Asn Ile Thr Ser Lys Pro Ser Glu Asp Val Lys Lys Asp Ala Thr
20 25 30

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

Val Phe Glu Lys Ala Glu Asp Ala Ile Glu Ala Ala Ser Lys Ala Gln
50 55 60

Lys Lys Leu Leu Lys Glu Phe Lys Ile Glu Asp Arg Glu Arg Phe Ile
65 70 75 80

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

Met Ile Ile Asp Glu Thr Gly Met Gly Lys Tyr Glu Asp Lys Val Leu
100 105 110

Lys His Lys Leu Val Ser Glu Lys Thr Pro Gly Thr Asp Ile Leu Thr
115 120 125

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

Pro Tyr Gly Val Ile Gly Ala Val Thr Pro Ser Thr Asn Pro Ser Glu

145					150					155					160
Thr	Ala	Ile	Cys	Asn 165	Ser	Ile	Gly	Met	Ile 170	Gly	Ala	Gly	Asn	Ser 175	Val
Val	Phe	Asn	Ala 180	His	Pro	Gly	Ala	Lys 185	Glu	Cys	Val	Ala	Tyr 190	Ala	Val
Asp	Met	Met 195	Asn	Lys	Ala	Ile	Val 200	Glu	Ala	Gly	Gly	Pro 205	Glu	Asn	Leu
Ile	Thr 210	Met	Val	Ala	Glu	Pro 215	Thr	Met	Glu	Ser	Leu 220	Glu	Ala	Ile	Met
Lys 225	His	Pro	Glu	Ile	Arg 230	Leu	Leu	Cys	Gly	Thr 235	Gly	Gly	Pro	Gly	Leu 240
Val	Lys	Thr	Leu	Leu 245	Ser	Ser	Gly	Lys	Lys 250	Ala	Ile	Gly	Ala	Gly 255	Ala
Gly	Asn	Pro	Pro 260	Val	Ile	Val	Asp	Asp 265	Thr	Ala	Asn	Val	Lys 270	Lys	Ala
Gly	Lys	Asp 275	Ile	Ile	Glu	Gly	Cys 280	Ser	Phe	Asp	Asn	Asn 285	Leu	Pro	Cys
Ile 290	Ala	Glu	Lys	Glu	Val	Phe 295	Val	Phe	Glu	Asn	Val 300	Ala	Asp	Asp	Leu
Ile 305	Tyr	His	Met	Leu	Gln 310	Asn	Lys	Ala	Tyr	Met 315	Leu	Thr	Lys	Asn	Gln 320
Val	Glu	Glu	Leu	Val 325	Lys	Ile	Val	Leu	His 330	Glu	Asn	Ile	Glu	Glu 335	Lys
Ala	Val	Gly	Cys 340	Ser	Leu	Asp	Arg	Lys 345	Arg	His	Tyr	Val	Ile 350	Asn	Lys
Lys	Trp	Val 355	Gly	Lys	Asp	Ala	Ala 360	Leu	Tyr	Leu	Lys	Ala 365	Leu	Gly	Ile

Glu Gly Lys Asp Asp Ile Gln Cys Leu Ile Cys Glu Val Asp Leu Asp
370 375 380

His Pro Phe Val Met Thr Glu Leu Met Met Pro Ile Leu Pro Ile Val
385 390 395 400

Arg Val Lys Gly Ile Asp Gln Ala Ile Ala Tyr Ala Lys Lys Ala Glu
405 410 415

His Gly Asn Arg His Ser Ala His Met His Ser Lys Asn Val Asp Asn
420 425 430

Leu Thr Arg Phe Ala Arg Glu Ile Glu Thr Thr Ile Phe Val Lys Asn
435 440 445

Ala Lys Ser Phe Ala Gly Val Gly Phe Gly Gly Glu Gly Phe Thr Thr
450 455 460

Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Ile Thr Ser Ala Arg Thr
465 470 475 480

Phe Thr Arg Gln Arg Arg Cys Val Leu Ala Glu Gly Phe Ser Ile Ile
485 490 495

<210> 18

<400> 18
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<210> 19

<211> 469

<212> PRT

<213> *Caldanaerobius polysaccharolyticus*

<400> 19

Met Ala Gly Ile Arg Glu Glu Asp Ile Glu Leu Ile Val Arg Arg Val
1 5 10 15

Leu Ser Asn Leu Asp Leu Lys Asn Leu Lys Ala Ala Val Lys Lys Asp
20 25 30

Ile Gly Val Phe Glu Asp Met Lys Gln Ala Ile Ser Ala Ala Lys Lys

35

40

45

Ala Gln Lys Glu Leu Lys Ser Met Ser Ile Glu Phe Arg Glu Lys Ile
 50 55 60

Ile Gln Asn Ile Arg Lys Lys Thr Leu Glu Asn Ala Arg Ile Met Ala
 65 70 75 80

Glu Met Gly Val Gln Glu Thr Gly Met Gly Lys Val Glu His Lys Val
 85 90 95

Leu Lys His Glu Leu Val Ala Arg Lys Thr Pro Gly Thr Glu Asp Ile
 100 105 110

Ile Thr Thr Ala Trp Ser Gly Asp Lys Gly Leu Thr Leu Val Glu Met
 115 120 125

Gly Pro Trp Gly Val Ile Gly Ala Ile Thr Pro Ser Thr Asn Pro Ser
 130 135 140

Glu Thr Val Ile Cys Asn Ser Ile Gly Met Ile Ala Ala Gly Asn Ser
 145 150 155 160

Val Val Phe Asn Pro His Pro Gly Ala Val Gly Val Ser Asn Tyr Ala
 165 170 175

Val Arg Leu Ile Asn Glu Ala Val Val Glu Ala Gly Gly Pro Pro Asn
 180 185 190

Leu Ala Val Ser Val Ala Lys Pro Thr Leu Glu Thr Ala Glu Ile Met
 195 200 205

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

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

Ala Gly Asn Pro Pro Val Val Val Asp Glu Thr Ala Asp Ile Arg Lys
 245 250 255

Ala Ala Lys Asp Ile Val Asp Gly Ala Thr Phe Asp Asn Asn Leu Pro
260 265 270

Cys Ile Ala Glu Lys Glu Val Ile Ala Val Asn Lys Val Ala Asp Glu
275 280 285

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

Glu Ile Glu Glu Leu Lys Ala Met Val Leu Gln Thr Arg Asp Gly Lys
305 310 315 320

Tyr Tyr Leu Asn Arg Lys Trp Val Gly Lys Asp Ala Ser Thr Leu Leu
325 330 335

Lys Gly Ile Gly Val Asp Val Asp Asp Lys Val Arg Cys Ile Ile Phe
340 345 350

Glu Ala Thr Lys Asp His Pro Phe Val Val Glu Glu Leu Met Met Pro
355 360 365

Ile Leu Gly Ile Ile Arg Ala Glu Asn Val Asp Glu Ala Ile Ala Ile
370 375 380

Ala Val Glu Leu Glu His Gly Phe Arg His Ser Ala His Met His Ser
385 390 395 400

Lys Asn Val Asp Asn Leu Thr Lys Phe Ala Arg Ala Ile Asp Thr Ala
405 410 415

Ile Phe Val Lys Asn Ala Pro Ser Tyr Ala Ala Ile Gly Phe Gly Gly
420 425 430

Glu Gly Tyr Cys Thr Phe Thr Ile Ala Ser Arg Thr Gly Glu Gly Leu
435 440 445

Thr Ser Ala Arg Thr Phe Thr Lys Ser Arg Arg Cys Val Leu Ala Asp
450 455 460

Gly Leu Ser Ile Arg

465

<210> 20

<400> 20
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<210> 21

<400> 21
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<210> 22

<400> 22
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<210> 23

<400> 23
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<210> 24

<211> 472

<212> PRT

<213> Cellulosilyticum sp. I15G10I2

<400> 24

Met Asn Glu Ile Glu Leu Lys Gln Val Val Glu Glu Val Val Arg Lys
1 5 10 15

Leu Gly Val Pro Ser Ala Thr Ala Pro Lys Thr Ala Pro Thr Ile Gly
20 25 30

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

Lys Ala Ala Gln Glu Asp Leu His Met Met Pro Leu Glu Phe Arg Glu
50 55 60

Lys Ile Ile Ala Arg Ile Arg Glu Lys Ile Met Ala Asn Lys Glu Thr
65 70 75 80

Leu Ala Lys Met Ala Val His Glu Thr Gly Met Gly Lys Ile Gly His
85 90 95

Lys Ile Leu Lys His Glu Leu Thr Ala Lys Lys Thr Pro Gly Thr Glu
100 105 110

Cys Ile Lys Thr Arg Ala Trp Ser Gly Asp Gln Gly Leu Thr Val Ile
115 120 125

Glu Ser Gly Pro Phe Gly Val Val Gly Ala Ile Thr Pro Ser Thr Asn
130 135 140

Pro Ser Glu Thr Val Phe Cys Asn Ala Ile Gly Met Ile Ala Ala Gly
145 150 155 160

Asn Thr Val Val Phe Asn Ser His Pro Asn Ala Ala Arg Thr Ser Asn
165 170 175

Phe Ala Val Gln Leu Val Asn Glu Ala Ala Val Glu Val Gly Gly Phe
180 185 190

Glu Asn Leu Ala Thr Ser Val Leu Lys Pro Thr Val Glu Ser Gly Asn
195 200 205

Thr Leu Phe Lys His Pro Asp Ile Gln Leu Leu Val Ala Thr Gly Gly
210 215 220

Pro Gly Val Val Lys Ala Ile Leu Gln Ser Gly Lys Arg Gly Ile Ala
225 230 235 240

Ala Gly Ala Gly Asn Pro Pro Val Leu Val Asp Glu Thr Ala Asn Ile
245 250 255

Lys Lys Ala Ala Ala Asp Ile Ile Asn Gly Ala Thr Phe Asp Asn Asn
260 265 270

Leu Pro Cys Ile Ala Glu Lys Glu Val Ile Val Val Asn Glu Val Ala
275 280 285

Asp Glu Leu Ile His Tyr Met Thr Ser Glu Asn Asp Cys Tyr Met Leu
290 295 300

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

Asn Gly His Tyr Ile Val Asn Arg Asp Tyr Val Gly Arg Asp Ala His
325 330 335

Val Ile Leu Lys Gly Ile Gly Ile Glu Ala Pro Glu Ser Ile Arg Cys
340 345 350

Ile Ile Phe Glu Ala Ser Lys Glu His Ile Leu Val Val Glu Glu Leu
355 360 365

Met Met Pro Val Leu Gly Ile Val Arg Val Ala Asn Val Asp Glu Gly
370 375 380

Ile Ala Val Ala Lys Val Leu Glu Gly Gly Asn Arg His Ser Ala His
385 390 395 400

Met His Ser Ser Asn Val Tyr Asn Leu Thr Lys Tyr Gly Arg Ala Leu
405 410 415

Asp Thr Ala Ile Phe Val Lys Asn Ala Pro Ser Tyr Ala Gly Ile Gly
420 425 430

Phe Gly Gly Glu Gly Phe Ala Thr Phe Thr Ile Ala Ser Lys Thr Gly
435 440 445

Glu Gly Leu Thr Asn Ala Ala Ser Phe Thr Lys Ser Arg Arg Cys Val
450 455 460

Met Ala Asp Ala Leu Tyr Ile Arg
465 470

<210> 25
<211> 455
<212> PRT
<213> Geosporobacter ferrireducens

<400> 25

Met Ile Val Lys Lys Ile Leu Thr Glu Ile Thr Leu Lys Asn Glu Ala
1 5 10 15

Thr Asp Ser Ala Tyr Gly Ile Phe Asp His Met Glu Glu Ala Ile Glu

20

25

30

Ala Ala Trp Ile Ala Gln Lys Glu Leu Val Lys Tyr Ser Leu Glu Cys
 35 40 45

Arg Gly Lys Phe Ile Ala Ala Met Arg Ala Ala Ala Arg Lys Asn Ile
 50 55 60

Glu Leu Phe Ser Lys Met Ala Val Glu Glu Thr Gly Met Gly Arg Tyr
 65 70 75 80

Glu His Lys Val Met Lys Asn Thr Val Ala Ile Glu Lys Thr Pro Gly
 85 90 95

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

Val Phe Glu Leu Ser Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Thr
 115 120 125

Thr Asn Pro Thr Glu Thr Val Ile Cys Asn Ala Ile Gly Met Ile Ala
 130 135 140

Ala Gly Asn Ala Val Val Phe Ala Pro His Pro Arg Ala Lys Asn Thr
 145 150 155 160

Ser Arg Lys Ala Ile Glu Ile Leu Asn Gln Ala Ile Ile Glu Ala Gly
 165 170 175

Gly Pro Ala Asn Leu Ile Thr Ala Ile Lys Glu Pro Thr Ile Glu Ser
 180 185 190

Ala Asn Ile Met Met Gln His Lys Lys Ile Lys Met Leu Val Ala Thr
 195 200 205

Gly Gly Pro Asp Val Val Arg Thr Val Leu Ser Ser Gly Lys Lys Ala
 210 215 220

Ile Gly Ala Gly Ala Gly Asn Pro Pro Ala Val Val Asp Glu Thr Ala
 225 230 235 240

Asp Ile Glu Lys Ala Ala Lys Asp Ile Ile Asp Gly Cys Ser Phe Asp
245 250 255

Asn Asn Leu Pro Cys Val Ala Glu Lys Glu Val Ile Val Val Asp Ser
260 265 270

Val Ala Asp Tyr Leu Ile Phe Asn Met Gln Lys His Asn Ala Tyr Leu
275 280 285

Leu Ser Asp Glu Asn Leu Ile Lys Lys Leu Glu Lys Leu Val Phe Asn
290 295 300

Asp Lys Gly His Leu Asn Arg Asp Leu Val Gly Lys Asp Ala Asp Tyr
305 310 315 320

Ile Leu Arg Lys Ile Gly Val Asp Cys Asp Pro Ser Ile Arg Ala Ile
325 330 335

Ile Val Glu Thr Asp Lys Asn His Asp Phe Val Gln Glu Glu Leu Met
340 345 350

Met Pro Ile Leu Pro Ile Val Arg Val Lys Asp Val Asn Glu Ala Ile
355 360 365

Glu Leu Ala Val Glu Val Glu His Gly Tyr Arg His Thr Ala Ile Ile
370 375 380

His Ser Lys Asn Ile Asp Asn Leu Ser Lys Met Ala Lys Glu Ile Gln
385 390 395 400

Thr Thr Ile Phe Val Lys Asn Gly Pro Ser Tyr Ala Gly Ile Gly Val
405 410 415

Gly Gly Glu Gly Tyr Ser Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu
420 425 430

Gly Leu Thr Thr Ala Lys Ser Phe Thr Arg Ser Arg Arg Cys Val Leu
435 440 445

Val Asp Gly Phe Ser Ile Arg

450

455

<210> 26

<400> 26

000

<210> 27

<211> 465

<212> PRT

<213> Bacillus korlensis

<400> 27

Met Ile Glu Val Lys Gln Ile Glu Asp Ile Val Met Gln Val Leu Ala
 1 5 10 15

Gly Leu Asn Asn His Glu Asp Pro Pro Leu Asp Gly Glu Asn Gly Leu
 20 25 30

Tyr Ser Glu Met Asn Asp Ala Ile Asp Ala Ala Phe Val Ala Gln Lys
 35 40 45

Glu Leu Val Lys Leu Ser Leu Ala Glu Arg Gly Arg Ile Ile Glu Ser
 50 55 60

Ile Arg Thr Glu Phe Arg Lys His Ile Glu Leu Leu Ser Glu Met Ala
 65 70 75 80

Val Glu Glu Thr Gly Met Gly Arg Val Lys Asp Lys Ile Asn Lys Asn
 85 90 95

Leu Val Ala Val Asn Asn Thr Pro Gly Ile Glu Asp Leu Thr Thr Ala
 100 105 110

Ala Cys Ser Gly Asp Asn Gly Leu Thr Val Glu Glu Leu Ser Pro Tyr
 115 120 125

Gly Val Ile Gly Ser Ile Thr Pro Thr Thr Asn Pro Ser Glu Thr Ile
 130 135 140

Ile Cys Asn Thr Ile Gly Met Leu Ala Ala Gly Asn Ala Ile Val Phe
 145 150 155 160

Ser Pro His Pro Thr Ala Lys Arg Thr Ser Ile Glu Thr Ile Lys Ile
165 170 175

Ile Ser Lys Ala Ile Ser Lys Ala Gly Gly Pro Lys Asn Leu Val Val
180 185 190

Ser Thr Leu Gln Pro Ser Ile Glu Gln Ala Asn Ile Met Met Asn His
195 200 205

Lys Lys Val Arg Met Leu Val Ala Thr Gly Gly Pro Ala Val Val Lys
210 215 220

Ala Val Leu Ser Thr Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn
225 230 235 240

Pro Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Glu Lys Ala Ala Lys
245 250 255

Asp Ile Ile Asp Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys Val Ala
260 265 270

Glu Lys Glu Val Ile Ala Val Asp Cys Ile Ala Asp Cys Leu Ile Glu
275 280 285

Asn Met Lys Asn Asn Gly Ala Tyr Gln Leu Thr Asp Pro Val Gln Ile
290 295 300

Gln Arg Leu Val Asp Leu Val Val Arg Asn Gly His Ala Asn Lys Asp
305 310 315 320

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

Val Gly Pro Glu Val Arg Val Val Ile Val Asp Val Lys Tyr Glu Gly
340 345 350

Arg His Pro Leu Val Leu Ala Glu Leu Met Met Pro Val Leu Pro Ile
355 360 365

Val Arg Val Asn Asn Val Asp Glu Gly Ile Asp Leu Ala Val Glu Val

370

375

380

Glu His Gly Phe Arg His Thr Ala Ile Met His Ser Lys Asn Ile Asp
 385 390 395 400

Asn Leu Thr Lys Phe Ala Lys Glu Ile Gln Thr Thr Ile Phe Val Lys
 405 410 415

Asn Gly Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Val Gly Tyr Thr
 420 425 430

Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys
 435 440 445

His Phe Ala Arg Lys Arg Arg Cys Val Leu Val Asp Gly Leu Ser Ile
 450 455 460

Arg
 465

<210> 28
 <211> 459
 <212> PRT
 <213> Acidaminococcus massiliensis

<400> 28

Met Glu Gln Ala Val Lys Asp Tyr Leu Asp Lys Met Val Ala Ala Ser
 1 5 10 15

Arg Ile Ala Gln Gln Glu Phe Ala Thr Tyr Pro Gln Glu Thr Val Asp
 20 25 30

Lys Ala Val Arg Thr Val Gly Lys Ala Ile Tyr Asp Asn Ala Glu Leu
 35 40 45

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

Lys Ile Ala Lys Cys Val Asn Lys Ser Lys Ser Val Trp Trp Arg Met
 65 70 75 80

Lys Asp Lys Lys Ser Arg Gly Ile Ile Lys Arg Ile Pro Glu Leu Gly
85 90 95

Leu Val Glu Val Ala Lys Pro Ile Gly Val Ile Gly Cys Val Ala Pro
100 105 110

Thr Thr Asn Pro Val Ile Asn Val Met Gln Asn Ala Met Cys Ala Leu
115 120 125

Lys Cys Gly Asn Ser Met Ile Val Ser Pro His Pro Arg Ala Lys His
130 135 140

Ser Ser Val Lys Thr Val Glu Val Ile Asn Glu Ala Leu Ala Ala Leu
145 150 155 160

Gly Met Pro Lys Asn Leu Ile Gln Val Ile Thr Glu Pro Ser Met Glu
165 170 175

Leu Ser Ala Gly Leu Met Ser Ala Val Asp Leu Cys Ile Cys Thr Gly
180 185 190

Gly Pro Gly Leu Val Lys Ala Ala Tyr Ser Ser Gly Lys Pro Ala Ile
195 200 205

Gly Val Gly Gln Gly Asn Val Gln Val Leu Val Asp Arg Asp Ala Asp
210 215 220

Leu Asp Gln Val Ala Ala Met Val Ile Lys Gly Arg Thr Phe Asp Asn
225 230 235 240

Gly Val Leu Cys Thr Cys Glu Gln Asn Val Ile Cys Pro Glu Asp Lys
245 250 255

Lys Glu Glu Met Ile Ala Ala Leu Lys Lys His Gly Ala Tyr Tyr Ile
260 265 270

Gly Asn Ser Glu Asp Ala Ala Lys Leu Arg Asp Thr Ala Phe Pro Asn
275 280 285

Gly Gly Pro Val Ser Lys Glu Tyr Pro Gly Ala Ser Val Lys Lys Ile
290 295 300

Ala Gln Leu Ser Gly Ile Gln Gly Ile Pro Glu Asp Ala Lys Val Ile
305 310 315 320

Val Ser Cys Thr Arg Gly Tyr Gly Lys Asp Glu Pro Leu Ala Lys Glu
325 330 335

Lys Leu Phe Pro Val Leu Ala Phe Phe Thr Tyr Asp Lys Trp Glu Asp
340 345 350

Ala Ile His Ile Ala Lys Thr Asn Leu Glu Met Glu Gly Ile Gly His
355 360 365

Ser Val Val Ile His Ser Asn Thr Pro Glu His Ile Glu Ala Val Ala
370 375 380

Glu Ala Ile Pro Val Ser Arg Phe Ala Val Asn Gln Val Gly Gly Thr
385 390 395 400

Asn Leu Gly Gly Ala Met Asp Asn Gly Leu Asn Pro Thr Thr Thr Leu
405 410 415

Gly Cys Gly Thr Trp Gly Asn Asn Ser Ile Ser Glu Asn Phe Thr Tyr
420 425 430

Tyr His Leu Met Asn Leu Thr Arg Val Ser Tyr Arg Val Pro Asp Met
435 440 445

Tyr Ile Pro Thr Asp Glu Glu Ile Trp Ala Glu
450 455

<210> 29

<400> 29
000

<210> 30

<400> 30
000

<210> 31
<211> 462

<212> PRT

<213> Lachnospiraceae bacterium 32

<400> 31

Val Ser Val Asn Glu Lys Met Val Gln Asp Val Val Lys Glu Val Met
1 5 10 15

Ala Lys Leu Gln Leu Ala Ala Gly Ala Ser Glu Gly Lys Gly Ile Phe
20 25 30

Ala Asp Met Asn Asp Ala Ile Ala Ala Ala Lys Lys Ala Gln Arg Tyr
35 40 45

Ile His Arg Met Ser Met Asp Gln Arg Glu Gln Ile Ile Ser Asn Ile
50 55 60

Arg Arg Lys Thr Lys Glu Asn Ala Glu Ile Leu Ala Arg Met Gly Val
65 70 75 80

Glu Glu Thr Gly Met Gly Asn Val Pro His Lys Ile Leu Lys His Gln
85 90 95

Leu Val Ala Glu Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala
100 105 110

Trp Ser Gly Asp Lys Gly Leu Thr Leu Ile Glu Met Gly Pro Phe Gly
115 120 125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Ile Ile
130 135 140

Cys Asn Thr Ile Gly Met Leu Ala Gly Gly Asn Thr Val Val Phe Asn
145 150 155 160

Pro His Pro Ala Ala Val Lys Thr Ser Gln Phe Ala Val Asn Met Leu
165 170 175

Asn Glu Ala Ser Ile Glu Ala Gly Gly Pro Glu Asn Ile Ala Cys Thr
180 185 190

Val Gly Lys Pro Thr Met Glu Ser Ser Asn Ile Met Met Lys His Lys

195

200

205

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

Val Leu Ser Ser Gly Arg Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
 225 230 235 240

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

Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
 260 265 270

Lys Glu Ile Val Ala Val Asp Ser Val Val Ser Glu Leu Met His Tyr
 275 280 285

Met Val Asn Glu Gln Asp Cys Tyr Leu Ala Ser Lys Glu Glu Gln Asp
 290 295 300

Lys Leu Thr Ala Thr Val Leu Thr Pro Lys Gly Leu Asn Arg Lys Cys
 305 310 315 320

Val Gly Arg Asp Ala Lys Thr Leu Leu Gly Met Ile Gly Val Thr Val
 325 330 335

Pro Asp Asn Ile Arg Cys Ile Val Phe Glu Gly Glu Lys Glu His Pro
 340 345 350

Leu Ile Ala Thr Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Ala
 355 360 365

Lys Asp Phe Glu Asp Ala Val Glu Lys Ala Val Trp Leu Glu His Gly
 370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Ile Asp Asn Ile Thr
 385 390 395 400

Arg Tyr Ala Lys Ala Ile Asp Thr Ala Ile Leu Val Lys Asn Ala Pro
 405 410 415

Ser Tyr Ala Ala Leu Gly Phe Gly Gly Glu Gly Phe Cys Thr Phe Thr
420 425 430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Thr Phe Thr
435 440 445

Lys Arg Arg Arg Cys Val Met Ser Glu Ser Leu Cys Ile Arg
450 455 460

<210> 32

<211> 462

<212> PRT

<213> Eubacterium plexicaudatum

<400> 32

Val Ser Val Asn Asp Gln Met Val Gln Asp Ile Val Arg Gln Val Leu
1 5 10 15

Ala Asn Met Arg Ile Ser Ser Asp Ala Ser Gly Ser Arg Gly Val Phe
20 25 30

Ser Asp Met Asn Glu Ala Val Glu Ala Ala Lys Lys Ala Gln Ala Val
35 40 45

Ile Gly Lys Met Pro Met Asp His Arg Glu Lys Ile Ile Ser Ser Ile
50 55 60

Arg Ala Lys Ile Met Glu Asn Ala Glu Ile Leu Ala Arg Met Gly Val
65 70 75 80

Lys Glu Thr Gly Met Gly Asn Val Gly His Lys Ile Leu Lys His Gln
85 90 95

Leu Val Ala Glu Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Lys Ala
100 105 110

Trp Ser Gly Asp Arg Gly Leu Thr Leu Ile Glu Met Gly Pro Phe Gly
115 120 125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Ile Leu
130 135 140

Cys Asn Thr Ile Gly Met Val Ala Gly Gly Asn Thr Val Val Phe Asn
145 150 155 160

Pro His Pro Ala Ala Ile Lys Thr Ser Ile Phe Ala Val Asn Leu Val
165 170 175

Asn Glu Ala Ser Val Glu Ala Gly Gly Pro Asp Asn Ile Ala Cys Thr
180 185 190

Val Glu His Pro Thr Leu Asp Thr Ser Ala Ile Met Met Lys His Lys
195 200 205

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

Val Leu Ser Ser Gly Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
225 230 235 240

Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Glu Asp
245 250 255

Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
260 265 270

Lys Glu Ile Val Ala Val Asp Ser Ile Ala Asp Glu Leu Met His Tyr
275 280 285

Met Ile Ser Glu Gln Gly Cys Tyr Leu Ala Ser Ala Lys Glu Gln Glu
290 295 300

Ala Leu Ile Ser Val Val Leu Lys Gly Gly Gln Leu Asn Arg Asp Cys
305 310 315 320

Val Gly Arg Asp Ala Lys Thr Leu Leu Gly Met Ile Gly Val Gln Ala
325 330 335

Pro Asp Asn Ile Arg Cys Ile Thr Phe Glu Gly Pro Lys Glu His Pro
340 345 350

Leu Ile Thr Glu Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Ala
355 360 365

Asp Ser Phe Glu Asp Ala Val Glu Lys Ala Val Trp Leu Glu His Gly
370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Val Asp His Ile Thr
385 390 395 400

Thr Tyr Ala Lys Ala Ile Asp Thr Ala Ile Leu Val Lys Asn Gly Pro
405 410 415

Ser Tyr Ala Ala Ile Gly Phe Gly Gly Glu Gly Tyr Cys Thr Phe Thr
420 425 430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Ala Phe Thr
435 440 445

Lys Arg Arg Arg Cys Val Met Cys Asp Ser Leu Cys Ile Arg
450 455 460

<210> 33
<211> 462
<212> PRT
<213> Clostridium sp. KNHs205

<400> 33

Val Asn Leu Lys Glu Ala Gln Val Lys Asp Ile Val Arg Lys Val Leu
1 5 10 15

Leu Gln Met Glu Ala Ser Asn Lys Glu Glu Gln Lys Leu Ser Gly Ile
20 25 30

Phe Thr Glu Met Asn Asp Ala Ile Gly Ala Ser Ile Lys Ala Gln Lys
35 40 45

Val Met Gln Gln Leu Ser Met Asp Ser Arg Glu Lys Ile Ile Ser Asn
50 55 60

Ile Arg Lys Lys Thr Leu Glu Asn Ala Glu Leu Phe Ala Arg Met Gly
65 70 75 80

Val Glu Glu Thr Gly Met Gly Asn Val Gly His Lys Ile Leu Lys His
85 90 95

Gln Leu Leu Ala Glu Lys Thr Pro Gly Thr Glu Asp Ile Ser Thr Val
100 105 110

Ala Trp Ser Gly Asp Arg Gly Leu Thr Leu Val Glu Met Gly Pro Phe
115 120 125

Gly Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Ile
130 135 140

Leu Cys Asn Ser Ile Gly Met Ile Ala Gly Gly Asn Thr Val Val Phe
145 150 155 160

Asn Pro His Pro Ala Ala Ile Gly Val Ser Asn Leu Ala Val His Met
165 170 175

Val Asn Glu Ala Ser Arg Glu Ala Gly Gly Pro Asp Asn Ile Ala Val
180 185 190

Ser Val Val Lys Pro Thr Leu Ala Ser Gly Asp Ile Met Met Lys His
195 200 205

Gln Asn Ile Pro Leu Ile Val Ala Thr Gly Gly Pro Gly Val Val Thr
210 215 220

Thr Val Leu Ser Ser Gly Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn
225 230 235 240

Pro Pro Val Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Met
245 250 255

Asp Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala
260 265 270

Glu Lys Glu Val Val Ala Val Gly Lys Ile Met Asp Glu Leu Leu His
275 280 285

Tyr Leu Ile Glu Asn Gly Cys Tyr Val Ile Ser Lys Glu Glu Gln Glu

290

295

300

Lys Leu Thr Ala Val Val Leu Lys Asp Asn Arg Leu Asn Arg Lys Cys
 305 310 315 320

Val Gly Lys Asp Ala Arg Thr Ile Leu Ser Met Ile Gly Ile Glu Thr
 325 330 335

Pro Glu Asn Ile Arg Cys Ile Ile Phe Glu Gly Glu Lys Glu His Pro
 340 345 350

Leu Ile Ala Glu Glu Leu Met Met Pro Ile Leu Gly Ile Val Arg Ala
 355 360 365

Lys Asp Ile Asp Asp Ala Ile Glu Lys Ala Val Trp Leu Glu His Gly
 370 375 380

Asn Arg His Ser Ala His Met His Ser Lys Asn Val Asp Asn Leu Thr
 385 390 395 400

Arg Phe Gly Lys Ala Val Asp Thr Ala Ile Phe Val Lys Asn Ala Pro
 405 410 415

Ser Tyr Ala Ala Leu Gly Phe Gly Gly Glu Gly Phe Cys Thr Phe Thr
 420 425 430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Arg Thr Phe Thr
 435 440 445

Lys Gln Arg Arg Cys Val Met Ala Asp Ser Leu Cys Ile Arg
 450 455 460

<210> 34

<400> 34
000

<210> 35

<400> 35
000

<210> 36

<211> 470
<212> PRT
<213> Robinsoniella peoriensis

<400> 36

Met Ala Ile Asn Glu Gln Glu Ile Gln Asp Ile Val Arg Ser Val Leu
1 5 10 15

Lys Gly Met Gly Thr Thr Ala Asp Lys Pro Ala Gly Ser Ser Lys Lys
20 25 30

Leu Leu Gly Val Phe Asp Asp Ile Asn Asp Ala Ile Ala Ala Ala Lys
35 40 45

Glu Ala Gln Lys Glu Ile Gln Pro Met Pro Leu Glu Phe Arg Glu Lys
50 55 60

Ile Ile Ser Asn Ile Arg Lys Lys Thr Leu Glu Asn Ala Lys Met Phe
65 70 75 80

Ala Glu Leu Gly Val Glu Glu Thr Gly Met Gly Asn Val Gly His Lys
85 90 95

Ile Leu Lys His Gln Leu Val Ala Glu Lys Thr Pro Gly Thr Glu Asp
100 105 110

Leu Ser Thr Val Ala Trp Ser Gly Asp Arg Gly Leu Thr Leu Val Glu
115 120 125

Met Gly Pro Phe Gly Val Ile Gly Ala Val Cys Pro Ser Thr Asn Pro
130 135 140

Thr Glu Thr Val Val Cys Asn Ser Ile Gly Met Ile Ala Ala Gly Asn
145 150 155 160

Thr Val Val Phe Ala Pro His Pro Ser Ala Lys Asn Val Ser Asn Leu
165 170 175

Ala Ile Asp Met Ile Asn Arg Ala Ser Val Glu Val Gly Gly Pro Glu
180 185 190

Asn Ile Ala Val Ala Val Lys Glu Pro Thr Met Glu Val Ser Lys Val
195 200 205

Ile Phe Ser His Lys Asp Ile Ser Leu Leu Val Ala Thr Gly Gly Pro
210 215 220

Gly Val Val Thr Thr Val Leu Ser Ser Gly Lys Arg Ala Met Gly Ala
225 230 235 240

Gly Ala Gly Asn Pro Pro Val Leu Val Asp Glu Thr Ala Asn Ile Pro
245 250 255

Lys Ala Ala Glu Asp Ile Ile Asn Gly Cys Thr Phe Asp Asn Asn Leu
260 265 270

Pro Cys Ile Ala Glu Lys Glu Val Val Ala Val Asp Met Ile Ala Asp
275 280 285

Glu Leu Ile Tyr His Met Glu Gln Val Gly Cys Tyr His Ala Asn Ala
290 295 300

Glu Glu Val Gln Lys Leu Ile Gln Thr Val Phe Ile Glu Asn Asn Gly
305 310 315 320

Lys Arg Thr Leu Asn Arg Gln Cys Val Gly Arg Ser Ala Lys Val Leu
325 330 335

Leu Gly Lys Ile Gly Val Thr Val Gly Asp Glu Ile Arg Cys Ile Ile
340 345 350

Phe Glu Gly Glu Lys Thr Asn Pro Met Ile Trp Glu Glu Leu Met Met
355 360 365

Pro Ile Leu Gly Ile Val Arg Val Lys Asn Val Glu Glu Gly Met Gly
370 375 380

Ile Ala Leu Glu Leu Glu His Gly Asn Arg His Ser Ala His Met His
385 390 395 400

Ser Thr Asn Val Asn Asn Leu Thr Lys Phe Gly Lys Met Ile Asp Thr
405 410 415

Ala Ile Phe Val Lys Asn Ala Pro Ser Tyr Ala Ala Leu Gly Phe Gly
420 425 430

Gly Glu Gly Tyr Pro Thr Phe Thr Ile Cys Ser Arg Thr Gly Glu Gly
435 440 445

Leu Thr Ser Ala Lys Asn Phe Thr Lys Ser Arg Arg Cys Val Met Gly
450 455 460

Asp Ala Leu Cys Ile Arg
465 470

<210> 37

<400> 37
000

<210> 38

<211> 469

<212> PRT

<213> *Caldithrix abyssi*

<400> 38

Met His Leu Asp Asp Lys Gln Ile Ala Gln Ile Val Glu Thr Val Leu
1 5 10 15

Ser Arg Leu Glu Arg Asn Glu Ser Arg Thr Gly Arg Ser Arg His Pro
20 25 30

Gln Gly Val Phe Glu Thr Leu Asp Glu Ala Val Glu Ala Ala Arg Gln
35 40 45

Ala Gln Lys Lys Ile Arg Lys Leu Glu Leu Arg Ala Lys Ile Ile Gln
50 55 60

Ala Ile Arg Gln Ala Gly Val Lys His Ala Arg Glu Leu Ala Glu Met
65 70 75 80

Ala Val Gln Glu Thr Gly Met Gly Arg Val Glu Asp Lys Ile Ala Lys
85 90 95

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

Leu Ala Leu Ser Gly Asp His Gly Leu Thr Leu Ile Glu Asn Ala Ala
115 120 125

Trp Gly Val Ile Ala Ser Val Thr Pro Ser Thr Asn Pro Gly Ala Thr
130 135 140

Val Ile Asn Asn Ser Ile Ser Met Ile Ala Ala Gly Asn Ala Val Val
145 150 155 160

Tyr Ala Pro His Pro Ala Ala Lys Lys Val Ser Gln Arg Ala Ile Glu
165 170 175

Ile Leu Asn Lys Ala Ile Glu Ala Ala Gly Gly Pro Ala Thr Leu Leu
180 185 190

Thr Thr Val Ala Glu Pro Ser Ile Glu Thr Ala Gln Lys Leu Phe Val
195 200 205

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

Lys Ala Ala Arg Lys Val Thr Asp Lys Arg Leu Met Ala Ala Gly Ala
225 230 235 240

Gly Asn Pro Pro Val Val Val Asp Glu Thr Ala Asp Ile Ala Lys Ala
245 250 255

Ala Arg Asp Ile Val Trp Gly Ala Ser Phe Asp Asn Asn Ile Val Cys
260 265 270

Ala Asp Glu Lys Glu Ile Ile Ala Val Asp Ala Ile Ala Asp Arg Leu
275 280 285

Lys Glu Glu Met Lys Lys His Gln Ala Val Glu Leu Thr Pro Gln Gln
290 295 300

Gly Glu Glu Leu Ala Gln Ile Ile Leu Glu Asp Tyr Pro Gly Pro Asn
305 310 315 320

Ala Arg Ile Asn Arg Lys Trp Val Gly Lys Asp Ala Tyr Lys Phe Ala
325 330 335

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

Glu Ala Asp Lys Asp His Pro Phe Ala Gln Leu Glu Leu Met Met Pro
355 360 365

Val Ile Pro Leu Ile Arg Ala Ala Asp Ala Asp Lys Ala Ile Asp Leu
370 375 380

Ala Ile Glu Leu Glu His Gly Tyr Arg His Thr Ala Ala Met His Ser
385 390 395 400

Arg His Ile Asp His Met Asp Arg Met Ala Asn Glu Ile Asn Thr Ser
405 410 415

Ile Phe Val Lys Asn Gly Pro Cys Leu Ala Gly Leu Gly Phe Gly Gly
420 425 430

Glu Gly Trp Thr Ser Met Thr Ile Thr Thr Pro Thr Gly Glu Gly Val
435 440 445

Thr Ser Ala Arg Ser Phe Val Arg Leu Arg Arg Cys Val Val Val Asp
450 455 460

His Phe Arg Ile Val
465

<210> 39

<400> 39
000

<210> 40

<211> 479

<212> PRT

<213> Sporomusa sphaeroides

<400> 40

Met Thr Ile Asp Pro Asn Leu Ile Ala Lys Ile Ala Ala Glu Val Met
1 5 10 15

Ala Arg Val Gln Glu Arg Gln Pro Glu Thr Val Ser Ala Gly Glu Gly
20 25 30

Ile Phe Pro Thr Val Asp Glu Ala Val Ala Ala Ala Arg Ala Ala Gln
35 40 45

Lys Gln Leu Lys Lys Leu Ser Ile Glu Lys Arg Glu Glu Leu Ile Gln
50 55 60

Ala Met Arg Gln Ala Ala Cys Asp Asn Ala Glu Leu Leu Ala Glu Met
65 70 75 80

Gly Val Ser Glu Ser Gly Met Gly Arg Val Ser Asp Lys Val Ile Lys
85 90 95

Asn Arg Leu Ala Ala Thr Lys Thr Pro Gly Thr Glu Asp Leu Lys Ser
100 105 110

Glu Ala Trp Ser Gly Asp Arg Gly Leu Thr Leu Ile Glu Met Gly Pro
115 120 125

Tyr Gly Val Ile Gly Ser Ile Thr Pro Thr Thr Asn Pro Ser Glu Thr
130 135 140

Val Ile Cys Asn Gly Ile Gly Met Ile Ala Ala Gly Asn Ala Val Val
145 150 155 160

Phe Ser Pro His Pro Thr Ala Lys Asn Thr Ser Leu Val Thr Ile Lys
165 170 175

Leu Leu Asn Lys Ala Ile Ile Gln Ala Gly Gly Pro Pro Asn Leu Leu
180 185 190

Thr Ala Val Ala Glu Pro Ser Leu Ala Ala Thr Asn Ala Met Met Gln
195 200 205

His Pro Asp Ile Asn Met Leu Val Ala Thr Gly Gly Pro Ala Val Val
210 215 220

Lys Ala Val Met Ser Cys Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly
225 230 235 240

Asn Pro Pro Ala Val Val Asp Glu Thr Ala Asp Ile Glu Lys Ala Ala
245 250 255

Lys Asp Ile Ile Asp Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys Ile
260 265 270

Ala Glu Lys Glu Val Ile Val Val Gly Ser Val Ala Asp Lys Leu Met
275 280 285

Ala Tyr Met Gln Arg Tyr Gly Ala Tyr Leu Ile Ser Gly Pro Asp Val
290 295 300

Asp Arg Leu Ala Lys Val Ile Leu Thr Glu Lys Ala Glu Leu Ala Ala
305 310 315 320

Ala Gly Cys Thr Glu Lys Pro Lys Lys Ser Tyr Ala Val Asn Lys Asn
325 330 335

Tyr Val Gly Lys Asp Ala Arg Tyr Ile Leu Ser Gln Ile Gly Ile Gln
340 345 350

Val Pro Asp Ser Ile Arg Ala Val Ile Cys Glu Thr Pro Ala Asp His
355 360 365

Pro Phe Val Val Glu Glu Leu Met Met Pro Val Leu Pro Val Val Gln
370 375 380

Val Lys Asp Ile Asp Ala Ala Ile Glu Leu Ala Val Lys Val Glu His
385 390 395 400

Gly Asn Arg His Thr Ala Ile Met His Ser Lys Asn Val Asp Asn Leu
405 410 415

Thr Lys Leu Ala Lys Ala Ile Glu Thr Thr Ile Phe Val Lys Asn Ala
420 425 430

Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Phe Thr Thr Phe
435 440 445

Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Pro Arg Ser Phe
450 455 460

Thr Arg Gln Arg Arg Cys Val Leu Val Asp Ala Leu Ser Ile Val
465 470 475

<210> 41

<211> 524

<212> PRT

<213> Bacillus sp. FJAT-25547

<400> 41

Met Gly Val Asn Met Ser Glu Gln Asp Ile Gln Lys Ile Ile Gln Ser
1 5 10 15

Val Leu Gln Asn Ile Glu Ala Val Ser Glu Gln Asn Ser Gly His Gln
20 25 30

Val Leu His Ser Asn Asp Asn Thr Asn Pro Pro Lys Pro Leu Lys Met
35 40 45

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

His Gln Val Asn Glu Pro Gly Ala Asn Gly Val Phe Val Arg Ile Glu
65 70 75 80

Asp Ala Ile Glu Ala Gly Tyr Ile Ala Gln Leu Asn Tyr Val Lys His
85 90 95

Phe Gln Leu Lys Asp Arg Glu Lys Ile Ile Ala Ala Ile Arg Glu Ala
100 105 110

Val Ile Glu Asn Lys Glu Lys Leu Ala Gln Met Val Phe Glu Glu Thr
115 120 125

Lys Leu Gly Arg Tyr Glu Asp Lys Ile Ala Lys His Glu Leu Val Ala
130 135 140

Ser Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Ala Ala Phe Ser Gly
145 150 155 160

Asp Glu Gly Leu Thr Ile Val Glu Gln Ala Pro Phe Gly Leu Val Gly
165 170 175

Ala Val Thr Pro Val Thr Asn Pro Thr Glu Thr Ile Ile Asn Asn Ser
180 185 190

Ile Ser Leu Leu Ala Ala Gly Asn Ala Val Val Leu Asn Val His Pro
195 200 205

Ser Ser Lys Ala Ser Cys Ala Phe Val Val Asn Leu Ile Asn Gln Ala
210 215 220

Ile Gln Asp Ala Gly Gly Pro Lys Asn Leu Val Ser Met Val Lys Asp
225 230 235 240

Pro Thr Leu Glu Thr Leu Asn Arg Ile Ile Glu Ser Pro Lys Val Lys
245 250 255

Leu Leu Val Gly Thr Gly Gly Pro Gly Met Val Lys Thr Leu Leu Lys
260 265 270

Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile
275 280 285

Val Asp Glu Thr Ala Asp Leu Lys Gln Ala Ala Lys Ser Ile Ile Glu
290 295 300

Gly Ala Ser Phe Asp Asn Asn Leu Leu Cys Ile Ala Glu Lys Glu Leu
305 310 315 320

Phe Val Ile Asp Ser Val Ala Asp Asp Leu Ile Phe Gln Met Leu Asn
325 330 335

Glu Gly Ala Tyr Met Leu Asp Gln Gln Gln Leu Ser Lys Leu Met Ser
340 345 350

Phe Ala Leu Glu Glu Asn Val His Gln Glu Ala Gly Gly Cys Ser Leu

355

360

365

Asp Asn Lys Arg Glu Tyr His Val Ser Lys Asp Trp Val Gly Lys Asp
 370 375 380

Ala Ala Ser Phe Leu Arg Gln Ile Gly Val Ala Cys Glu Glu Asn Ile
 385 390 395 400

Lys Leu Leu Ile Cys Glu Val Asp Phe Asp His Pro Phe Val Gln Leu
 405 410 415

Glu Gln Met Met Pro Val Phe Pro Ile Val Arg Val Gly Asp Leu Asp
 420 425 430

Glu Ala Ile Glu Met Ala Leu Leu Ala Glu His Gly Asn Arg His Thr
 435 440 445

Ala Ile Met His Ser Lys Asn Val Asp His Leu Thr Lys Phe Ala Arg
 450 455 460

Ala Ile Glu Thr Thr Ile Phe Val Lys Asn Ala Ser Ser Leu Ala Gly
 465 470 475 480

Val Gly Phe Gly Gly Glu Gly His Thr Thr Met Thr Ile Ala Gly Pro
 485 490 495

Thr Gly Glu Gly Ile Thr Ser Ala Lys Thr Phe Thr Arg Gln Arg Arg
 500 505 510

Cys Val Leu Ala Glu Gly Gly Phe Arg Ile Ile Gly
 515 520

<210> 42

<211> 471

<212> PRT

<213> Dorea sp. D27

<400> 42

Met Glu Ile Ser Thr Ser Gln Ile Ser Arg Tyr Ile Leu Asp Leu Gln
 1 5 10 15

Asn Glu Leu Lys Gly Asp Ser Pro Ser Pro Ala His Met Ser Ala Gly
20 25 30

Glu His Gly Ile Phe Gln Asp Ala Glu Cys Ala Ile Met Ala Ala Ser
35 40 45

Gln Ala Gln Lys Arg Leu Met Glu Tyr Ser Leu Lys Glu Arg Glu Thr
50 55 60

Phe Ile Glu Ala Met Arg Ala Ala Ala Arg Glu Asn Ala Arg Lys Leu
65 70 75 80

Ala Glu Thr Ala His Asp Glu Thr Gly Tyr Gly His Val Glu Asp Lys
85 90 95

Val Ala Lys Asn Val Leu Ala Ala Asp Lys Thr Pro Gly Ile Glu Asp
100 105 110

Leu Asn Thr Met Ala Val Ser Gly Asp Ala Gly Leu Met Leu Thr Glu
115 120 125

Met Ala Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Ser Thr Asn Pro
130 135 140

Thr Ala Thr Val Ile Asn Asn Gly Ile Gly Met Ile Ala Gly Gly Asn
145 150 155 160

Ala Val Val Phe Asn Pro His Pro Gly Ala Lys Lys Ala Ser Leu Leu
165 170 175

Thr Ile Lys Leu Met Asn Glu Ala Ile Val Gly Ala Gly Gly Pro Asp
180 185 190

Asn Leu Leu Cys Ala Pro Glu Glu Pro Thr Leu Asp Thr Ser Ser Val
195 200 205

Ile Met Ser His Pro Leu Val Lys Leu Leu Val Val Thr Gly Gly Glu
210 215 220

Ala Val Val Arg Thr Ala Met Lys Thr Gly Lys Lys Cys Ile Ala Ala
225 230 235 240

Gly Pro Gly Asn Pro Pro Val Val Val Asp Gly Thr Ala Asp Ile Lys
245 250 255

Arg Ala Ala Ala Asp Ile Val Lys Gly Ala His Tyr Glu Asn Cys Ile
260 265 270

Leu Cys Ile Ala Glu Lys Glu Ile Leu Val Glu Ser Cys Val Ala Asp
275 280 285

Glu Leu Ile Arg Glu Met Val Lys Glu Gly Ala Tyr Leu Ala Asp Glu
290 295 300

Lys Glu Leu Ser Ala Ile Val Gly Lys Val Met Ile Thr Ala Lys Asp
305 310 315 320

Gly Ser Tyr Ala Pro Asn Lys Lys Tyr Val Gly Arg Asp Ala Thr Tyr
325 330 335

Ile Leu Lys Glu Ala Gly Ile Cys Val Asp Arg Glu Ala Lys Ile Ile
340 345 350

Ile Ala Glu Val Pro Phe Gly His Pro Leu Val Met Thr Glu Met Leu
355 360 365

Met Pro Val Ile Pro Val Thr Arg Val Ala Thr Val Glu Glu Ala Ile
370 375 380

Glu Lys Ala Val Ile Ala Glu Asn Gly Cys His His Thr Ala Met Met
385 390 395 400

His Ser Glu Asn Val Ser Asn Leu Thr Lys Met Ala Arg Ala Ala Asp
405 410 415

Thr Thr Ile Phe Val Lys Asn Ala Pro Ser Tyr Ala Gly Leu Gly Ile
420 425 430

Asp Gly Glu Gly Tyr Thr Thr Leu Thr Ile Ala Thr Pro Thr Gly Glu
435 440 445

Gly Leu Thr Ser Ala Arg Asn Phe Thr Arg Ser Arg Arg Cys Thr Leu
450 455 460

His Gly Ser Phe Arg Ile Val
465 470

<210> 43

<400> 43
000

<210> 44
<211> 448
<212> PRT
<213> Enterococcus phoeniculicola

<400> 44

Ile Met Asn Thr Leu Ser Asp Lys Ile Leu Arg Gly Arg Gln Ala Met
1 5 10 15

Gln Ser Ile Ser Asn Tyr Thr Gln Glu Gln Val Asp Glu Met Leu Ser
20 25 30

Val Ile Ser Lys Thr Ile Phe Asp His Ala Glu Glu Leu Ala Lys Glu
35 40 45

Ala Val Glu Glu Thr Gly Leu Gly Asn Tyr Glu His Lys Ile Gly Lys
50 55 60

Asn Gln Asn Met Ala Ile Asn Ile Phe Ser His Leu Lys Gly Lys Lys
65 70 75 80

Ser Val Gly Ile Ile Gln Thr Leu Lys Glu Glu Gly Val Val Glu Ile
85 90 95

Ala His Pro Val Gly Val Ile Gly Ser Val Thr Pro Thr Thr Asn Pro
100 105 110

Thr Ile Thr Pro Leu Gly Asn Gly Leu Met Ala Leu Lys Gly Lys Asn
115 120 125

Ala Met Ile Val Ser Pro His Pro Arg Ala Lys Lys Thr Thr Lys His
130 135 140

Thr Ile Asp Leu Met Arg Ser Ala Leu Glu Ser Ile His Ala Pro Lys
145 150 155 160

Asp Leu Leu Gln Val Ile Glu Glu Pro Ser Leu Glu Leu Ser Gln Gln
165 170 175

Leu Met Arg Glu Ser Asp Val Ile Val Ala Thr Gly Gly Pro Gly Leu
180 185 190

Val Arg Ala Ala Tyr Ser Ser Gly Lys Pro Ala Phe Gly Val Gly Pro
195 200 205

Gly Asn Val Gln Ala Ile Leu Asp Asp Asp Phe Asp Ile Asn Leu Ala
210 215 220

Ala Glu Leu Thr Val Ile Gly Arg Ser Phe Asp Asn Gly Ile Val Cys
225 230 235 240

Ala Cys Gln Gln Ser Leu Leu Tyr Pro Glu Lys Lys Glu Glu Glu Leu
245 250 255

Phe Gln Ala Leu Glu Asn Asn Lys Ala Tyr Ile Ile Lys Glu Glu Ile
260 265 270

Asp Val Gln Lys Met Arg Glu Leu Leu Phe Pro Gly Gly Lys Ser Asn
275 280 285

Pro Asp Leu Val Gly Gln Thr Ala Thr Phe Ile Ala Glu Lys Ala Gly
290 295 300

Ile Lys Val Pro Glu Asp Thr Ile Ile Leu Ala Val Lys Val Thr Thr
305 310 315 320

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

Val Val Lys Gly Cys Glu Ser Phe Glu Glu Ala Leu Leu Asp Ala Lys
340 345 350

Asn Asn Leu Trp Val Glu Gly Ala Gly His Ser Thr Gly Ile Phe Ser
355 360 365

Asn Asn Glu Gln His Ile Leu Ser Ala Gly Glu Thr Leu Pro Val Ser
370 375 380

Arg Val Val Val Asn Gln Pro Thr Ile Asp Ala Gly Gly Ser Pro Thr
385 390 395 400

Asn Gly Leu Asn Pro Thr Val Ser Leu Gly Cys Gly Ser Trp Gly Asn
405 410 415

Asn Ser Ile Ser Glu Asn Leu Ser Tyr His His Leu Ile Asn Ile Ser
420 425 430

Arg Ile Ala Tyr Pro Ile Ser Pro Lys His Thr Glu Thr Pro Trp Asn
435 440 445

<210> 45
<211> 462
<212> PRT
<213> *Blautia schinkii*

<400> 45

Met Pro Ile Ser Asp Ser Met Val Gln Glu Ile Val Gln Glu Val Met
1 5 10 15

Ala Lys Met Gln Ile Ala Asp Ala Pro Ala Gly Lys His Gly Val Phe
20 25 30

Lys Asp Met Asn Glu Ala Ile Glu Ala Ala Lys Lys Thr Glu Asn Ile
35 40 45

Val Lys Arg Met Ser Met Asp Gln Arg Glu Lys Ile Ile Thr Cys Ile
50 55 60

Arg Lys Ser Ile Lys Lys Asn Ala Glu Ile Met Ala Arg Met Gly Val
65 70 75 80

Asp Glu Thr Gly Met Gly Asn Val Gly Asp Lys Ile Leu Lys His His
85 90 95

Leu Val Ala Asp Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala
100 105 110

Trp Ser Gly Asp Arg Gly Leu Thr Leu Val Glu Met Gly Pro Phe Gly
115 120 125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Ile Leu
130 135 140

Cys Asn Thr Met Gly Met Leu Ala Gly Gly Asn Thr Val Val Phe Asn
145 150 155 160

Pro His Pro Ala Ala Ile Lys Thr Ser Ile Tyr Ala Val Asn Leu Leu
165 170 175

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

Val Glu Gln Pro Thr Leu Glu Thr Ser Asn Ile Met Met Lys His Lys
195 200 205

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

Val Leu Ser Ser Gly Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
225 230 235 240

Pro Ala Leu Val Asp Glu Thr Ala Asp Val Arg Lys Ala Ala Gln Asp
245 250 255

Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
260 265 270

Lys Glu Ile Val Ala Val Ser Pro Ile Val Asp Glu Leu Met His Tyr
275 280 285

Leu Val Ser Glu Asn Asp Cys Tyr Leu Ala Ser Lys Glu Glu Gln Asp
290 295 300

Lys Leu Thr Glu Val Val Leu Ala Gly Gly Arg Leu Asn Arg Lys Cys

305 310 315 320

Val Gly Arg Asp Ala Arg Thr Leu Leu Ser Met Ile Gly Val Asn Val
 325 330 335

Pro Ala Asn Ile Arg Cys Ile Val Phe Glu Gly Pro Lys Glu His Pro
 340 345 350

Leu Ile Ala Thr Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Ala
 355 360 365

Lys Asp Phe Asp Asp Ala Val Glu Gln Ala Val Trp Leu Glu His Gly
 370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Ile Asp Asn Ile Thr
385 390 395 400

Lys Tyr Ala Lys Ala Ile Asp Thr Ala Ile Leu Val Lys Asn Ala Pro
 405 410 415

Ser Tyr Ala Ala Leu Gly Phe Gly Gly Glu Gly Tyr Cys Thr Phe Thr
 420 425 430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Thr Phe Thr
 435 440 445

Lys Arg Arg Arg Cys Val Met Ser Asp Ser Leu Cys Ile Arg
 450 455 460

<210> 46

<400> 46
000

<210> 47

<211> 472

<212> PRT

<213> Clostridium intestinale

<400> 47

Met Ser Ile Asp Ala Thr Leu Val Glu Lys Leu Val Arg Gln Ala Ile
1 5 10 15

Glu Glu Ala Lys Ser Lys Asn Leu Ile Ser Phe Asn Lys Val Glu Thr
20 25 30

Leu Asn Asn Tyr Gly Ile Phe Asn Thr Met Asp Glu Ala Ile Glu Ala
35 40 45

Ser Asp Val Ala Gln Lys Glu Leu Leu Asn Thr Ser Met Ala Asn Arg
50 55 60

Gln Lys Tyr Ile Asn Ile Ile Lys Ser Thr Val Leu Lys Arg Glu Asn
65 70 75 80

Leu Glu Leu Ile Ser Arg Met Ala Val Glu Glu Thr Glu Ile Gly Arg
85 90 95

Tyr Glu His Lys Leu Ile Lys Asn Arg Val Ala Ala Glu Lys Thr Pro
100 105 110

Gly Thr Glu Asp Leu Val Thr Glu Ala Ile Thr Gly Asp Asn Gly Ile
115 120 125

Thr Leu Ile Glu Tyr Cys Pro Phe Gly Val Ile Gly Ser Ile Thr Pro
130 135 140

Thr Thr Asn Pro Thr Glu Thr Ile Ile Cys Asn Ser Met Ser Met Ile
145 150 155 160

Ala Gly Gly Asn Thr Val Val Phe Ser Pro His Pro Arg Ala Lys Asn
165 170 175

Val Ser Ile Lys Leu Ile Thr Met Leu Asn Lys Ala Leu Glu Glu Ala
180 185 190

Gly Ala Pro Lys Asn Leu Ile Val Thr Val Lys Glu Pro Ser Ile Glu
195 200 205

Asn Thr Asn Ala Met Met Asp His Pro Lys Val Arg Val Leu Val Ala
210 215 220

Thr Gly Gly Pro Ala Ile Val Lys Lys Val Met Ser Thr Gly Lys Lys

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

Glu Gly Leu Thr Thr Ala Lys Ser Phe Cys Arg Lys Arg Arg Cys Ile
450 455 460

Met Val Asp Ala Phe Asn Ile Arg
465 470

<210> 48
<211> 483
<212> PRT
<213> Massilioclostridium coli

<400> 48

Met Val Phe Ser Gln Asn Gln Ile Asp Ser Ile Val Gln Ser Val Val
1 5 10 15

Ala Gln Met Gln Gly Thr Thr Pro Thr Ser Ala Pro Ala Tyr Asp Ser
20 25 30

Thr Gln Tyr Asn Gly Arg Gln Tyr Leu Gly Val Tyr Ala Thr Met Glu
35 40 45

Glu Gly Ile Asp Ala Ala Ala Asp Ser Tyr Lys Val Ile Arg Asn Met
50 55 60

Ser Val Glu Gln Arg Glu Lys Ile Ile Thr Glu Ile Arg Lys Leu Thr
65 70 75 80

Arg Ala Glu Ala Glu Ile Met Ala Lys Leu Gly Val Glu Glu Thr Lys
85 90 95

Met Gly Arg Val Glu His Lys Thr Leu Lys His Ile Leu Val Ala Asp
100 105 110

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

Gly Gly Leu Thr Leu Val Glu Met Ala Pro Phe Gly Ile Ile Gly Ala
130 135 140

Ile Thr Pro Ser Thr Asn Pro Ser Glu Thr Val Ile Cys Asn Ser Ile
145 150 155 160

Ala Met Ile Ala Ala Gly Asn Ala Val Val Phe Asn Pro His Pro Gly
165 170 175

Ala Ile Lys Val Ser Asn Tyr Ala Val Asp Leu Val Asn Arg Ala Ser
180 185 190

Leu Ala Ala Gly Gly Pro Ala Ser Leu Val Cys Ser Met Val Lys Pro
195 200 205

Thr Met Gln Thr Ala Asp Val Met Tyr Lys Asp Pro Arg Val Arg Met
210 215 220

Leu Val Cys Thr Gly Gly Pro Gly Val Val Lys Ser Val Leu Ser Ser
225 230 235 240

Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val
245 250 255

Asp Asp Thr Ala Asp Ile Lys Lys Ala Ala Lys Asp Ile Ile Asp Gly
260 265 270

Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu Lys Glu Val Phe
275 280 285

Ala Phe Ser Asn Ile Ala Asp Glu Leu Met Tyr Asn Met Gln Gln Asn
290 295 300

Gly Ala Tyr Phe Ile Thr Ala Ala Gln Ala Asp Glu Leu Ala Lys Ile
305 310 315 320

Val Leu Val Glu Lys Lys Asn Glu Lys Thr Gly Lys Ile Thr Tyr Ser
325 330 335

Val Ser Arg Asp Trp Val Gly Arg Asp Ala Lys Lys Phe Ala Ala Ala
340 345 350

Leu Gly Ile Glu Val Asp Asp Ser Val Arg Cys Leu Ile Cys Glu Val
355 360 365

Glu Glu Asp His Leu Phe Val Gln Thr Glu Leu Met Met Pro Ile Leu
370 375 380

Ala Val Val Arg Val Lys Asp Ile Asp Glu Ala Ile Glu Lys Ala Val
385 390 395 400

Arg Ala Glu His Gly Asn Arg His Ser Ala His Met His Ser Lys Asn
405 410 415

Ile Glu Asn Leu Ser Lys Phe Ala Lys Ala Ile Glu Thr Thr Ile Phe
420 425 430

Val Lys Asn Ala Pro Ser Tyr Ala Gly Ile Gly Phe Gly Ala Glu Gly
435 440 445

His Thr Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser
450 455 460

Ala Arg Ser Phe Thr Arg Lys Arg Arg Cys Val Met Lys Asp Met Phe
465 470 475 480

His Ile Ile

<210> 49

<211> 466

<212> PRT

<213> Cloacibacillus porcorum

<400> 49

Met Asn Ile Asp Ala Ala Leu Ile Glu Gly Ile Val Lys Gly Val Met
1 5 10 15

Arg Lys Ile Asp Glu Ser Glu Asn Asn Ser Ala Gly Ser Cys Gly Ile
20 25 30

Phe Ala Asp Met Asn Asp Ala Ile Glu Ala Ala Ala Ala Ala Gln Arg
35 40 45

Arg Tyr Leu Asp Cys Ser Met Ala Asp Arg Ala Arg Phe Val Glu Ala
50 55 60

Ile Arg Gly Thr Val Leu Asn Glu Glu Asn Leu Lys Phe Met Ser Leu
65 70 75 80

Ser Thr Ile Glu Glu Thr Gly Met Gly Asn Tyr Glu His Lys Leu Val
85 90 95

Lys Asn Arg Leu Ala Ala Thr Lys Thr Pro Gly Ile Glu Asp Leu Thr
100 105 110

Thr Asp Ala Ile Thr Gly Asp Asp Gly Leu Thr Ile Val Glu Tyr Ser
115 120 125

Pro Phe Gly Val Ile Gly Ala Ile Thr Pro Thr Thr Asn Pro Thr Glu
130 135 140

Thr Ile Ile Cys Asn Ser Ile Gly Met Leu Ala Ala Gly Asn Thr Val
145 150 155 160

Val Phe Ser Pro His Pro Arg Ala Lys Lys Val Ser Leu Trp Leu Val
165 170 175

Ser Glu Leu Asn Arg Ala Leu Ala Ala Gly Ala Pro Ala Asn Leu
180 185 190

Ile Val Thr Val Ser Glu Pro Ser Ile Glu Asn Thr Asn Leu Met Met
195 200 205

Ala His Pro Lys Val Arg Met Leu Val Ala Thr Gly Gly Pro Ala Ile
210 215 220

Val Lys Thr Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala
225 230 235 240

Gly Asn Pro Pro Ala Val Val Asp Glu Ser Ala Asn Ile Glu Lys Ala
245 250 255

Ala Lys Asp Ile Val Asp Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys
260 265 270

Ile Ala Glu Lys Glu Val Ile Val Val Asp Ser Ala Ala Asp Tyr Leu

275

280

285

Ile Phe Asn Met Lys Lys Asn Gly Ala Phe Glu Val Lys Asp Pro Ala
 290 295 300

Val Ile Glu Arg Leu Val Gly Leu Val Thr Lys Glu Gly Lys Ser Pro
 305 310 315 320

Lys Thr Glu Phe Val Gly Lys Ser Ala Lys Tyr Ile Leu Glu Lys Ala
 325 330 335

Gly Val Glu Ala Pro Glu Asp Thr Arg Val Ile Ile Met Glu Ala Arg
 340 345 350

Glu Glu His Pro Phe Val Gln Val Glu Leu Met Met Pro Ile Leu Pro
 355 360 365

Ile Val Arg Ala Asp Asn Val Asn Glu Ala Ile Glu Met Ala Val Arg
 370 375 380

Val Glu His Gly Asn Arg His Thr Ala Met Met His Ser Arg Asn Val
 385 390 395 400

Asp Ser Leu Thr Lys Met Ala Lys Leu Ile Gln Thr Thr Ile Phe Val
 405 410 415

Lys Asn Gly Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Met Gly His
 420 425 430

Thr Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala
 435 440 445

Lys Thr Phe Ala Arg Arg Arg Arg Cys Val Leu Val Gly Gly Met Asp
 450 455 460

Ile Arg
 465

<210> 50

<400> 50

000

<210> 51

<400> 51
000

<210> 52

<400> 52
000

<210> 53

<211> 500

<212> PRT

<213> Sporosarcina globispora

<400> 53

Met Gln Glu Met Arg Asp Ala Val Lys Arg Ala Lys Glu Ala Gln Leu
1 5 10 15

Glu Tyr Met Ala Phe Thr Gln Glu Gln Val Asp Glu Ile Val Lys Asn
20 25 30

Ala Ala Asp Ala Ala Tyr Ala Lys Ser Leu Tyr Leu Ala Gln Met Ala
35 40 45

Val Glu Glu Thr Gly Met Gly Ile Val Glu His Lys Lys Ile Lys Asn
50 55 60

Glu Val Gly Ser Lys Ala Val Tyr Glu Ser Ile Lys Asp Glu Lys Thr
65 70 75 80

Val Gly Ile Ile Arg Glu Asp Arg Val Asn Lys Val Thr Glu Ile Ala
85 90 95

Tyr Pro Tyr Gly Val Val Ala Gly Ile Ile Pro Thr Thr Asn Pro Thr
100 105 110

Ser Thr Ala Ile Phe Lys Ala Leu Ile Ser Leu Lys Thr Arg Asn Ala
115 120 125

Ile Val Val Ser Pro His Pro Arg Ala Val Lys Cys Thr Val Glu Ala
130 135 140

Leu Lys Ile Val Asn Glu Ala Ala Ile Gln Ala Gly Ala Pro Glu Gly
145 150 155 160

Leu Ile Gly Trp Ile Ser Lys Pro Ser Met Gly Ala Thr Asn Glu Leu
165 170 175

Met Lys His Arg Asp Ile Ser Leu Ile Leu Ala Thr Gly Gly Gly Gly
180 185 190

Leu Val Arg Ala Ala Tyr Ser Ser Gly Lys Pro Ala Tyr Gly Val Gly
195 200 205

Pro Gly Asn Val Pro Cys Tyr Ile Glu Lys Thr Ala Lys Val Ala Gln
210 215 220

Ser Val Lys Met Ile Ile Asp Ser Lys Ser Phe Asp Asn Gly Thr Ile
225 230 235 240

Cys Ala Thr Glu Gln Ser Ile Val Ala Asp Arg Asn Ile Lys Glu Met
245 250 255

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

Glu Lys Ala Ala Leu Glu Lys Ile Ile Ser Pro Ser Pro Gly Lys Leu
275 280 285

Asn Pro Asp Ile Val Gly Gln Ser Ala Val Lys Ile Ala Ala Met Ala
290 295 300

Gly Ile Gln Val Pro Asn Asp Thr Arg Val Leu Ile Ala Glu Glu Thr
305 310 315 320

Lys Val Gly Lys Asp Ile Pro Phe Ser Ile Glu Lys Leu Ser Pro Ile
325 330 335

Phe Ala Phe Tyr Thr Ala Glu Ser Tyr Gln Asp Ala Lys Glu Ile Cys
340 345 350

Leu Gln Leu Leu Asn Leu Gly Gly Arg Gly His Ser Leu Ser Leu His

355

360

365

Thr Asn Asp Asp Ala Val Ala Lys Asp Phe Ala Leu Glu Met Pro Val
 370 375 380

Ser Arg Ile Leu Val Asn Thr Leu Ser Ser Ile Gly Ala Val Gly Ala
 385 390 395 400

Thr Thr Gly Leu Met Pro Ser Leu Thr Leu Gly Cys Gly Ser Phe Gly
 405 410 415

Gly Asn Ile Thr Ser Asp Asn Val Thr Ala Arg His Leu Ile Asn Thr
 420 425 430

Lys Arg Met Ala Tyr Gly Thr Lys Glu Val Thr Val Pro Lys Pro Ala
 435 440 445

Ala Ser Ser Ser Ile Ala Glu Lys Glu Gln Ala Gly Ser Gln Asp Val
 450 455 460

Asp His Ile Val Ser Gln Val Leu Gln Gln Val Ser Pro Gly Gly Glu
 465 470 475 480

Val Asp Ala Lys Met Ile Ala Asp Met Val Asn Gln Val Met Lys Lys
 485 490 495

Tyr Gln Thr Asn
 500

<210> 54

<400> 54
 000

<210> 55

<400> 55
 000

<210> 56

<400> 56
 000

<210> 57

<400> 57
000

<210> 58

<211> 528

<212> PRT

<213> Rhodobacter aestuarii

<400> 58

Met Lys Asp Ile Asp Ile Glu Asn Ala Val Ala Arg Val Leu Ser Gly
1 5 10 15

Tyr Thr Gly Pro Ala Glu Thr Pro Ala Pro Ala Pro Thr Ser Lys Pro
20 25 30

Gly Thr Thr Gly Cys Val Trp Glu Pro Val Lys Ala Val Asp Pro Val
35 40 45

Asp Asp Ile Ile Gly Gly Met Leu Thr Arg Ala Leu Gly Glu Arg Asn
50 55 60

Cys Ser Asn Cys Lys Ala Gly Asp Cys Gln Gly Lys Ala Gly Cys Leu
65 70 75 80

Ser Ile Ser Asp Ala Glu Ala Leu Glu Leu Gly Asp Gly Val Phe Ala
85 90 95

Thr Met Asp Glu Ala Val Asn Ala Ala Glu Ala Gln Arg Lys Tyr
100 105 110

Leu Phe Cys Thr Met Gly Asp Arg Lys Arg Phe Val Glu Gly Ile Arg
115 120 125

Ala Ile Phe Thr Asp Glu Ala Val Leu Glu Arg Ile Ser Arg Leu Thr
130 135 140

Val Glu Gln Thr Gly Met Gly Asn Leu Ala His Lys Ile Ile Lys Asn
145 150 155 160

Arg Leu Ala Ala Glu Lys Thr Pro Gly Val Glu Asp Leu Thr Thr Glu
165 170 175

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

Gly Val Ile Gly Ala Ile Thr Pro Thr Thr Asn Pro Thr Glu Thr Val
195 200 205

Ile Cys Asn Ser Ile Gly Met Leu Ala Ala Gly Asn Ala Ala Val Phe
210 215 220

Ser Pro His Pro Arg Ala Lys Gly Val Ser Leu Leu Ala Ile Lys Leu
225 230 235 240

Ile Asn Arg Lys Leu Ala Ala Leu Gly Ala Pro Ala Asn Leu Val Val
245 250 255

Thr Val Gln Ala Pro Ser Ile Asp Asn Thr Asn Ala Met Met Ala His
260 265 270

Pro Gln Val Arg Met Leu Val Ala Thr Gly Gly Pro Gly Ile Val Arg
275 280 285

Thr Val Met Ser Thr Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn
290 295 300

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

Asp Ile Val Asn Gly Ala Ser Phe Asp Asn Asn Met Pro Cys Ile Ala
325 330 335

Glu Lys Glu Val Ile Val Val Asp Gln Val Ala Asp Phe Leu Ile Ser
340 345 350

Glu Met Gln Arg Asn Gly Ala Trp Leu Ala Ser Asp Pro Ser Val Val
355 360 365

Glu Arg Leu Ala Gln Leu Val Leu Thr Glu Lys Gly Gly Pro Gln Thr
370 375 380

Gly Cys Val Gly Lys Ser Ala Ala Trp Leu Leu Gly Gln Ile Gly Ile
385 390 395 400

Gln Val Gly Pro Asp Val Arg Leu Ile Ile Leu Glu Thr Thr Lys Asp
405 410 415

His Pro Phe Val Gln Glu Glu Leu Met Met Pro Ile Leu Pro Val Val
420 425 430

Arg Val Pro Asp Val Asp Thr Ala Ile Asp Leu Ala Val Asp Leu Glu
435 440 445

His Gly Asn Arg His Thr Ala Met Met His Ser Thr Asn Val Arg Lys
450 455 460

Leu Thr Lys Met Ala Lys Leu Ile Gln Thr Thr Ile Phe Val Lys Asn
465 470 475 480

Gly Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Tyr Thr Thr
485 490 495

Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Pro Arg Ser
500 505 510

Phe Ala Arg Arg Arg Lys Cys Val Met Val Glu Ala Leu Asn Val Arg
515 520 525

<210> 59
<211> 468
<212> PRT
<213> Clostridium grantii

<400> 59

Met Ala Ile Asn Glu Ser Gln Ile Glu Glu Ile Val Lys Gln Val Leu
1 5 10 15

Leu Asn Val Ser Gly Thr Thr Lys Val Lys Asn Glu Asn Lys Ala Ile
20 25 30

Gly Ile Phe Glu Asp Ile Glu Glu Ala Ile Asp Ala Ala Lys Ile Ala
35 40 45

Gln Lys Lys Ile Lys Lys Met Ser Met Glu Gln Arg Glu Lys Ile Ile
50 55 60

Thr Arg Ile Arg Glu Lys Thr Arg Glu Asn Ala Lys Ile Met Ser Glu
65 70 75 80

Met Ala Val Glu Glu Thr Gly Met Gly Arg Val Asp His Lys Ile Leu
85 90 95

Lys His Leu Leu Val Ala Asp Lys Thr Pro Gly Thr Glu Asp Ile Thr
100 105 110

Thr Thr Ala Trp Ser Gly Asp Asn Gly Leu Thr Leu Ile Glu Met Gly
115 120 125

Ala Phe Gly Val Ile Gly Gly Ile Thr Pro Ser Thr Asn Pro Ser Cys
130 135 140

Thr Val Leu Cys Asn Ser Ile Gly Met Ile Ala Gly Gly Asn Thr Val
145 150 155 160

Val Phe Asn Pro His Pro Gly Ala Val Lys Val Ser Asn Tyr Ala Val
165 170 175

Thr Leu Val Asn Glu Ala Ser Val Glu Cys Gly Gly Pro Glu Asn Ile
180 185 190

Ala Cys Ser Val Thr Lys Pro Thr Leu Asp Ser Gly Lys Ile Leu Met
195 200 205

Thr His Lys Asp Ile Ala Leu Leu Ala Val Thr Gly Gly Pro Gly Val
210 215 220

Val Thr Ala Ala Leu Lys Ser Gly Lys Arg Ala Leu Gly Ala Gly Ala
225 230 235 240

Gly Asn Pro Pro Val Val Val Asp Glu Thr Ala Asp Leu Gln Ser Ala
245 250 255

Ala Lys His Ile Val Asp Gly Ala Thr Phe Asp Asn Asn Leu Pro Cys

260

265

270

Ile Ala Glu Lys Glu Val Val Ala Val Glu Ser Ile Val Glu Glu Leu
 275 280 285

Lys Tyr His Met Ile Asn Asn Gly Cys Tyr Glu Leu Lys Gly Ser Asp
 290 295 300

Ile Asp Lys Leu Val Asn Thr Val Leu Ile Asn Asn Asn Gly Ile Ile
 305 310 315 320

Gly Leu Asn Arg Asp Cys Val Gly Lys Asp Ala Lys Val Ile Leu Lys
 325 330 335

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

Ala Asp Glu Asp His Ile Leu Val Leu Glu Glu Leu Met Met Pro Ile
 355 360 365

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

Val Arg Tyr Glu His Gly Asn Arg His Ser Ala His Met His Ser Lys
 385 390 395 400

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

Phe Val Lys Asn Ala Pro Ser Tyr Ser Ala Leu Gly Phe Asn Gly Glu
 420 425 430

Gly Tyr Cys Thr Phe Thr Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr
 435 440 445

Ser Gly Lys Thr Phe Thr Lys Ser Arg Arg Cys Val Leu Ser Asp Gly
 450 455 460

Leu Ser Ile Arg
 465

<210> 60
<211> 449
<212> PRT
<213> Collinsella sp. GD7

<400> 60

Val Ala Glu Phe Ile Glu Arg Ala Arg Val Ala Gln Ala Glu Phe Glu
1 5 10 15

Thr Tyr Ser Gln Glu Glu Val Asp Arg Ala Val Arg Ala Ile Gly Lys
20 25 30

Ala Val Phe Asp Ala Ala Glu Pro Leu Ala Lys Leu Ala Val Glu Glu
35 40 45

Thr Arg Met Gly Arg Tyr Glu Asp Lys Ile Ala Lys Asn Ser Gly Lys
50 55 60

Thr Lys Ile Thr Trp Asp Arg Leu Lys Gly Val Lys Ser Arg Gly Ile
65 70 75 80

Ile Ala Arg His Glu Asp Glu Gly Ile Val Glu Val Ala Lys Pro Met
85 90 95

Gly Val Ile Gly Cys Ile Pro Pro Thr Thr Asn Pro Thr Met Thr Pro
100 105 110

Ala His Asn Ala Met Cys Ala Leu Lys Gly Gly Asn Ala Leu Leu Ile
115 120 125

Ser Pro His Pro Arg Ala Lys Lys Thr Gly Val Glu Thr Val Arg Ile
130 135 140

Met Arg Glu Ala Leu Glu Ala Met Gly Ala Pro Ala Asp Leu Ile Gln
145 150 155 160

Ile Ile Pro Asp Pro Thr Leu Glu Ile Ser Ser Leu Val Met Ser Met
165 170 175

Cys Asp Cys Thr Ile Ala Thr Gly Gly Pro Gly Met Val Lys Ala Val
180 185 190

Tyr Ser Ser Gly Lys Pro Ala Phe Gly Val Gly Ala Gly Asn Val Gln
195 200 205

Thr Ile Val Asp Thr Asp Ala Asp Leu Glu Leu Ser Ala Gln Gln Ile
210 215 220

Val Arg Ser Arg Thr Tyr Asp Asn Gly Val Leu Cys Thr Cys Glu Gln
225 230 235 240

Cys Ile His Val Gln Glu Asp Ile Tyr Gly Glu Met Val Arg Leu Phe
245 250 255

Gln Gln Glu Gly Ala Phe Tyr Ile Ser Glu Gln Ala Asp Val Asp Ala
260 265 270

Leu Arg Ala Ala Leu Phe Pro Asn Gly Ala Ile Asn Lys Asp Ala Val
275 280 285

Gly Ala Ser Pro Gln Phe Ile Gly Ser Leu Ala Gly Leu Asp Val Pro
290 295 300

Glu Asp Ala Lys Leu Leu Met Val Lys Val Asp Ala Tyr Gly Ala Asp
305 310 315 320

Glu Leu Leu Cys Lys Glu Lys Leu Cys Pro Val Met Cys Val Ala Ser
325 330 335

Tyr Gly Thr Trp Glu Glu Gly Val Ala Asn Ala Lys Thr Asn Leu Leu
340 345 350

His Glu Gly Ala Gly His Ser Ala Ile Val Arg Ser His Thr Ala Glu
355 360 365

His Val Asp Tyr Ala Gly Glu Gln Leu Pro Val Ser Arg Ile Gly Val
370 375 380

Asn Met Ile Gly Ser Ser Gly Leu Gly Gly Ala Phe Asp Asn Gly Leu
385 390 395 400

Asn Pro Thr Ala Thr Leu Gly Cys Gly Ser Trp Gly Asn Asn Ser Ile
405 410 415

Ser Glu Asn Leu Trp Trp His His Leu Val Asn Ile Ala Arg Ile Ala
420 425 430

Val Ala Leu Pro Asp Val Gln Val Pro Ser Asp Glu Glu Val Trp Gly
435 440 445

Glu

<210> 61
<211> 471
<212> PRT
<213> Clostridium estertheticum

<400> 61

Met Glu Ile Lys Asn Asp Glu Ile Ser Ala Met Val Glu Lys Val Leu
1 5 10 15

Gln Glu Met Asn Arg Arg Asp Leu Asn Val Ser Glu Ser Asp Gly Val
20 25 30

Phe Asp Asp Met Asp Glu Ala Ile Glu Ala Ala Ser Ile Ala Gln Lys
35 40 45

Glu Leu Ile Cys Met Ser Ile Ser Gln Arg Glu Glu Leu Ile Ser Ala
50 55 60

Met Arg Lys Ala Ile Leu Asp Asn Ala Thr Lys Ile Ala Asp Ile Cys
65 70 75 80

Val Glu Asp Thr Gly Met Gly Arg Lys Asp His Lys Tyr Leu Lys Leu
85 90 95

Lys Leu Val Ala Asn Lys Thr Pro Gly Thr Glu Val Leu Lys Thr Met
100 105 110

Ala Ile Ser Gly Asp Lys Gly Leu Thr Leu Ile Glu Met Gly Pro Phe
115 120 125

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

Met Cys Asn Ser Ile Gly Met Ile Ala Ser Gly Asn Ala Ala Val Phe
145 150 155 160

Ser Pro His Pro Gly Ala Ile Glu Ser Cys Leu Ile Ser Val Arg Val
165 170 175

Leu Asn Lys Ala Ile Thr Asp Ala Gly Gly Pro Arg Asn Leu Ile Thr
180 185 190

Thr Leu Arg Lys Pro Ser Leu Glu Ser Thr Asp Thr Met Ile Asn Asn
195 200 205

Pro Lys Ile Arg Leu Val Val Ala Thr Gly Gly Pro Phe Ile Val Lys
210 215 220

Lys Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn
225 230 235 240

Pro Pro Val Val Val Asp Glu Thr Ala Asp Ile Val Lys Ala Ala Arg
245 250 255

Asp Ile Ile Ala Gly Cys Cys Phe Asp Asn Asn Leu Pro Cys Ile Ala
260 265 270

Glu Lys Glu Ala Ile Val Val Glu Ser Val Tyr Glu Lys Leu Ile Ala
275 280 285

Glu Met Leu Lys Asn Gly Asn Val Tyr Glu Leu Asp Glu Gln Gln Lys
290 295 300

Gln Lys Val Leu Asp Val Val Met Asn Lys Thr Glu Lys Gly Gly Lys
305 310 315 320

Ile Lys Tyr Gly Val Asn Lys Asn Phe Val Gly Lys Asp Ala Ser Val
325 330 335

Ile Leu Ala Ala Ala Gly Ile Glu Ala Pro Lys Gly Val Glu Cys Leu

340

345

350

Ile Cys Arg Ala Glu Asn Leu His Pro Phe Val Gln Glu Glu Leu Met
 355 360 365

Met Pro Ile Leu Ala Ile Val Lys Val Lys Asp Val Asp Glu Ala Ile
 370 375 380

Asn Thr Ala Val Leu Asp Glu His Gly Asn Arg His Thr Ala Met Met
 385 390 395 400

His Ser Lys Asn Ile Asp Asn Leu Thr Lys Met Ser Arg Leu Ile Asp
 405 410 415

Thr Thr Ile Phe Val Lys Asn Ala Pro Ser Tyr Ala Gly Ile Gly Phe
 420 425 430

Gly Gly Glu Gly Trp Thr Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu
 435 440 445

Gly Ile Thr Asn Ala Thr Ser Phe Thr Arg Gln Arg Arg Cys Thr Met
 450 455 460

Val Asp Ser Phe Arg Ile Ile
 465 470

<210> 62

<211> 483

<212> PRT

<213> bacterium MS4

<400> 62

Met Asp Ile Asp Ala Asn Leu Ile Glu Lys Met Val Lys Gln Val Leu
 1 5 10 15

Asn Glu Ile Asp Ala Gly Lys Ala Glu Lys Thr Ala Ala Ala Glu Ile
 20 25 30

Lys Lys Glu Glu Lys Gly Gly Ala Tyr Gly Ile Phe Asn Thr Met Glu
 35 40 45

Glu Ala Ile Asp Ala Cys Asp Ile Ala Gln Lys Gln Tyr Leu Phe Cys
50 55 60

Ser Met Ala Glu Arg Gln Lys Tyr Val Gln Thr Leu Arg Asp Val Val
65 70 75 80

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

Thr Gly Met Gly Asn Tyr Pro His Lys Leu Ile Lys Asn Arg Leu Ala
100 105 110

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

Gly Asp Asp Gly Leu Thr Leu Val Glu Tyr Cys Pro Phe Gly Val Ile
130 135 140

Gly Ala Ile Thr Pro Ala Thr Asn Pro Thr Glu Thr Ile Ile Cys Asn
145 150 155 160

Ser Ile Gly Met Leu Ala Ala Gly Asn Ser Ile Val Phe Ser Pro His
165 170 175

Pro Arg Ala Lys Asp Val Thr Ile Arg Leu Val Thr Met Ile Asn Arg
180 185 190

Ala Leu Glu Glu Thr Gly Ala Pro Lys Asn Leu Ile Val Thr Val Met
195 200 205

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

Arg Met Leu Val Ala Thr Gly Gly Pro Gly Ile Val Lys Leu Val Met
225 230 235 240

Ser Thr Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Val
245 250 255

Val Val Asp Glu Thr Ala Asp Ile Lys Lys Ala Ala Ile Asp Ile Val
260 265 270

Asn Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu Lys Glu
275 280 285

Val Ile Ala Val Asp Arg Ile Thr Asp Glu Leu Ile Arg Ser Met Arg
290 295 300

Glu Asn Gly Ala Tyr Gln Val Thr Asp Pro Ala Val Ile Gln Lys Leu
305 310 315 320

Ala Asp Leu Val Arg Lys Glu Gly Gly Gly Pro Lys Thr Ser Phe Val
325 330 335

Gly Lys Ser Ala Ile Tyr Ile Leu Asp Lys Ile Gly Ile Gln Ala Gly
340 345 350

Pro Glu Val Lys Val Ile Ile Met Glu Thr Pro Lys Asp His Pro Phe
355 360 365

Val Met Glu Glu Leu Met Met Pro Ile Leu Pro Ile Val Arg Thr Arg
370 375 380

Asn Val Asp Glu Ala Ile Asp Leu Ala Leu Ile Ala Glu Arg Gly Asn
385 390 395 400

Arg His Thr Ala Met Met His Ser Lys Asn Val Asp Lys Leu Thr Lys
405 410 415

Met Ala Lys Leu Leu Gln Thr Thr Ile Phe Val Lys Asn Ala Pro Ser
420 425 430

Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly His Thr Thr Phe Thr Ile
435 440 445

Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys Ser Phe Cys Arg
450 455 460

Lys Arg Arg Cys Val Leu Ser Asp Ala Phe His Ile Arg Asp Phe Ser
465 470 475 480

Lys Gly Leu

<210> 63
<211> 462
<212> PRT
<213> Clostridium glycyrrhizinilyticum

<400> 63

Val Ser Val Asn Glu Gln Met Val Gln Asp Ile Val Gln Glu Val Met
1 5 10 15

Ala Lys Met Gln Ile Thr Ser Asp Val Ser Gly Ser His Gly Val Phe
20 25 30

Lys Asp Met Asn Glu Ala Ile Ala Ala Ala Lys Lys Thr Gln Lys Ile
35 40 45

Val Gly Lys Met Ser Met Asp Gln Arg Glu Lys Ile Ile Ser Asn Ile
50 55 60

Arg Thr Lys Ile Lys Glu Asn Ala Glu Ile Met Ala Arg Met Gly Val
65 70 75 80

Gln Glu Thr Gly Met Gly Asn Val Gly His Lys Ile Leu Lys His Val
85 90 95

Leu Val Ala Glu Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala
100 105 110

Trp Ser Gly Asp Arg Gly Leu Thr Leu Ile Glu Met Gly Pro Phe Gly
115 120 125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Val Leu
130 135 140

Cys Asn Thr Ile Gly Met Leu Ala Gly Gly Asn Thr Val Val Phe Asn
145 150 155 160

Pro His Pro Ala Ala Ile Lys Thr Ser Ile Phe Ala Ile Asn Leu Leu
165 170 175

Asn Glu Ala Ser Leu Glu Ala Gly Gly Pro Asp Asn Ile Ala Cys Thr
180 185 190

Val Glu Lys Pro Thr Leu Ala Ser Ser Asp Ile Met Met Lys His Lys
195 200 205

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

Val Leu Ser Ser Gly Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
225 230 235 240

Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Glu Asp
245 250 255

Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
260 265 270

Lys Glu Ile Val Ala Val Asp Ser Ile Ala Asp Glu Leu Met Tyr Tyr
275 280 285

Met Val Ser Glu Gln Gly Cys Tyr Lys Ile Thr Lys Glu Glu Gln Asp
290 295 300

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

Val Gly Arg Asp Ala Lys Thr Leu Leu Gly Met Ile Gly Val Thr Val
325 330 335

Pro Asp Asn Ile Arg Cys Ile Thr Phe Glu Gly Pro Lys Glu His Pro
340 345 350

Leu Ile Ala Glu Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Ala
355 360 365

Lys Asp Phe Asp Asp Ala Val Glu Gln Ala Val Trp Leu Glu His Gly
370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Val Asp Asn Ile Thr

385		390		395		400									
Thr	Tyr	Ala	Lys	Ala	Ile	Asp	Thr	Ala	Ile	Leu	Val	Lys	Asn	Gly	Pro
			405						410					415	

Ser	Tyr	Ala	Ala	Leu	Gly	Phe	Gly	Gly	Glu	Gly	Tyr	Cys	Thr	Phe	Thr
			420					425					430		

Ile	Ala	Ser	Arg	Thr	Gly	Glu	Gly	Leu	Thr	Ser	Ala	Ser	Thr	Phe	Thr
		435					440					445			

Lys	Arg	Arg	Arg	Cys	Val	Met	Thr	Asp	Ser	Leu	Cys	Ile	Arg
	450					455					460		

<210> 64

<400> 64
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<210> 65

<211> 482

<212> PRT

<213> Thermincola ferriacetica

<400> 65

Met	Ala	Ile	Glu	Ala	Tyr	Gln	Ile	Glu	Lys	Ile	Val	Glu	Glu	Val	Met
1				5					10					15	

Lys	Lys	Met	Val	Ser	Gly	Gly	Ser	Gly	Asp	Ser	Phe	Ala	Gly	Lys	Ala
			20					25					30		

Lys	Gly	Ile	Phe	Glu	Ser	Val	Asp	Glu	Ala	Val	Lys	Ala	Ala	Lys	Ala
		35					40					45			

Ala	Gln	Lys	Glu	Leu	Val	Ala	Met	Arg	Ile	Glu	Lys	Arg	Glu	Met	Leu
	50					55					60				

Leu	Lys	Ala	Met	Arg	Glu	Ala	Ala	Ile	Ala	His	Ala	Glu	Glu	Leu	Ala
65					70				75					80	

Arg	Leu	Ala	Val	Glu	Glu	Thr	Gly	Met	Gly	Arg	Val	Thr	Asp	Lys	Ile
				85					90					95	

Ile Lys Asn Arg Val Ala Ala Glu Lys Thr Pro Gly Thr Glu Asn Leu
100 105 110

Gln Pro Ser Ala Val Thr Gly Asp Arg Gly Leu Thr Leu Ile Glu Arg
115 120 125

Ala Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Ser Thr Asn Pro Cys
130 135 140

Ala Thr Val Ile Asn Asn Ser Ile Ser Met Val Ala Ala Gly Asn Ser
145 150 155 160

Val Val Phe Ser Val His Pro Gly Ala Lys Lys Ala Ser Leu Leu Thr
165 170 175

Val Glu Ile Leu Asn Glu Ala Ile Glu Lys Ala Gly Gly Pro Ala Asn
180 185 190

Val Leu Thr Ala Val Ala Ser Pro Ser Leu Glu Asn Thr Asn Ala Leu
195 200 205

Met Lys His Pro Asp Ile Lys Leu Leu Val Ala Thr Gly Gly Pro Gly
210 215 220

Leu Val Lys Ala Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly
225 230 235 240

Ala Gly Asn Pro Pro Ala Leu Val Asp Glu Thr Ala Asp Leu Glu Arg
245 250 255

Ala Ala Lys Ser Ile Val Ala Gly Ala Ser Phe Asp Asn Asn Leu Pro
260 265 270

Cys Ile Ala Glu Lys Glu Val Ile Val Val Asp Tyr Val Ala Asn Gln
275 280 285

Leu Ile Ser Tyr Met Lys Gln Asn Gly Ala Tyr Leu Ala Asn Asp Arg
290 295 300

Glu Ile Lys Ala Leu Met Asp Leu Val Leu Thr Lys Asn Glu Asn Leu

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

Ile Val

<210> 66
 <211> 461
 <212> PRT
 <213> Lachnospiraceae bacterium AC3007
 <400> 66

Met Asn Glu Lys Leu Val Gln Glu Ile Val Arg Arg Val Met Ala Asp
1 5 10 15

Ile Asn Asp Glu Gly Gly Ala Asp Gly Met His Gly Val Phe Ser Asp
20 25 30

Met Asn Asp Ala Ile Glu His Ala Leu Lys Ala Gln Glu Lys Val Arg
35 40 45

Val Met Thr Leu Asp Gln Arg Glu Lys Ile Ile Ser Ala Ile Arg Arg
50 55 60

Lys Thr Asn Glu Asn Val Glu Thr Ile Ala Arg Met Gly Val Glu Glu
65 70 75 80

Thr Gly Met Gly Asn Val Gly Asp Lys Ile Leu Lys His Lys Leu Thr
85 90 95

Ala Asp Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala Trp Ser
100 105 110

Gly Asp Arg Gly Leu Thr Leu Val Glu Met Gly Pro Phe Gly Val Ile
115 120 125

Gly Ala Ile Thr Pro Ala Thr Asn Pro Ser Glu Thr Val Ile Cys Asn
130 135 140

Ser Ile Gly Met Ile Ala Gly Gly Asn Thr Val Val Phe Asn Pro His
145 150 155 160

Pro Asn Ala Lys Lys Thr Thr Ile Tyr Thr Ile Asn Met Ile Asn Glu
165 170 175

Ala Ser Leu Glu Ala Gly Gly Pro Asp Asn Ile Ala Cys Thr Val Gln
180 185 190

Glu Pro Thr Met Glu Thr Ser Ala Ile Met Met Lys His Pro Lys Ile
195 200 205

Pro Leu Leu Val Ala Thr Gly Gly Pro Gly Val Val Thr Ala Val Leu
210 215 220

Ser Ser Gly Lys Arg Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Ala
225 230 235 240

Leu Val Asp Glu Thr Ala Asp Ile Glu Lys Ala Ala Arg Asp Ile Ile
245 250 255

Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu Lys Glu
260 265 270

Val Val Ala Val Asp Ala Ile Phe Asp Glu Leu Met Arg His Phe Glu
275 280 285

Glu Glu Asn Gly Cys Tyr Arg Ala Ser Arg Glu Ile Gln Asp Lys Leu
290 295 300

Ile Ala Thr Val Ile Thr Pro Lys Gly Ala Leu Asn Arg Lys Cys Val
305 310 315 320

Gly Arg Asp Ala Lys Thr Leu Leu Lys Met Val Gly Val Asp Ala Pro
325 330 335

Ala Asp Thr Arg Cys Ile Ile Phe Glu Gly Glu Lys Glu His Pro Leu
340 345 350

Ile Ala Thr Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Val Lys
355 360 365

Asp Phe Arg Glu Gly Val Glu Thr Ala Val Trp Leu Glu His Gly Asn
370 375 380

Arg His Ser Ala His Ile His Ser Lys Asn Val Asp Arg Ile Thr Glu
385 390 395 400

Tyr Ala Arg Ala Leu Asp Thr Ala Ile Leu Val Lys Asn Gly Pro Ser
405 410 415

Tyr Ala Ala Leu Gly Phe Gly Gly Glu Gly Tyr Pro Thr Phe Thr Ile
420 425 430

Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Thr Phe Thr Lys
435 440 445

Arg Arg Arg Cys Val Met Thr Asp Ser Leu Cys Ile Arg
450 455 460

<210> 67

<211> 471

<212> PRT

<213> Eubacterium sp. 14-2

<400> 67

Met Asn Ile Asp Glu Arg Val Val Ala Ser Ile Val Asn Ala Val Leu
1 5 10 15

Gly Arg Leu Asp Asp Val Ser Ser Pro Ala Ala Glu Ala Gly Gly Gly
20 25 30

Asn Trp Gly Ile Phe Glu Ser Met Asn Asp Ala Val Glu Ala Ala Ala
35 40 45

Ala Ala Gln Lys Lys Tyr Ile Asn Cys Thr Met His Asp Arg Ala Ala
50 55 60

Tyr Val Gln Ala Ile Arg Asp Val Val Leu Lys Gln Glu Asn Leu Glu
65 70 75 80

Tyr Ile Ser Arg Gln Ser Ala Glu Glu Thr Gly Met Gly Asn Tyr Glu
85 90 95

His Lys Leu Ile Lys Asn Arg Leu Ala Ala Thr Lys Thr Pro Gly Thr
100 105 110

Glu Asp Leu Thr Thr Asp Ala Met Ser Gly Asp Asp Gly Leu Thr Leu
115 120 125

Val Glu Tyr Ser Pro Phe Gly Val Ile Gly Ala Ile Thr Pro Thr Thr
130 135 140

Asn Pro Thr Glu Thr Ile Ile Cys Asn Ser Ile Gly Met Leu Ala Ala
145 150 155 160

Gly Asn Ser Val Val Phe Ser Pro His Pro Arg Ala Lys Asn Val Ser
165 170 175

Leu His Leu Ile Arg Leu Ile Asn Arg Ala Leu Ala Glu Ala Gly Ala
180 185 190

Pro Ala Asn Leu Val Val Thr Val Ser Gln Pro Ser Ile Glu Asn Thr
195 200 205

Asn Ala Met Met Ser His Pro Met Val Arg Met Leu Val Ala Thr Gly
210 215 220

Gly Pro Gly Ile Val Lys Thr Val Leu Ser Ser Gly Lys Lys Ala Ile
225 230 235 240

Gly Ala Gly Ala Gly Asn Pro Pro Val Val Val Asp Glu Thr Ala Asn
245 250 255

Ile Glu Lys Ala Gly Lys Asp Ile Ile Asp Gly Cys Cys Phe Asp Asn
260 265 270

Asn Leu Pro Cys Ile Ala Glu Lys Glu Val Ile Val Val Asp Ser Ala
275 280 285

Ala Asp Tyr Leu Ile Phe Asn Met Lys Lys Asn Gly Ala Tyr Glu Val
290 295 300

Lys Asp Pro Glu Ile Ile Asp Arg Ile Val Lys Leu Val Val Gln Glu
305 310 315 320

Asn Gly Lys Ser Pro Val Thr Ser Phe Val Gly Lys Ser Ala Lys Tyr
325 330 335

Ile Leu Glu Gln Ala Gly Val His Val Asp Asp Asp Val Arg Val Ile
340 345 350

Ile Ala Gln Thr Gly Glu Asp His Pro Phe Val Gln Val Glu Leu Met
355 360 365

Met Pro Ile Leu Pro Ile Val Arg Val Pro Asp Val Asp Ala Gly Ile

370

375

380

Glu Met Ala Val Arg Val Glu His Gly Asn Arg His Thr Ala Met Met
 385 390 395 400

His Ser Arg Asn Val Asp Lys Leu Thr Lys Met Ala Lys Leu Ile Gln
 405 410 415

Thr Thr Ile Phe Val Lys Asn Gly Pro Ser Tyr Ala Gly Ile Gly Val
 420 425 430

Gly Gly Glu Gly Tyr Thr Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu
 435 440 445

Gly Leu Thr Ser Ala Lys Ser Phe Ala Arg Arg Arg Arg Cys Val Leu
 450 455 460

Val Gly Gly Met Asp Val Arg
 465 470

<210> 68

<400> 68
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<210> 69

<400> 69
000

<210> 70

<400> 70
000

<210> 71

<400> 71
000

<210> 72

<400> 72
000

<210> 73

<400> 73
000

<210> 74
<211> 469
<212> PRT
<213> Anaerosalibacter massiliensis

<400> 74

Met Glu Leu Asp Lys Met Asp Leu Glu Gln Ile Val Asn Leu Val Val
1 5 10 15

Glu Gln Leu Lys Gly Glu Asp Thr Ser Ser Tyr Cys Lys Glu Glu Ser
20 25 30

Lys Asn Gly Val Phe Asn Asn Met Asn Glu Ala Ile Glu Lys Ala Tyr
35 40 45

Ile Ala Gln Lys Asp Phe Phe Lys Asn Tyr Asn Leu Glu Asp Arg Arg
50 55 60

Arg Ile Ile Lys Thr Ile Arg Lys Glu Leu Met Glu Asp Val Glu Leu
65 70 75 80

Leu Ala Lys Leu Gly Val Glu Asp Thr Gly Met Gly Arg Tyr Glu Asp
85 90 95

Lys Leu Lys Lys Asn Lys Leu Val Ile Glu Lys Thr Pro Gly Val Glu
100 105 110

Asp Leu Asn Ser Glu Val Phe Thr Gly Asp Asn Gly Leu Thr Leu Val
115 120 125

Glu Leu Ser Pro Tyr Gly Val Ile Gly Ala Ile Ala Pro Ser Thr Asn
130 135 140

Pro Ser Glu Thr Val Ile Cys Asn Ser Ile Gly Met Ile Ala Ala Gly
145 150 155 160

Asn Ser Val Val Phe Ser Pro His Pro Gly Ala Lys Asn Ile Ser Met
165 170 175

Lys Thr Val Glu Leu Ile Asn Lys Ala Ile Glu Lys Ala Gly Gly Pro
180 185 190

Lys Asn Leu Val Val Thr Thr Ser Asn Pro Ser Ile Glu Asn Ala Glu
195 200 205

Ile Met Met Lys His Glu Lys Ile Lys Met Ile Val Ala Thr Gly Gly
210 215 220

Pro Gly Val Val Lys Ser Ala Leu Ser Gln Gly Lys Lys Ala Ile Gly
225 230 235 240

Ala Gly Ala Gly Asn Pro Pro Ala Val Ile Asp Glu Thr Ala Asp Ile
245 250 255

Glu Lys Ala Ala Arg Asp Ile Ile Ala Gly Cys Ser Phe Asp Asn Asn
260 265 270

Leu Pro Cys Ile Ala Glu Lys Glu Val Ile Val Val Asp Ser Val Ala
275 280 285

Asp Tyr Leu Ile Phe Ser Met Asn Lys Asn Asn Val Tyr His Leu Lys
290 295 300

Asp Glu Glu Lys Ile Asp Lys Leu Ala Ser Met Val Ile Asp Lys Asn
305 310 315 320

Gly Arg Ile Asn Arg Lys Phe Val Gly Lys Asp Ala Lys Val Ile Leu
325 330 335

Lys Ala Val Asp Ile Glu Cys Glu His Asp Val Arg Ala Ile Ile Val
340 345 350

Glu Thr Glu Lys Asp His Pro Phe Val Val Thr Glu Leu Met Met Pro
355 360 365

Ile Leu Pro Ile Val Arg Val Lys Asp Ile Asp Glu Ala Ile Lys Leu
370 375 380

Ala Val Glu Val Glu Gln Gly Asn Arg His Thr Ala Ile Met His Ser
385 390 395 400

Lys Asn Val Asp Asn Leu Ser Arg Phe Ala Arg Glu Ile Glu Thr Thr
405 410 415

Ile Phe Val Lys Asn Ala Pro Ser Phe Ala Gly Leu Gly Phe Gly Gly
420 425 430

Glu Gly Tyr Pro Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu
435 440 445

Thr Ser Ala Arg Ser Phe Ala Arg Lys Arg Arg Cys Ser Leu Val Gly
450 455 460

Ser Phe Ser Ile Lys
465

<210> 75
<211> 473
<212> PRT
<213> Clostridium indolis DSM 755

<400> 75

Met Glu Ile Gly Ala Lys Glu Ile Glu Leu Ile Val Arg Glu Val Leu
1 5 10 15

Ala Gly Ile Glu Ser Arg Gly Ile Lys Pro Ser Tyr Thr Pro Ser Arg
20 25 30

Ser Glu Asp Gly Val Phe Glu Arg Val Glu Asp Ala Ile Glu Ala Ala
35 40 45

Tyr Ala Ala Gln Arg Glu Trp Val Glu His Tyr Arg Val Glu Asp Arg
50 55 60

Arg Arg Ile Ile Glu Ala Ile Arg Val Thr Ala Lys Ser His Ala Glu
65 70 75 80

Ser Leu Ala Lys Met Val Trp Glu Glu Thr Gly Met Gly Arg Phe Glu
85 90 95

Asp Lys Ile Gln Lys His Met Ala Val Ile Glu Lys Thr Pro Gly Val

100

105

110

Glu Cys Leu Thr Thr Glu Ala Ile Ser Gly Asp Gly Gly Leu Met Ile
 115 120 125

Glu Glu Tyr Ala Pro Phe Gly Val Ile Gly Ala Ile Thr Pro Ser Thr
 130 135 140

Asn Pro Thr Glu Thr Ile Ile Asn Asn Thr Ile Ser Met Ile Ala Gly
 145 150 155 160

Gly Asn Ser Val Val Phe Asn Val His Pro Gly Ala Lys Arg Cys Cys
 165 170 175

Ala His Cys Leu Lys Ile Leu His Gln Ala Ile Val Glu Asn Gly Gly
 180 185 190

Pro Ala Ser Leu Ile Thr Met Gln Lys Glu Pro Asp Met Glu Ala Val
 195 200 205

Ser Lys Leu Thr Ser Asp Pro Arg Ile Arg Leu Met Val Gly Thr Gly
 210 215 220

Gly Met Pro Met Val Asn Ala Leu Leu Arg Ser Gly Lys Lys Thr Ile
 225 230 235 240

Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val Asp Asp Thr Ala Asp
 245 250 255

Val Ser Leu Ala Ala Arg Glu Ile Tyr Arg Gly Ala Ser Phe Asp Asn
 260 265 270

Asn Ile Leu Cys Leu Ala Glu Lys Glu Val Phe Val Met Glu Arg Ala
 275 280 285

Ala Asp Glu Leu Val Asn Lys Leu Ile Lys Glu Gly Ala Tyr Leu Leu
 290 295 300

Ser Ser Leu Glu Leu Ser Glu Ile Leu Lys Phe Ala Met Val Glu Lys
 305 310 315 320

Asn Gly Ser Tyr Glu Val Asn Lys Lys Trp Val Gly Lys Asp Ala Gly
325 330 335

Gln Phe Leu Glu Ala Ile Gly Val Ser Gly His Lys Asp Val Arg Leu
340 345 350

Leu Ile Cys Glu Thr Asp Arg Ser His Pro Phe Val Met Val Glu Gln
355 360 365

Leu Met Pro Ile Leu Pro Ile Val Arg Leu Arg Thr Phe Glu Glu Cys
370 375 380

Val Glu Ser Ala Leu Ala Ala Glu Ser Gly Asn Arg His Thr Ala Ser
385 390 395 400

Met Phe Ser Arg Asn Val Glu Asn Met Thr Lys Phe Gly Lys Ile Ile
405 410 415

Glu Thr Thr Ile Phe Thr Lys Asn Gly Ser Thr Leu Lys Gly Val Gly
420 425 430

Ile Gly Gly Glu Gly His Thr Thr Met Thr Ile Ala Gly Pro Thr Gly
435 440 445

Glu Gly Leu Thr Cys Ala Arg Ser Phe Thr Arg Arg Arg Arg Cys Met
450 455 460

Leu Ala Glu Gly Gly Leu Arg Ile Ile
465 470

<210> 76

<400> 76
000

<210> 77

<211> 467

<212> PRT

<213> Catabacter hongkongensis

<400> 77

Met Gly Leu Ser Glu Gln Gln Ile Lys Gln Ile Val Glu Glu Thr Val

1	5	10	15
Arg Asn Ile Gly Thr Gly Thr Ala Gly Ala Ala Cys Ser Gly Ser Trp	20	25	30
Met Cys Asp Asp Ala Asn Asp Ala Val Glu Asn Ala Lys Arg Ala Gln	35	40	45
Lys Gln Leu Met Thr Met Thr Leu Glu Gln Arg Gly Arg Leu Val Ser	50	55	60
Ala Met Arg Glu Ala Ala Leu Ala Asn Ser Val Lys Leu Ala Glu Met	65	70	75
Ala His Glu Glu Thr Gly Tyr Gly Ser Val Glu His Lys Ile Met Lys	85	90	95
Asn Glu Leu Ala Ala Lys Lys Thr Pro Gly Ile Glu Asp Leu His Thr	100	105	110
Gln Ala Phe Ser Gly Asp Asp Gly Leu Thr Ile Val Glu Gln Ala Pro	115	120	125
Phe Gly Val Ile Gly Ser Ile Thr Pro Ser Thr Asn Pro Thr Ser Thr	130	135	140
Val Ile Asn Asn Ser Ile Ser Met Val Ala Ala Gly Asn Ala Val Val	145	150	155
Tyr Asn Pro His Pro Ala Ala Lys Arg Ala Ser Gln Glu Ala Met Arg	165	170	175
Ile Leu Asn Glu Ala Ile Val Ser Ala Gly Gly Pro Ala Thr Leu Ile	180	185	190
Thr Thr Val Lys Glu Pro Thr Leu Glu Ser Gly Gln Val Ile Met Asn	195	200	205
His Arg Asp Ile Lys Met Leu Ser Ile Thr Gly Gly Glu Ala Val Val	210	215	220

Ala Val Ala Met Lys Thr Gly Lys Lys Val Val Ala Ala Gly Pro Gly
225 230 235 240

Asn Pro Pro Val Ile Val Asp Asp Thr Ala Val Ile Pro Lys Ala Ala
245 250 255

Lys Asp Ile Val Asp Gly Ala Ser Phe Asp Asn Asn Val Leu Cys Val
260 265 270

Ala Glu Lys Glu Val Phe Ala Phe Asp Asn Ile Thr Asp Gln Leu Met
275 280 285

Ser Glu Met Glu Lys Asn Gly Ala Tyr Arg Val Ser Gly Glu Asp Ile
290 295 300

Asn Lys Ile Val Asn Thr Val Leu Val Leu Lys Asp Gly His Tyr Val
305 310 315 320

Ile Asn Arg Lys Phe Val Gly Arg Asp Ala Thr Tyr Ile Met Gln Glu
325 330 335

Ser Gly Val Ser Tyr Thr Gly Asn Pro Arg Leu Val Ile Ala Glu Val
340 345 350

Ser Ala Asn His Pro Phe Val Thr Val Glu Met Leu Met Pro Val Leu
355 360 365

Gly Val Val Arg Val Arg Asn Ile Asp Glu Ala Val Asp Glu Ala Phe
370 375 380

Arg Ala Glu Arg Gly Cys Gln His Ser Ala Leu Ile His Ser Thr Asn
385 390 395 400

Ile Arg Asn Met Ser Lys Ala Ala Ser Thr Met Asn Thr Thr Ile Phe
405 410 415

Val Lys Asn Ala Pro Ser Tyr Ser Gly Leu Gly Phe Gly Gly Glu Gly
420 425 430

Tyr Ala Thr Leu Thr Ile Ala Thr Pro Thr Gly Glu Gly Leu Thr Ser

435

440

445

Ala Lys Thr Phe Thr Arg Ala Arg Arg Cys Val Leu Lys Gly Asp Leu
 450 455 460

Arg Ile Ile
 465

<210> 78

<400> 78
 000

<210> 79

<400> 79
 000

<210> 80

<211> 463

<212> PRT

<213> Bacillus thermotolerans

<400> 80

Met Ala Val Gln Glu Arg Asp Leu Glu Ser Ile Val Lys Lys Val Leu
 1 5 10 15

Glu Glu Leu Ser Arg Lys Glu Glu Thr Pro Glu Ala Gly Gln Gly Val
 20 25 30

Phe Glu Asp Met Asn Asp Ala Ile Glu Ala Ala Glu Gln Ala Gln Lys
 35 40 45

Glu Leu Ile Lys Leu Ser Leu Glu Glu Arg Gly Ala Ile Ile Glu Ala
 50 55 60

Ile Arg Glu Ala Ser Arg Lys His Val Glu Thr Phe Ala Arg Met Ala
 65 70 75 80

Val Glu Glu Thr Gly Met Gly Asn Tyr Glu Asp Lys Val Arg Lys Asn
 85 90 95

Val Leu Val Ile Asp Lys Thr Pro Gly Ile Glu Asp Leu Lys Thr Glu
 100 105 110

Ala Val Ser Gly Asp Asn Gly Leu Thr Val Val Glu Leu Ser Pro Tyr
115 120 125

Gly Val Ile Gly Ser Ile Thr Pro Thr Thr Asn Pro Thr Glu Thr Ile
130 135 140

Ile Cys Asn Ser Ile Gly Met Ile Ala Ala Gly Asn Ser Val Val Phe
145 150 155 160

Ser Pro His Pro Gly Ala Lys Asp Thr Ser Leu Lys Ala Val Glu Ile
165 170 175

Ile Asn Gln Ala Ile Val Glu Ala Gly Gly Pro Lys Asn Leu Ile Thr
180 185 190

Ser Ile Ala Glu Pro Ser Ile Asp Gln Ala Asn Ile Met Met Arg His
195 200 205

Lys Lys Val Arg Met Leu Val Ala Thr Gly Gly Pro Gly Val Val Lys
210 215 220

Ala Val Leu Thr Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn
225 230 235 240

Pro Pro Val Val Val Asp Glu Thr Ala Asp Leu Glu Lys Ala Ala Lys
245 250 255

Asp Ile Val Asp Gly Cys Ser Phe Asp Asn Asn Ile Pro Cys Val Ala
260 265 270

Glu Lys Glu Leu Phe Val Val Glu Ala Val Ala Asp Tyr Leu Val Phe
275 280 285

His Met Lys Lys His Gly Ala Phe Gln Leu Asn Asp Pro Lys His Val
290 295 300

Glu Lys Leu Thr Glu Leu Val Val Asp Asn Gly His Ala Asn Lys Glu
305 310 315 320

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

Ala Pro Gln Asp Ala Arg Ile Ala Ile Met Asp Val Gly Ala Asp His
340 345 350

Pro Leu Val Ser Ala Glu Leu Met Met Pro Ile Leu Pro Val Val Arg
355 360 365

Thr Ala Asn Val Asp Glu Ala Ile Glu Leu Ala Val Glu Ala Glu His
370 375 380

Gly Phe Arg His Thr Ser Ile Met His Ser Lys Asn Ile Asp Asn Leu
385 390 395 400

Thr Lys Phe Ala Lys Ala Ile Gln Thr Thr Ile Phe Val Lys Asn Gly
405 410 415

Pro Ser Tyr Ala Gly Leu Gly Val Gly Gly Glu Gly Tyr Thr Ser Phe
420 425 430

Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys Asp Phe
435 440 445

Ala Arg Lys Arg Lys Cys Val Leu Val Asp Ser Leu Ser Val Arg
450 455 460

<210> 81

<400> 81
000

<210> 82

<211> 511

<212> PRT

<213> Gracilibacillus kekensis

<400> 82

Met Gln Leu Asn Glu Lys Asp Ile Gln Thr Ile Ile Asp Ser Val Leu
1 5 10 15

Lys Asn Val Glu Ala Ala Val Glu Asn Arg Gln Pro Thr Gln Ala Ser
20 25 30

Gly Gln Ser Ser Glu Gln Gln Pro Ile Lys Met Lys Gln Leu Ser Pro
35 40 45

Ser Ala Pro Ser Asn Thr Phe Asn Met Ser Ser Asn Lys Asp Gly Val
50 55 60

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

Val Trp Met Lys Gln Tyr Thr Leu Glu Glu Lys Glu Asn Leu Ile Asn
85 90 95

Ser Ile Arg Gln Ala Val Ala Gln Gln Val Asn His Phe Ala Lys Ser
100 105 110

Ala Leu Glu Glu Thr Gly Leu Gly Asn Tyr Glu Asp Lys Val Leu Lys
115 120 125

Leu Ser Leu Thr Val Glu Lys Thr Pro Gly Thr Glu Leu Leu Gln Thr
130 135 140

Glu Thr Phe Ser Gly Asp Asp Gly Leu Ser Phe Val Glu Gln Thr Pro
145 150 155 160

Phe Gly Val Ile Gly Ala Val Thr Pro Val Thr Asn Pro Ile Asp Thr
165 170 175

Ile Val Asn Asn Gly Ile Gly Met Ile Ala Ala Gly Asn Ala Val Val
180 185 190

Phe Asn Val His Pro Ser Ala Lys Lys Thr Ser Arg Glu Met Ile Gln
195 200 205

Leu Leu Asn Gln Thr Ile Val Asn Ala Gly Gly Pro Glu Asn Leu Leu
210 215 220

Thr Met Val Gln Glu Pro Thr Ile Glu Thr Val Gln Glu Ile Ala Asn
225 230 235 240

His Pro Ser Val Lys Leu Leu Val Gly Thr Gly Gly Pro Gly Met Val
245 250 255

Lys Ser Leu Leu Lys Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly
260 265 270

Asn Pro Pro Val Ile Val Asp Glu Thr Ala Asp Leu Lys Gln Ala Ala
275 280 285

Lys Asp Ile Ile Glu Gly Ala Ser Phe Asp Asn Asn Leu Leu Cys Ile
290 295 300

Ala Glu Lys Glu Val Phe Val Leu Asp Gln Val Ala Asp Asp Leu Ile
305 310 315 320

Phe Glu Leu Leu Asn Gln Gln Val His Met Leu Asp His Gln Gln Leu
325 330 335

Glu Lys Val Met Lys Leu Thr Leu Lys Glu Asn Thr Glu Gly Ile Pro
340 345 350

Gly Gly Cys Ser Tyr Leu Ser Arg Asp Tyr Leu Val Ser Lys Asp Trp
355 360 365

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

Val Gln Thr Lys Leu Leu Ile Cys Glu Val Asp Ala Glu His Pro Tyr
385 390 395 400

Val Gln Leu Glu Gln Leu Met Pro Ile Leu Pro Ile Val Arg Val Lys
405 410 415

Ser Val Asp Glu Ala Ile Glu Lys Ala Val Lys Ala Glu His Gly Asn
420 425 430

Arg His Thr Ala Val Met His Ser Asn His Ile Lys Asn Val Thr Lys
435 440 445

Phe Ala Lys Ala Ile Gly Thr Thr Ile Phe Val Asn Asn Gly Ser Ser
450 455 460

Leu Ser Gly Val Gly Tyr Arg Gly Glu Gly Phe Thr Thr Met Thr Ile
465 470 475 480

Ala Gly Pro Thr Gly Glu Gly Val Thr Ser Ala Arg Thr Phe Thr Arg
485 490 495

Gln Arg Arg Thr Val Ile Ala Asn Gly Gly Phe Asn Ile Arg Gly
500 505 510

<210> 83

<400> 83
000

<210> 84

<211> 479

<212> PRT

<213> Propionispora sp. 2/2-37

<400> 84

Met Ile Gln Glu Gln Glu Leu Ile Ala Lys Ile Thr Ala Gln Val Ile
1 5 10 15

Ala Gln Met Gln Gln Gly Gln Ala Ala Ala Val Pro Glu His Tyr Gly
20 25 30

Val Phe Asp Ser Ile Asp Gly Ala Val Ala Ala Ala Arg Lys Ala Tyr
35 40 45

Gln Ser Leu Arg Ala Leu Pro Leu Glu Lys Arg Glu Gln Leu Val Gly
50 55 60

Ala Met Arg Lys Thr Ala Tyr Asp His Ala Glu Ile Met Ala Glu Met
65 70 75 80

Ala Val Thr Glu Ser Gly Met Gly Arg Tyr Ser Asp Lys Val Ile Lys
85 90 95

Asn Arg Thr Ala Ala Leu Lys Thr Pro Gly Thr Glu Asp Leu Lys Thr
100 105 110

Arg Ala Trp Ser Gly Asp Cys Gly Leu Thr Leu Val Glu Met Gly Pro
115 120 125

Tyr Gly Val Ile Gly Ala Ile Thr Pro Thr Thr Asn Pro Thr Glu Thr
130 135 140

Leu Ile Cys Asn Gly Ile Gly Met Ile Ala Ala Gly Asn Ala Val Phe
145 150 155 160

Phe Ser Pro His Pro Thr Ala Lys Asn Thr Ser Ile Trp Thr Ile Gln
165 170 175

Leu Leu Asn Lys Ala Leu Val Glu Ala Gly Gly Pro Pro Asn Leu Leu
180 185 190

Thr Thr Val Tyr Asn Pro Ser Ile Ala Val Ala Asn Ala Met Met Lys
195 200 205

His Pro Asp Val Asn Met Leu Val Ala Thr Gly Gly Pro Gly Val Val
210 215 220

Lys Ala Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly
225 230 235 240

Asn Pro Pro Ala Val Val Asp Glu Thr Ala Asp Leu Glu Lys Ala Ala
245 250 255

Lys Asp Ile Val Ala Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys Ile
260 265 270

Ala Glu Lys Glu Val Ile Ala Val Gly Ser Ile Ala Asp Arg Leu Met
275 280 285

Asp Tyr Met Val Arg Asn Gly Ala Tyr Lys Ile Thr Pro Gln Gln Thr
290 295 300

Ala Glu Leu Val Asn Leu Leu Leu Thr Val Lys Glu Glu Lys Met Ala
305 310 315 320

Glu Gly Cys Thr Ala Lys Thr Lys Arg Thr Tyr Gly Ile Asn Lys Asp
325 330 335

Tyr Val Gly Lys Ser Ala Gln Cys Ile Leu Ser Lys Ile Gly Val Thr
340 345 350

Val Lys Asp Asp Ile Arg Val Ile Leu Cys Glu Ala Glu Ala Asp His
355 360 365

Pro Phe Val Leu Glu Glu Leu Met Met Pro Val Leu Pro Val Val Gln
370 375 380

Val Lys Asp Val Asp Ala Ala Ile Glu Leu Ala Val Arg Val Glu His
385 390 395 400

Gly Asn Arg His Thr Ala Val Met His Ser Lys Asn Val Asp His Leu
405 410 415

Thr Arg Met Ala Arg Ala Ile Asp Thr Thr Ile Phe Val Lys Asn Ala
420 425 430

Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Tyr Cys Thr Phe
435 440 445

Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Pro Arg Ser Phe
450 455 460

Thr Arg Ala Arg Arg Cys Val Leu Val Asp Gly Phe Ser Ile Val
465 470 475

<210> 85

<400> 85
000

<210> 86

<211> 478

<212> PRT

<213> Clostridium chauvoei

<400> 86

Val Phe Ser Asp Glu Lys Ser Ile Glu Glu Ile Val Ile Lys Val Leu
1 5 10 15

Glu Glu Ile His Thr Asp Arg Lys Thr Lys Cys Asn Lys Asn Cys Asn
20 25 30

Ser Asn Cys Gly Cys Asn Lys Asp Lys Phe Ile Phe Ser Ser Val Asp
35 40 45

Asp Ala Val Ala Ala Ala Lys Lys Ser Phe Phe Glu Leu Lys Lys Leu
50 55 60

Thr Ile Arg Glu Arg Glu Glu Ile Ile Lys Asn Ile Arg Lys Lys Cys
65 70 75 80

Leu Asp Tyr Ala Asp Lys Leu Ser Ile Met Ala Val Glu Glu Thr Gly
85 90 95

Met Gly Lys Val Glu Asp Lys Val Thr Lys His Ile Leu Ile Ala Glu
100 105 110

Lys Thr Pro Gly Thr Glu Asp Leu Lys Thr Thr Ala Trp Ser Gly Asp
115 120 125

Gly Gly Leu Thr Leu Ile Glu Gln Gly Ala Phe Gly Val Ile Ala Ala
130 135 140

Ile Thr Pro Ser Thr Asn Pro Thr Ala Thr Val Leu Cys Asn Ala Ile
145 150 155 160

Gly Met Ile Ser Ala Gly Asn Thr Ile Val Phe Ala Pro His Pro Asn
165 170 175

Ala Val Lys Cys Ser Asn Leu Ala Val Lys Leu Ile Asn Glu Ala Ser
180 185 190

Lys Glu Ala Gly Gly Pro Glu Asn Ile Ala Val Ser Phe Arg Lys Pro
195 200 205

Ser Ile Asp Ile Thr Thr Glu Leu Met Lys His Lys Asp Ile Ala Leu
210 215 220

Ile Ser Ala Thr Gly Gly Pro Gly Val Val Asn Gln Ala Leu Ser Ser
225 230 235 240

Gly Lys Arg Ala Leu Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val
245 250 255

Asp Glu Thr Ala Asn Ile Glu Lys Ala Ala Lys Asp Ile Ile Asp Gly
260 265 270

Ala Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu Lys Glu Val Ile
275 280 285

Val Ile Asp Ser Val Ser Asn Lys Leu Ile Glu Tyr Met Ile Lys Phe
290 295 300

Gly Ala Tyr Leu Leu Lys Asp Lys Glu Gln Ile Lys Arg Leu Glu Asp
305 310 315 320

Lys Leu Leu Ile Lys Asn Gly Lys Lys Val Thr Leu Asn Arg Asp Phe
325 330 335

Val Gly Lys Asp Ala Lys Val Ile Leu Asp Ser Ile Asp Ile Leu Val
340 345 350

Asp Asp Ser Ile Lys Cys Ile Ile Phe Glu Gly Asp Lys Asp Ser Leu
355 360 365

Leu Ile Lys Glu Glu Leu Met Met Pro Ile Leu Gly Ile Val Lys Val
370 375 380

Asn Asn Phe Asp Glu Ala Val Glu Cys Ala Leu Glu Leu Glu His Gly
385 390 395 400

Asn Arg His Ser Ala His Met His Ser Lys Asn Ile Asp Asn Leu Thr
405 410 415

Thr Phe Ala Arg Val Ile Asp Thr Ala Ile Phe Val Lys Asn Ala Pro
420 425 430

Ser Tyr Ser Ala Leu Gly Val Asn Ala Glu Gly Phe Ala Thr Phe Thr
435 440 445

Ile Ala Ser Lys Thr Gly Glu Gly Leu Ser Ser Thr Lys Thr Phe Thr
450 455 460

Lys Asn Arg Arg Cys Val Leu Ser Asp Gly Leu Ser Ile Arg
465 470 475

<210> 87
<211> 467
<212> PRT
<213> 10500A Thermoanaerobacterium aotearoense

<400> 87

Met Lys Val Lys Glu Glu Asp Ile Glu Ala Ile Val Lys Lys Val Leu
1 5 10 15

Ser Glu Phe Asn Phe Glu Lys Asn Thr Lys Ser Phe Arg Asp Phe Gly
20 25 30

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

Lys Lys Leu Arg Asn Met Ser Met Glu Ser Arg Glu Lys Ile Ile Gln
50 55 60

Asn Ile Arg Lys Lys Ile Met Glu Asn Lys Lys Ile Leu Ala Glu Met
65 70 75 80

Gly Val Ser Glu Thr Gly Met Gly Lys Val Glu His Lys Ile Ile Lys
85 90 95

His Glu Leu Val Ala Leu Lys Thr Pro Gly Thr Glu Asp Ile Val Thr
100 105 110

Thr Ala Trp Ser Gly Asp Lys Gly Leu Thr Leu Val Glu Met Gly Pro
115 120 125

Phe Gly Val Ile Gly Thr Ile Thr Pro Ser Thr Asn Pro Ser Glu Thr
130 135 140

Val Leu Cys Asn Ser Ile Gly Met Ile Ala Ala Gly Asn Ser Val Val
145 150 155 160

Phe Asn Pro His Pro Gly Ala Val Asn Val Ser Asn Tyr Ala Val Lys
165 170 175

Leu Val Asn Glu Ala Val Met Glu Ala Gly Gly Pro Glu Asn Leu Val
180 185 190

Ala Ser Val Glu Lys Pro Thr Leu Glu Thr Gly Asn Ile Met Phe Lys
195 200 205

Ser Pro Asp Val Ser Leu Leu Val Ala Thr Gly Gly Pro Gly Val Val
210 215 220

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

Asn Pro Pro Val Val Val Asp Glu Thr Ala Asp Ile Lys Lys Ala Ala
245 250 255

Lys Asp Ile Val Asp Gly Ala Thr Phe Asp Asn Asn Leu Pro Cys Ile
260 265 270

Ala Glu Lys Glu Val Val Ser Val Asp Lys Ile Thr Asp Glu Leu Ile
275 280 285

Tyr Tyr Met Gln Gln Asn Gly Cys Tyr Lys Ile Glu Gly Arg Glu Ile
290 295 300

Glu Lys Leu Ile Glu Leu Val Leu Asp His Lys Gly Gly Lys Ile Thr
305 310 315 320

Leu Asn Arg Lys Trp Val Gly Lys Asp Ala His Leu Ile Leu Lys Ala
325 330 335

Ile Gly Ile Asp Ala Asp Glu Ser Val Arg Cys Ile Ile Phe Glu Ala
340 345 350

Glu Lys Asp Asn Pro Leu Val Val Glu Glu Leu Met Met Pro Ile Leu
355 360 365

Gly Ile Val Arg Ala Lys Asn Val Asp Glu Ala Ile Met Ile Ala Thr

370

375

380

Glu Leu Glu His Gly Asn Arg His Ser Ala His Met His Ser Lys Asn
 385 390 395 400

Val Asp Asn Leu Thr Lys Phe Gly Lys Ile Ile Asp Thr Ala Ile Phe
 405 410 415

Val Lys Asn Ala Pro Ser Tyr Ala Ala Leu Gly Tyr Gly Gly Glu Gly
 420 425 430

Tyr Cys Thr Phe Thr Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser
 435 440 445

Ala Arg Thr Phe Thr Lys Ser Arg Arg Cys Val Leu Ala Asp Gly Leu
 450 455 460

Ser Ile Arg
 465

<210> 88
 <211> 462
 <212> PRT
 <213> Ruminococcus sp. AT10

<400> 88

Val Ser Val Asn Glu Gln Met Val Gln Asp Ile Val Gln Glu Val Leu
 1 5 10 15

Ala Lys Met Gln Ile Ala Ser Asp Val Ser Gly Asn Arg Gly Val Phe
 20 25 30

Ala Asp Met Asn Glu Ala Ile Ala Ala Ala Gln Lys Ala Gln Lys Val
 35 40 45

Val Ala Arg Met Thr Leu Asp His Arg Glu Lys Val Ile Ser Asn Ile
 50 55 60

Arg Lys Lys Ile Asn Glu Asn Ala Glu Ile Leu Ala Arg Met Gly Val
 65 70 75 80

Glu Glu Thr Gly Met Gly Asn Val Gly His Lys Ile Leu Lys His Gln
85 90 95

Leu Val Ala Glu Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala
100 105 110

Trp Ser Gly Asp Arg Gly Leu Thr Leu Ile Glu Met Gly Pro Phe Gly
115 120 125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Val Leu
130 135 140

Cys Asn Thr Ile Gly Met Phe Ala Gly Gly Asn Thr Val Val Phe Asn
145 150 155 160

Pro His Pro Ala Ala Ile Lys Thr Ser Ile Tyr Ala Val Asn Leu Leu
165 170 175

Asn Glu Ala Ser Val Glu Ala Gly Gly Pro Asp Asn Ile Ala Cys Thr
180 185 190

Val Glu His Pro Thr Leu Glu Thr Ser Asn Ile Met Met Lys His Lys
195 200 205

Ala Ile Gln Leu Ile Ala Ala Thr Gly Gly Pro Gly Val Val Thr Ala
210 215 220

Val Leu Ser Ser Gly Arg Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
225 230 235 240

Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Glu Asp
245 250 255

Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
260 265 270

Lys Glu Ile Val Ala Val Glu Ser Val Ala Asp Glu Leu Leu His Tyr
275 280 285

Met Ile Gln Glu Gln Gly Cys Tyr Leu Ala Ser Lys Glu Glu Gln Asp
290 295 300

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

Val Gly Arg Asp Ala Lys Thr Leu Leu Gly Met Ile Gly Val Thr Val
325 330 335

Pro Asp Asn Ile Arg Cys Ile Thr Phe Glu Gly Pro Lys Glu His Pro
340 345 350

Leu Ile Ala Thr Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Ala
355 360 365

Lys Asp Phe Asn Asp Ala Val Glu Gln Ala Val Trp Leu Glu His Gly
370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Val Asp His Ile Thr
385 390 395 400

Lys Tyr Ala Lys Ala Ile Asp Thr Ala Ile Leu Val Lys Asn Gly Pro
405 410 415

Ser Tyr Ala Ala Leu Gly Phe Gly Gly Glu Gly Phe Cys Thr Phe Thr
420 425 430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Thr Phe Thr
435 440 445

Lys Arg Arg Arg Cys Val Met Ser Asp Ser Leu Cys Ile Arg
450 455 460

<210> 89

<400> 89
000

<210> 90

<211> 469

<212> PRT

<213> Acetobacterium dehalogenans

<400> 90

Met Asn Ile Asp Thr Thr Gly Ile Glu Tyr Ile Val Lys Lys Val Met
1 5 10 15

Ala Glu Ile Asp Cys Ala Asp Ala Gly Gly Lys Pro Leu Lys Asp Gly
20 25 30

Glu Leu Gly Val Phe Asn Asp Met Glu Asn Ala Ile Asp Ala Ala Phe
35 40 45

Thr Ala Gln Lys Thr Phe Met Arg Glu Ser Leu Ala Tyr Arg Ser Lys
50 55 60

Leu Ile Ala Ala Met Arg Ala Glu Met Leu Lys Lys Glu Asn Met Glu
65 70 75 80

Met Ile Cys Gln Met Ala Val Glu Glu Thr Gly Met Gly Asn Tyr Glu
85 90 95

His Lys Leu Leu Lys His Glu Leu Ala Thr Val Lys Thr Pro Gly Val
100 105 110

Glu Asp Leu Val Ala Glu Ala Phe Thr Gly Asp Asp Gly Leu Thr Leu
115 120 125

Ile Glu Gln Ser Pro Phe Gly Val Ile Gly Ser Val Ser Pro Ser Thr
130 135 140

Asn Pro Ser Glu Thr Val Ile Cys Asn Ser Ile Gly Met Leu Ala Ala
145 150 155 160

Gly Asn Thr Val Val Phe Ala Pro His Pro Ser Ala Lys Asn Thr Ser
165 170 175

Ala Leu Thr Val Lys Leu Leu Asn Lys Ala Ile Leu Glu Ala Gly Gly
180 185 190

Pro Glu Asn Leu Ile Val Thr Thr Ala Glu Pro Thr Ile Asp Ser Ala
195 200 205

Asn Thr Met Phe Ala Ser Pro Lys Ile Thr Leu Leu Cys Ala Thr Gly
210 215 220

Gly Pro Gly Val Val Lys Thr Val Leu Gln Ser Gly Lys Lys Ala Ile
225 230 235 240

Gly Ala Gly Ala Gly Asn Pro Pro Ala Leu Val Asp Glu Thr Ala Asp
245 250 255

Ile Glu Lys Ala Gly Lys Asp Ile Ile Asp Gly Cys Cys Phe Asp Asn
260 265 270

Asn Leu Pro Cys Ile Ala Glu Lys Glu Val Val Val Val Glu Gln Val
275 280 285

Ala Asp Tyr Leu Ile Phe Asn Met Lys Lys Asn Gly Ala Tyr Glu Leu
290 295 300

Lys Asp Ala Lys Lys Ile Ala Glu Leu Glu Glu Leu Val Ile Pro Gly
305 310 315 320

Gly Arg Leu Ser Arg Asp Tyr Val Gly Arg Ser Ala Lys Val Ile Leu
325 330 335

Lys Gly Ile Gly Ile Asp Val Asp Asp Ser Ile Arg Val Ile Ile Met
340 345 350

Glu Thr Ser Lys Asp His Ile Phe Ala Val Glu Glu Leu Met Met Pro
355 360 365

Ile Leu Pro Ile Val Arg Val Lys Asn Ile Ala Glu Gly Ile Asp Leu
370 375 380

Ala Val Ala Leu Glu His Gly Asn Arg His Thr Ala Ile Met His Ser
385 390 395 400

Thr Asn Ile Asn Asn Leu Thr Glu Met Ala Lys Arg Val Gln Thr Thr
405 410 415

Ile Phe Val Lys Asn Gly Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly
420 425 430

Glu Gly Tyr Thr Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu
435 440 445

Thr Ser Ala Lys Thr Phe Thr Arg Lys Arg Arg Cys Val Leu Val Gly
450 455 460

Gly Phe Thr Ile Lys
465

<210> 91
<211> 461
<212> PRT
<213> Spirochaeta alkalica

<400> 91

Ala Thr Leu Leu Glu Arg Ala Arg Ala Ala Gln Glu Lys Ile Ala Thr
1 5 10 15

Cys Thr Gln Arg Glu Ile Asp Asp Leu Cys Leu Ser Val Gly Trp Glu
20 25 30

Val Tyr Thr Asp Glu Asn Ile Ala Lys Leu Ala Glu Cys Ala Val Gln
35 40 45

Thr Thr Gly Met Gly Asn Val Pro Asp Lys Ile Thr Lys His Lys Val
50 55 60

Lys Val Leu Gly Val Leu Lys Asp Leu Arg Lys Ala Arg Thr Val Gly
65 70 75 80

Leu Ile Glu Arg Asp Glu Ala Arg Gly Leu Ser Lys Tyr Ala Lys Pro
85 90 95

Val Gly Val Val Gly Ala Leu Leu Pro Val Thr Asn Pro Thr Ala Thr
100 105 110

Pro Ala Ser Asn Gly Leu Ser Ile Leu Lys Gly Arg Asn Ala Val Ile
115 120 125

Phe Ala Pro His Pro Arg Gly Ala Ala Ala Ser Ala Leu Ala Val Glu
130 135 140

Phe Met Arg Arg Gly Leu Arg Arg Val Gly Ala Pro Glu Asp Leu Ile
145 150 155 160

Gln Ile Val Glu Asp Pro Ser Leu Gly Gln Thr Gly Glu Leu Met Lys
165 170 175

Gln Val Asp Leu Val Val Ala Thr Gly Gly Gly Ala Met Val Lys Ala
180 185 190

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

Val Gln Ile Ile Ala Glu Asp Ala Asp Leu Ala Asp Ala Ala Ala Lys
210 215 220

Ile Ala Leu Ser Lys Ala Phe Asp His Ala Thr Ser Cys Ser Ser Glu
225 230 235 240

Asn Ser Ile Ile Val Glu Asp Ser Val Tyr Glu Gly Met Ile Thr Glu
245 250 255

Leu Val Gln Asn Gln Gly Cys Tyr Leu Thr Thr Pro Arg Glu Arg Ser
260 265 270

Gln Leu Glu Ala Leu Leu Trp Arg Pro Gly Lys Thr Gly Gln Leu Ala
275 280 285

Leu Asn Pro Gly Ile Ile Ala Arg Ser Ala Ala Thr Ile Ala Ala Glu
290 295 300

Ala Gly Ile Thr Leu Pro Glu Gly Thr Arg Val Ile Leu Val Glu Gly
305 310 315 320

Gln His Pro Leu Glu Gln Asp Pro Phe Ser Gln Glu Lys Leu Cys Pro
325 330 335

Val Leu Thr Val Tyr Arg Tyr Thr Arg Trp Glu Glu Ala Val Asp Leu
340 345 350

Leu Val Arg Leu Thr Asp Gln Ala Gly Thr Gly His Ser Cys Gly Ile

355

360

365

His Thr Phe Arg Glu Asp Tyr Ile Arg His Leu Gly Glu Thr Met Arg
 370 375 380

Thr Ser Arg Ile Met Val Arg Gln Ala Gln Ala Pro Ala Asn Gly Gly
 385 390 395 400

Asn Phe Phe Asn Ala Met Pro Ser Thr Val Thr Leu Gly Cys Gly Thr
 405 410 415

Trp Gly Gly Asn Ile Thr Thr Glu Asn Ile His Trp Lys His Phe Ile
 420 425 430

Asn Val Thr Trp Val Ser Glu Pro Ile Pro Pro Asp Arg Pro Asp Asp
 435 440 445

Glu Glu Ile Trp Gly Ser Phe Trp Ser Arg Tyr Ala Glu
 450 455 460

<210> 92

<400> 92
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<210> 93

<400> 93
000

<210> 94

<211> 494

<212> PRT

<213> Clostridium caminithermale DSM 15212

<400> 94

Met Gln Ile Asn Glu Leu Gln Ile Glu Lys Leu Val Ala Glu Val Leu
 1 5 10 15

Ala Lys Thr Leu Gly Ala Glu Gly Asn Ser Ser Leu Val Asn Asn Asn
 20 25 30

Ser Ile Gly Asn Ser Asn Glu Tyr Glu Tyr Asn Gln Ser Leu Glu Val
 35 40 45

Gly Val Phe Glu Lys Met Glu Asp Ala Ile Asn Glu Ala His Arg Ala
50 55 60

Tyr Gln Gln Leu Lys Asn Tyr Ser Ile Lys Asp Arg Gln Arg Phe Ile
65 70 75 80

Asp Gly Ile Lys Glu Trp Thr Leu Arg Glu Lys Asn Ile Leu Ala Lys
85 90 95

Lys Val Val Glu Glu Thr Gly Leu Gly Asn Tyr Glu Asp Lys Ile Ile
100 105 110

Lys His Glu Leu Ala Ala Arg Thr Ala Gly Thr Glu Val Leu Ser Ser
115 120 125

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

Tyr Gly Val Val Gly Ala Thr Thr Pro Ser Thr Asn Pro Ser Glu Thr
145 150 155 160

Val Ile Ser Asn Thr Ile Ala Met Leu Ala Ala Gly Asn Thr Val Val
165 170 175

Phe Asn Val His Pro Ser Ser Lys His Val Cys Ala Tyr Thr Val Ala
180 185 190

Lys Ile Asn Glu Cys Ile Met Asp Leu Gly Gly Pro Ala Asn Ile Ile
195 200 205

Thr Met Val Lys Asp Pro Thr Met Glu Ser Leu Gln Val Met Ala Asn
210 215 220

Cys Pro Lys Ile Asn Leu Leu Val Gly Thr Gly Gly Pro Gly Leu Val
225 230 235 240

Arg Ala Leu Leu Lys Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly
245 250 255

Asn Pro Pro Val Val Val Asp Ser Thr Ala Asn Ile Lys Lys Ala Ala
260 265 270

Ala Asp Ile Ile Lys Gly His Ser Phe Asp Asn Asn Ile Val Cys Ile
275 280 285

Leu Glu Lys Glu Val Phe Val Val Asp Glu Val Ala Asn Glu Leu Ile
290 295 300

Glu Asn Met Lys Ser Glu Gly Ala Phe Tyr Leu Asp Ser Ser Tyr Ile
305 310 315 320

Ser Ala Leu Thr Asp Leu Ile Ile Glu Ala Thr Asp Lys Lys Phe Phe
325 330 335

Leu Gly Asn Ser Ser Lys Thr Thr Asn Leu His Thr Lys Lys Glu Trp
340 345 350

Val Gly Lys Asp Ala Tyr Lys Ile Leu Asp Ala Leu Gly Ile Arg Tyr
355 360 365

Ser Thr Arg Pro Lys Cys Ile Ile Cys Glu Val Pro Phe Glu His Pro
370 375 380

Phe Val Gln Leu Glu Leu Leu Met Pro Val Leu Pro Ile Val Arg Val
385 390 395 400

Glu Asn Phe Val Lys Gly Val Glu Tyr Ala Val Glu Ala Glu His Gly
405 410 415

Asn Arg His Thr Ala Ile Val His Ser Gln Asn Ile Asp Asn Ile Thr
420 425 430

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

Ser Val Ala Gly Ile Gly Val Asp Ser Glu Ser Val Val Ser Phe Ser
450 455 460

Ile Ala Gly Pro Thr Gly Glu Gly Ile Thr Thr Ala Lys Asp Phe Thr
465 470 475 480

Arg Ala Arg His Cys Val Leu Val Asp Gly Phe Arg Ile Ile
485 490

<210> 95
<211> 464
<212> PRT
<213> *Caldanaerobius fijiensis*

<400> 95

Val Val Lys Glu Glu Gln Ile Glu Ala Ile Val Arg Glu Val Leu Arg
1 5 10 15

Arg Ile Asp Arg Glu Asp Ile Lys Leu Asn Glu Asp Lys His Gln Leu
20 25 30

Gly Val Phe Asp Lys Met Glu Asp Ala Ile Glu Ala Ala Lys Asp Ala
35 40 45

Phe Glu Lys Phe Ser Asn Met Thr Leu Glu Asp Arg Glu Arg Phe Ile
50 55 60

Ser Glu Ile Arg Lys Ala Thr Leu Glu Asn Ala Arg Val Leu Ala Glu
65 70 75 80

Met Gly Val Lys Glu Thr Gly Met Gly Lys Val Glu His Lys Val Leu
85 90 95

Lys His Gln Leu Val Ala Lys Lys Thr Pro Gly Thr Glu Asp Leu Lys
100 105 110

Thr Gln Ala Trp Ser Gly Asp Lys Gly Leu Thr Leu Val Glu Met Ala
115 120 125

Pro Phe Gly Val Ile Gly Ala Ile Thr Pro Ser Thr Asn Pro Ser Glu
130 135 140

Thr Ile Ile Cys Asn Ser Ile Gly Met Ile Ala Ala Gly Asn Ala Val
145 150 155 160

Val Phe Ser Pro His Pro Gly Ala Lys Arg Val Ser Asn Phe Ala Val

165

170

175

Asp Met Ile Asn Arg Ala Ile Ile Arg Ala Gly Gly Pro Glu Asn Leu
 180 185 190

Val Val Ser Ile Lys Glu Pro Ser Ile Asn Thr Thr Asn Ala Met Ile
 195 200 205

Lys His Pro Asp Val Lys Leu Leu Val Ala Thr Gly Gly Pro Glu Ile
 210 215 220

Val Lys Ile Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala
 225 230 235 240

Gly Asn Pro Pro Val Val Val Asp Glu Thr Ala Asp Ile Lys Lys Ala
 245 250 255

Ala Lys Asp Ile Ile Asp Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys
 260 265 270

Ile Ala Glu Lys Glu Val Ile Ala Val Glu Lys Ile Tyr Arg Asp Leu
 275 280 285

Leu Asp Glu Ile Leu Lys Gln Gly Val Tyr Lys Leu Asn Ala Leu Gln
 290 295 300

Ile Ser Lys Leu Glu Asn Leu Val Leu Met Asp Gly Lys Leu Asn Lys
 305 310 315 320

Lys Leu Val Gly Lys Asp Ala Lys Val Ile Leu Asp Gln Ile Gly Ile
 325 330 335

Asn Val Ser Asp Asp Ile Arg Cys Ile Ile Cys Glu Thr Asp Glu Asp
 340 345 350

His Pro Phe Val Met Glu Glu Leu Met Met Pro Ile Leu Pro Ile Val
 355 360 365

Lys Ala Lys Asn Ile Asp Asp Ala Ile Arg Ile Ala Val Lys Ala Glu
 370 375 380

Lys Asn Asn Arg His Thr Ala His Ile His Ser Lys Asn Ile Asp Asn
385 390 395 400

Ile Thr Arg Tyr Ala Lys Ala Ile Asn Thr Thr Ile Leu Val Lys Asn
405 410 415

Ala Pro Ser Tyr Ala Gly Ile Gly Phe Gly Gly Glu Gly Phe Thr Thr
420 425 430

Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Gln Thr
435 440 445

Phe Thr Arg Met Arg Arg Cys Val Leu Ala Asp Gly Leu Arg Ile Ile
450 455 460

<210> 96

<400> 96
000

<210> 97

<211> 480

<212> PRT

<213> Pelosinus fermentans

<400> 97

Met Ser Ile Asp Gln Ala Leu Ile Glu Lys Ile Thr Leu Glu Ile Leu
1 5 10 15

Thr Lys Met Gln Thr Gly Ala Lys Ala Ala Pro Ala Gly Tyr Gly Asp
20 25 30

Gly Ile Phe Glu Thr Val Asp Glu Ala Val Ala Ala Ala Arg Lys Ala
35 40 45

Tyr Gln Glu Leu Lys Thr Leu Ser Leu Glu Lys Arg Glu Val Leu Ile
50 55 60

Lys Ala Met Arg Asp Val Ala Tyr Glu Asn Ala Thr Ile Leu Ala Gln
65 70 75 80

Met Ala Val Asp Glu Ser Gly Met Gly Arg Val Ser Asp Lys Ile Ile

85

90

95

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

Thr Gln Ala Trp Ser Gly Asp Asn Gly Leu Thr Leu Ile Glu Met Gly
 115 120 125

Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Thr Thr Asn Pro Thr Glu
 130 135 140

Thr Val Ile Cys Asn Gly Ile Gly Met Ile Ala Ala Gly Asn Thr Val
 145 150 155 160

Phe Phe Ser Pro His Pro Thr Ala Lys Asn Thr Ser Met Lys Ile Ile
 165 170 175

Thr Leu Leu Asn Gln Ala Ile Val Lys Ala Gly Gly Pro Asn Asn Leu
 180 185 190

Leu Thr Ser Val Ala Asn Pro Ser Ile Lys Ala Ala Asn Glu Met Met
 195 200 205

Lys His Pro Gly Ile Asn Met Leu Val Ala Thr Gly Gly Pro Gly Val
 210 215 220

Val Lys Ala Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala
 225 230 235 240

Gly Asn Pro Pro Val Ile Val Asp Glu Thr Ala Asp Ile Glu Lys Ala
 245 250 255

Ala Arg Asp Ile Val Ala Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys
 260 265 270

Ile Ala Glu Lys Glu Val Ile Ala Ile Gly Ser Ile Ala Asp Arg Leu
 275 280 285

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

Ile Asp Arg Leu Leu Asn Val Ile Met Thr Val Gln Glu Glu Lys Ile
305 310 315 320

Ala Glu Gly Cys Thr Asp Lys Pro Lys Arg Ser Tyr Gly Ile Asn Lys
325 330 335

Asp Tyr Val Gly Lys Asp Ala Lys Tyr Leu Leu Ser Lys Ile Gly Ile
340 345 350

Asp Val Pro Asp Ser Val Arg Val Val Leu Cys Glu Thr Pro Ala Asp
355 360 365

His Pro Phe Val Ile Glu Glu Leu Met Met Pro Val Leu Pro Val Val
370 375 380

Gln Val Lys Asp Ile Asp Glu Ala Ile Glu Val Ala Val Arg Val Glu
385 390 395 400

His Gly Asn Arg His Thr Ala Ala Met His Ser Lys Asn Val Asp His
405 410 415

Leu Thr Arg Phe Ala Arg Ala Val Glu Thr Thr Ile Phe Val Lys Asn
420 425 430

Ala Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Phe Thr Ser
435 440 445

Phe Thr Leu Ala Gly Pro Thr Gly Glu Gly Ile Thr Ser Pro Arg Ser
450 455 460

Phe Thr Arg Gln Arg Arg Cys Val Leu Val Asp Ala Phe Ser Ile Val
465 470 475 480

<210> 98

<400> 98
000

<210> 99

<400> 99
000

<210> 100
<211> 463
<212> PRT
<213> *Blautia wexlerae*

<400> 100

Met Pro Val Ser Glu Ser Met Val Gln Glu Ile Val Gln Gln Val Met
1 5 10 15

Ala Lys Met Gln Ile Ala Asp Ala Pro Ala Glu Lys Gln His Gly Val
20 25 30

Phe Lys Asp Met Asn Asp Ala Ile Glu Ala Ala Lys Lys Ser Gln Glu
35 40 45

Ile Val His Lys Met Ser Met Asp Gln Arg Glu Lys Ile Ile Ser Cys
50 55 60

Ile Arg Lys Lys Ile Lys Glu Asn Ala Glu Ile Met Ala Arg Met Gly
65 70 75 80

Val Glu Glu Thr Lys Met Gly Asn Val Gly Asp Lys Ile Leu Lys His
85 90 95

His Leu Val Ala Asp Lys Thr Pro Gly Thr Glu Ala Ile Thr Thr Thr
100 105 110

Ala Trp Ser Gly Asp Arg Gly Leu Thr Leu Val Glu Met Gly Pro Phe
115 120 125

Gly Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Val
130 135 140

Leu Cys Asn Thr Met Gly Met Leu Ala Gly Gly Asn Thr Val Val Phe
145 150 155 160

Asn Pro His Pro Ala Ala Val Lys Thr Ser Leu Tyr Ala Val Asn Leu
165 170 175

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

Ser Val Glu Asn Pro Thr Leu Asp Thr Ser Ser Val Met Met Lys His
195 200 205

Lys Asp Ile His Leu Leu Val Ala Thr Gly Gly Pro Gly Val Val Thr
210 215 220

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

Pro Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Arg
245 250 255

Asp Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala
260 265 270

Glu Lys Glu Val Val Ala Val Ser Ser Ile Met Asp Glu Leu Met His
275 280 285

Tyr Met Leu Thr Glu Asn Asp Cys Tyr Leu Ala Ser Lys Glu Glu Gln
290 295 300

Asp Lys Leu Val Glu Val Val Leu Ala Gly Gly Lys Leu Asn Arg Lys
305 310 315 320

Cys Val Gly Arg Asp Ala Arg Thr Leu Leu Ser Met Ile Gly Val Asp
325 330 335

Ala Pro Ala Asn Ile Arg Cys Ile Ile Phe Glu Gly Pro Lys Glu His
340 345 350

Pro Leu Ile Thr Thr Glu Leu Met Met Pro Ile Leu Gly Ile Val Arg
355 360 365

Ala Arg Asp Phe Glu Asp Ala Val Glu Gln Ala Val Trp Leu Glu His
370 375 380

Gly Asn Arg His Ser Ala His Ile His Ser Lys Asn Val Asp Arg Ile
385 390 395 400

Thr Thr Tyr Ala Lys Ala Ile Asp Thr Ala Ile Val Val Lys Asn Gly
405 410 415

Pro Ser Tyr Ala Ser Leu Gly Phe Gly Ser Glu Gly Tyr Thr Thr Phe
420 425 430

Thr Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Cys Ala Ser Thr Phe
435 440 445

Thr Lys Arg Arg Arg Cys Ile Met Glu Asp Ser Leu Cys Ile Arg
450 455 460

<210> 101
<211> 500
<212> PRT
<213> Paenibacillus sp. OSY-SE

<400> 101

Ile Lys Leu Thr Glu Thr Asp Ile Gln Asn Ile Ile Gln Gly Val Leu
1 5 10 15

Lys Asn Ile Glu Gln Asn Leu Pro Gly Ala Gln Ala Ala Asp Asp Ala
20 25 30

Ala Thr Gly Gln Ala Lys Pro Glu Ser Ala Pro Val Ala Ala Ala Pro
35 40 45

Val Arg Ser Asn Gly Asp Tyr Gly Val Phe Asp Glu Ala Glu Ala Ala
50 55 60

Ile Ala Ala Ala Tyr Gln Ala Gln Arg Ala Tyr Ala His His Phe Ser
65 70 75 80

Met Gln Asp Arg Glu Arg Phe Ile Ala Ala Ile Arg Lys Ala Thr Leu
85 90 95

Glu His Lys Glu Thr Leu Ala Ser Met Val Leu Lys Glu Thr Lys Leu
100 105 110

Gly Arg Tyr Glu Asp Lys Ile Ala Lys Leu Glu Leu Thr Ala Leu Lys
115 120 125

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

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

Thr Pro Val Thr Asn Ser Val Glu Thr Val Ile Asn Asn Ala Ile Gly
165 170 175

Met Leu Ala Ala Gly Asn Ala Val Val Tyr Asn Val His Pro Ser Ser
180 185 190

Lys Ala Cys Cys Ala Tyr Ala Val Lys Met Ile Asn Arg Ala Val Gln
195 200 205

Glu Ala Gly Gly Pro Glu His Leu Val Thr Met Val Lys Glu Pro Thr
210 215 220

Lys Glu Thr Leu Asp Ala Ile Thr Gln Ser Pro Lys Val Gln Leu Leu
225 230 235 240

Val Gly Thr Gly Gly Pro Gly Leu Val Arg Ala Leu Leu Arg Ser Gly
245 250 255

Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val Asp
260 265 270

Glu Thr Ala Asn Ile Glu Arg Ala Ala Lys Glu Ile Ile Ala Gly Ala
275 280 285

Ser Phe Glu Asn Asn Ile Leu Cys Ile Ala Glu Lys Glu Val Phe Val
290 295 300

Val Asp Lys Val Ala Asp Asp Leu Leu Phe His Met Leu Asn His Gly
305 310 315 320

Ala Tyr Arg Leu Asp Asp Arg Glu Leu Glu Gln Val Met Ser Phe Ala
325 330 335

Leu Glu Ala Asn Val Asn Glu Thr Ala Gly Gly Cys Ser Leu Asp Met

340

345

350

Lys Arg Glu Tyr His Thr Val Lys Glu Trp Ile Gly Lys Asp Ala Ala
 355 360 365

Leu Phe Leu Glu Lys Ile Gly Val Thr Pro Glu Lys Glu Val Lys Leu
 370 375 380

Leu Ile Cys Glu Val Asp Phe Asp His Pro Phe Val Gln Leu Glu Gln
 385 390 395 400

Met Met Pro Val Leu Pro Ile Val Arg Val Ser Asp Leu Asp Glu Ala
 405 410 415

Ile Arg Leu Ala Val Glu Ala Glu His Gly Asn Arg His Thr Ala Leu
 420 425 430

Met His Ser Thr Asn Val Ala Asn Phe Ala Ala Phe Glu Arg Ala Ile
 435 440 445

Gly Thr Thr Ile Phe Val Lys Asn Ala Ser Ser Leu Ala Gly Val Gly
 450 455 460

Ala Gly Gly Glu Gly Cys Thr Thr Met Thr Ile Ala Gly Pro Thr Gly
 465 470 475 480

Glu Gly Leu Thr Ser Ala Arg Thr Phe Thr Arg Lys Lys Arg Cys Val
 485 490 495

Leu Ala Glu Arg
 500

<210> 102

<400> 102
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<210> 103

<211> 476

<212> PRT

<213> Spirochaetes bacterium GWC2_52_13

<400> 103

Val Ser Gln Ser Ile Glu Asp Thr Val Arg Thr Leu Val Glu Lys Leu
1 5 10 15

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

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

Ala Ala Tyr Glu Ala Gln Arg His Leu Val Gly Leu Pro Leu Glu Lys
50 55 60

Arg Lys Glu Ile Val Gln Ala Met Arg Glu Thr Ala Met Asp His Ala
65 70 75 80

Gln Glu Phe Ala Glu Met Ala Val Gln Glu Ser Gly Arg Gly Asn Val
85 90 95

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

Val Glu Asp Val Glu Thr Ser Ala Tyr Ser Asp Glu His Gly Leu Ser
115 120 125

Leu Val Glu Arg Ala Pro Tyr Gly Val Ile Gly Ser Ile Thr Pro Val
130 135 140

Thr Asn Pro Thr Ala Thr Ile Ile Asn Asn Gly Ile Ser Met Ile Ser
145 150 155 160

Gly Gly Asn Ser Val Val Phe Asn Pro His Pro Gly Ala Lys Asn Val
165 170 175

Ser Cys Phe Ala Ile Glu Val Leu Asn Ala Ala Ile Glu Arg Val Gly
180 185 190

Gly Pro Arg Asn Leu Leu Val Ser Leu Ala Gln Pro Thr Ile Glu Ser
195 200 205

Ala Asn Glu Met Met Gly His Gln Lys Ile Ser Leu Leu Val Val Thr

210

215

220

Gly Gly Pro Gly Val Val Lys Ala Ala Met Asn Ser Gly Lys Lys Val
 225 230 235 240

Ile Ala Ala Gly Pro Gly Asn Pro Pro Cys Val Val Asp Glu Thr Ala
 245 250 255

Lys Ile Gln Lys Ala Ala Lys Asp Ile Val Asp Gly Ala Ser Phe Asp
 260 265 270

Asn Asn Leu Val Cys Ile Cys Glu Lys Glu Val Leu Val Val Lys Ser
 275 280 285

Val Ala Asn Glu Leu Ile Gly Glu Met Gln Lys Val Gly Ala Tyr Leu
 290 295 300

Leu Ser Asp Gln Gln Ala Lys Ser Leu Leu Asp Gln Ile Ile Glu Val
 305 310 315 320

Pro Gly Met Met Asn Ser Glu Gly Val Val Lys Arg Glu Tyr Val Gly
 325 330 335

Lys Ser Pro Ser Phe Leu Ala Ser Leu Ile Gly Val Thr Val Pro Glu
 340 345 350

Ser Thr Arg Leu Leu Ile Cys Asp Val Asp Ala Gly Asn Pro Leu Val
 355 360 365

Trp Thr Glu Gln Leu Met Pro Phe Leu Pro Ile Val Arg Met Glu Asn
 370 375 380

Val Asp Gln Cys Ile Asp Leu Ala Val Gln Cys Glu His Gly Phe Arg
 385 390 395 400

His Thr Ala Ile Met His Ser Leu Asn Val Glu Lys Leu Ser Lys Met
 405 410 415

Ala Arg Gln Met Asn Cys Ser Leu Phe Val Lys Asn Gly Pro Cys Tyr
 420 425 430

Ala Gly Leu Gly Asn Gly Gly Ala Gly Tyr Thr Ser Phe Thr Ile Ala
435 440 445

Ser Pro Thr Gly Glu Gly Leu Thr Arg Ala Arg Thr Phe Thr Arg Glu
450 455 460

Arg Arg Cys Thr Leu Val Asp Tyr Phe Arg Ile Ile
465 470 475

<210> 104

<400> 104
000

<210> 105

<400> 105
000

<210> 106

<400> 106
000

<210> 107

<211> 454

<212> PRT

<213> Romboutsia lituseburensis DSM

<400> 107

Met Glu Ala Arg Asp Tyr Val Leu Gln Leu Ile Asn Lys Ala Arg Ile
1 5 10 15

Ala Gln Lys Glu Phe Glu Lys Tyr Ser Gln Glu Gln Val Asp Glu Ala
20 25 30

Val Arg Ala Ile Gly Lys Ser Ile Tyr Asp Asn Gly Glu Met Leu Ala
35 40 45

Arg Met Ala Val Asp Glu Thr Lys Met Gly Val Tyr Glu Asp Lys Ile
50 55 60

Val Lys Asn Lys Gly Lys Ser Lys Ala Val Trp Asn Lys Leu Lys Gly
65 70 75 80

Val Lys Ser Arg Gly Ile Ile Lys Tyr Ile Ala Glu Glu Gly Leu Val
85 90 95

Glu Val Ala Lys Pro Ile Gly Val Val Gly Ala Val Thr Pro Thr Thr
100 105 110

Asn Pro Thr Met Thr Pro Met His Asn Ala Met Ile Ala Leu Lys Gly
115 120 125

Gly Asn Ala Ile Ile Ile Cys Pro His Pro Arg Ala Lys Asn Thr Gly
130 135 140

Val Lys Thr Val Asp Leu Met Arg Glu Ala Leu Asp Lys Val Gly Ala
145 150 155 160

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

Asn Leu Val Met Gln Leu Ser Asp Val Cys Val Ser Thr Gly Gly Pro
180 185 190

Gly Met Val Lys Val Ala Tyr Ser Ser Gly Lys Pro Ala Phe Gly Val
195 200 205

Gly Ala Gly Asn Val Gln Cys Leu Ile Asp Lys Asp Ala Asn Leu Glu
210 215 220

Glu Val Val Pro Lys Val Ile Lys Gly Arg Ile Tyr Asp Asn Gly Ile
225 230 235 240

Leu Cys Thr Cys Glu Gln Ser Ala Ile Cys Pro Asp Glu Met Tyr Asn
245 250 255

Glu Phe Ile Asp Arg Leu Val Gln Ser Gly Ala Tyr Tyr Ile Glu Lys
260 265 270

Glu Glu Glu Val Lys Ser Leu Arg Lys Ala Leu Phe Pro Asp Gly Asn
275 280 285

Ile Ser Lys Asp Cys Val Gly Ala Ser Pro Tyr Glu Ile Ala Lys Met

290

295

300

Ala Ser Ile Ala Ile Pro Lys Asp Thr Lys Leu Leu Val Val Lys Val
 305 310 315 320

Glu Lys Tyr Gly Thr Glu Glu Tyr Phe Ala Lys Glu Lys Met Cys Pro
 325 330 335

Val Leu Ser Ala Tyr Lys Tyr Glu Lys Trp Glu Asp Ala Val Asn Ile
 340 345 350

Ala Asn Gln Asn Leu Glu Tyr Glu Gly Lys Gly His Ser Ala Ile Ile
 355 360 365

His Ser Tyr Thr Lys Glu Asn Ile Glu Tyr Ala Ala Asn Ile Leu Pro
 370 375 380

Val Ser Arg Phe Gly Val Asn Gln Ile Gly Ser Ser Gly Leu Gly Gly
 385 390 395 400

Ser Phe Leu Asn Gly Leu Asn Pro Thr Ala Thr Leu Gly Cys Gly Ser
 405 410 415

Trp Gly Asn Asn Ser Ile Ser Glu Asn Leu Trp Phe Asn His Leu Ile
 420 425 430

Asn Val Ser Lys Ile Ala Tyr Glu Val Pro Ser Lys Lys Ile Pro Thr
 435 440 445

Asp Asp Glu Ile Trp Asn
 450

<210> 108

<400> 108
 000

<210> 109

<211> 485

<212> PRT

<213> Clostridium sp. CAG:448

<400> 109

Met Ala Ile Asn Trp Thr Glu Ala Gln Ile Ala Asp Ile Val Ser Lys
1 5 10 15

Val Ile Ala Gly Met Gly Glu Gln Thr Leu Val Asn Asp Lys Glu Trp
20 25 30

Asp Ala Thr Gln Tyr His Gly Arg Lys Leu Ile Gly Ile Phe Glu Thr
35 40 45

Met Glu Glu Ala Ile Asp Ala Ala Ser Ala Gly Tyr Ala Ala Ile Arg
50 55 60

Ala Met Ser Val Ala Gln Arg Glu Thr Leu Ile Ser Ser Ile Arg Thr
65 70 75 80

Tyr Cys Arg Asn Glu Ala Arg Ile Met Ala Glu Leu Gly Val Ala Glu
85 90 95

Thr His Met Gly Arg Val Asp His Lys Thr Ala Lys His Ile Leu Val
100 105 110

Ala Asp Lys Thr Pro Gly Thr Glu Asp Ile Val Ala Glu Ala Lys Thr
115 120 125

Gly Asp Cys Gly Leu Thr Leu Thr Glu Arg Ala Pro Phe Gly Val Val
130 135 140

Gly Ala Ile Thr Pro Ser Thr Asn Pro Ser Glu Thr Val Ile Cys Asn
145 150 155 160

Ser Met Gly Met Ile Ala Ala Gly Asn Gly Val Val Phe Asn Pro His
165 170 175

Pro Gly Ala Ile Ala Thr Ser Asn Tyr Ala Val Asp Leu Val Asn Arg
180 185 190

Ala Val Phe Ala Ala Gly Gly Pro Lys Val Leu Val Ala Ser Val Arg
195 200 205

Lys Pro Thr Met Asp Thr Ala Gln Val Met Tyr Lys His Pro Ala Ile

210

215

220

Arg Leu Leu Val Cys Thr Gly Gly Pro Gly Val Val Lys Ala Val Leu
 225 230 235 240

Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Val
 245 250 255

Ile Val Asp Asp Thr Ala Asp Ile Glu Lys Ala Ala Lys Asp Ile Ile
 260 265 270

Asp Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu Lys Glu
 275 280 285

Val Phe Val Phe Asp Asn Val Ala Asp Arg Leu Ile Ala Gly Met Leu
 290 295 300

Arg Asn Gly Cys Ile Lys Leu Thr Arg Glu Gln Ala Asp Glu Leu Ala
 305 310 315 320

Lys Val Val Val Val Glu Lys Thr Asp Ser Lys Thr Gly Lys Val Thr
 325 330 335

Arg Ser Val Asn Arg Asp Cys Val Gly Arg Asp Cys Arg Val Ile Leu
 340 345 350

Lys Lys Ile Gly Ile Glu Val Gly Pro Glu Ile Arg Cys Ala Ile Ala
 355 360 365

Glu Val Pro Phe Glu His Thr Phe Val Gln Thr Glu Leu Met Met Pro
 370 375 380

Ile Leu Gly Ile Val Arg Val Lys Asp Ile Asp Glu Ala Ile Asp Leu
 385 390 395 400

Ala Val Lys Ala Glu His Gly Asn Arg His Thr Ala His Met His Ser
 405 410 415

Lys Asn Ile Asp Asn Leu Ser Arg Phe Ala Lys Ala Ile Glu Thr Thr
 420 425 430

Ile Phe Val Lys Asn Ala Pro Ser Tyr Ala Gly Ile Gly Phe Gly Gly
435 440 445

Glu Gly His Thr Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Ile
450 455 460

Thr Ser Ala Lys Ser Tyr Thr Arg Leu Arg Arg Cys Val Met Ala Asp
465 470 475 480

His Phe Arg Ile Ile
485

<210> 110

<400> 110
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<210> 111
<211> 462
<212> PRT
<213> *Yersinia bercovieri* ATCC 43970

<400> 111

Met Asn Thr Asn Asp Leu Glu Ser Leu Ile Arg Thr Ile Leu Thr Glu
1 5 10 15

Gln Leu Thr Pro Ala Thr Ala Ser Ala Ser Asn Ala Ile Phe Ala Ser
20 25 30

Val Asp Glu Ala Val Asn Ala Ala His Ser Ala Phe Leu Arg Tyr Gln
35 40 45

Gln Ser Pro Met Lys Thr Arg Ser Ala Ile Ile Ser Ala Leu Arg Gln
50 55 60

Gln Leu Lys Pro Gln Leu Ala Ser Leu Ser Glu Arg Gly Ala Ser Glu
65 70 75 80

Thr Gly Met Gly Asn Lys Glu Asp Lys Phe Leu Lys Asn Lys Ala Ala
85 90 95

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

100	105	110
Gly Asp Gly Gly Met Val Leu Phe Glu Tyr Ser Pro Phe Gly Val Ile		
115	120	125
Gly Ser Val Ala Pro Ser Thr Asn Pro Thr Glu Thr Ile Ile Asn Asn		
130	135	140
Ser Ile Ser Met Leu Ala Ala Gly Asn Ala Val Tyr Phe Ser Pro His		
145	150	155
Pro Gly Ala Lys Ala Val Ser Leu Asp Leu Ile Ala Gln Ile Glu Ala		
165	170	175
Ile Ile Phe Asn Ser Cys Gly Ile Arg Asn Leu Val Val Thr Val Gln		
180	185	190
Glu Pro Ser Phe Glu Ala Thr Gln Gln Met Met Ala His Asp Lys Ile		
195	200	205
Ala Leu Leu Ala Ile Thr Gly Gly Pro Ala Ile Val Ala Met Gly Met		
210	215	220
Lys Ser Gly Lys Lys Val Ile Gly Ala Gly Ala Gly Asn Pro Pro Cys		
225	230	235
Leu Val Asp Glu Thr Ala Glu Leu Ala Lys Ala Ala Gln Asp Ile Val		
245	250	255
Ser Gly Ala Ser Phe Asp Tyr Asn Leu Pro Cys Ile Ala Glu Lys Ser		
260	265	270
Leu Ile Val Val Glu Ser Val Ala Asp Arg Leu Leu Gln Gln Met Gln		
275	280	285
Ala Phe Asp Ala Leu Leu Ile Ser Asn Pro Gln Asp Val Asp Ser Leu		
290	295	300
Arg Lys Ala Cys Leu Thr Pro Gln Gly His Ala Asn Lys Asn Leu Val		
305	310	315
		320

Gly Lys Ser Pro Leu Glu Leu Leu Lys Ala Ala Gly Leu Thr Cys Pro
325 330 335

Ala Lys Ala Pro Arg Leu Leu Leu Val Glu Val Ala Gly Asp Asp Pro
340 345 350

Leu Val Thr Thr Glu Gln Leu Met Pro Leu Leu Pro Val Val Arg Val
355 360 365

Lys Asp Phe Asp Ala Ala Leu Thr Leu Ala Leu Gln Val Glu Gly Gly
370 375 380

Leu His His Thr Ala Thr Met His Ser Gln Asn Val Ser Arg Leu Asn
385 390 395 400

Leu Ala Ala Arg Leu Leu Gln Thr Ser Ile Phe Val Lys Asn Gly Pro
405 410 415

Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Phe Thr Thr Phe Thr
420 425 430

Ile Ala Thr Pro Thr Gly Glu Gly Thr Thr Ser Ala Arg Thr Phe Ala
435 440 445

Arg Gln Arg Arg Cys Val Leu Thr Asn Gly Phe Ser Ile Arg
450 455 460

<210> 112
<211> 511
<212> PRT
<213> Proteocatella sphenisci

<400> 112

Val Asp Ile Gly Gln Lys Asp Ile Glu Leu Ile Val Gln Gln Val Leu
1 5 10 15

Lys Asn Val Val Ser Gln Ser Ala Ala Ala Gln Ser Asn Ser Gln Pro
20 25 30

Glu Val Lys Thr Tyr Arg Pro Gly Val Pro Val Gln Glu Phe Ser Met
35 40 45

Lys Ser Gln Tyr Ala Pro Ser Ser Pro Tyr Pro Ser Ser Ser Gln Ser
50 55 60

Ser Ala Gly Asp Tyr Gly Val Phe Glu Thr Met Asp Gln Ala Val Glu
65 70 75 80

Ala Ala Tyr Gln Ala Gln Lys Ile Tyr Gln Ala Lys Phe Gln Leu Lys
85 90 95

Asp Arg Glu Arg Leu Ile Lys Ser Ile Arg Glu Thr Gly Met Lys Asn
100 105 110

Val Glu Lys Leu Ala Arg Met Ser Val Asp Glu Thr Gly Leu Gly Arg
115 120 125

Tyr Glu Asp Lys Ile Leu Lys Asn Thr Leu Val Leu Glu Arg Thr Pro
130 135 140

Gly Thr Glu Cys Leu Lys Thr Glu Ala Ile Ser Gly Asp Asp Gly Leu
145 150 155 160

Thr Ile Ile Glu His Ala Pro Tyr Gly Val Ile Gly Ser Ile Thr Pro
165 170 175

Val Thr Asn Pro Thr Glu Thr Ile Ile Asn Asn Val Ile Ser Met Ile
180 185 190

Ala Gly Gly Asn Ser Val Val Phe Asn Val His Pro Ser Ala Lys Glu
195 200 205

Ser Cys Arg Phe Ala Val Gln Met Ile Asn Lys Ala Ile Glu Glu Val
210 215 220

Gly Gly Pro Lys Asn Leu Val Ser Met Val Lys Gln Pro Thr Leu Asp
225 230 235 240

Thr Val Ser Gln Leu Ser Lys Asn Asp Lys Val Arg Leu Met Ala Gly
245 250 255

Thr Gly Gly Met Pro Met Val Arg Ser Leu Leu Gln Ser Gly Lys Lys
260 265 270

Val Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val Asp Glu Thr
275 280 285

Ala Asp Ile Lys Arg Ala Ala Ala Glu Ile Phe Lys Gly Ala Ser Phe
290 295 300

Asp Asn Asn Val Leu Cys Leu Ala Glu Lys Glu Val Phe Ile Val Glu
305 310 315 320

Ser Val Ala Thr Asp Phe Val Tyr Asn Met Ile Gln Glu Gly Ala Phe
325 330 335

Leu Leu Asn Glu Ser Gln Leu Glu Lys Ile Met Asn Leu Val Leu Thr
340 345 350

Tyr Glu Glu Thr Pro Asn Gly Arg Glu Tyr His Thr Ser Lys Asn Trp
355 360 365

Val Gly Lys Asp Ala Gly Lys Met Leu Asp Ala Ile Gly Ile Asn Gly
370 375 380

Lys Ser Asp Cys Arg Leu Leu Ile Cys Glu Val Gly Pro Asn His Pro
385 390 395 400

Phe Val Leu Leu Glu Gln Leu Met Pro Val Leu Pro Ile Val Lys Cys
405 410 415

Lys Asn Leu Asp Glu Ala Ile Lys Phe Ala Met Ile Ala Glu His Gly
420 425 430

Asn Arg His Thr Ala Ser Met Phe Ser Gln Ser Ile Asn Asn Leu Thr
435 440 445

Arg Phe Ala Arg Glu Val Glu Thr Thr Ile Phe Val Lys Asn Ala Ala
450 455 460

Thr Leu Ala Gly Val Gly Phe Gly Gly Glu Gly His Thr Thr Met Thr
465 470 475 480

Ile Ala Gly Pro Thr Gly Glu Gly Ile Thr Asn Ala Val Ser Phe Thr
485 490 495

Arg Gln Arg Arg Cys Ala Leu Ser Glu Gly Gly Phe Arg Ile Ile
500 505 510

<210> 113

<400> 113
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<210> 114

<400> 114
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<210> 115

<400> 115
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<210> 116

<400> 116
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<210> 117

<211> 480

<212> PRT

<213> Pelosinus propionicus DSM

<400> 117

Met Ser Ile Asp Gln Ala Leu Ile Glu Lys Ile Thr Leu Glu Ile Leu
1 5 10 15

Ser Lys Met Gln Thr Gly Ala Lys Ala Ala Pro Thr Gly Tyr Gly Ser
20 25 30

Gly Ile Phe Glu Thr Val Asp Glu Ala Val Ala Ala Ala Arg Lys Ala
35 40 45

Tyr Gln Glu Leu Lys Thr Leu Ser Leu Glu Lys Arg Glu Val Leu Ile
50 55 60

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

65

70

75

80

Met Ala Val Asp Glu Ser Gly Met Gly Arg Val Ser Asp Lys Ile Ile
 85 90 95

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

Thr Gln Ala Trp Ser Gly Asp Asn Gly Leu Thr Leu Ile Glu Met Gly
 115 120 125

Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Thr Thr Asn Pro Thr Glu
 130 135 140

Thr Val Ile Cys Asn Gly Ile Gly Met Ile Ala Ala Gly Asn Thr Val
 145 150 155 160

Phe Phe Ser Pro His Pro Thr Ala Lys Asn Thr Ser Ile Lys Ile Ile
 165 170 175

Thr Leu Leu Asn Asp Ala Ile Val Lys Ala Gly Gly Pro Asn Asn Leu
 180 185 190

Leu Thr Ser Val Ala Asn Pro Ser Ile Lys Ala Ala Asn Glu Met Met
 195 200 205

Lys His Pro Gly Ile Asn Met Leu Val Ala Thr Gly Gly Pro Gly Val
 210 215 220

Val Lys Ala Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala
 225 230 235 240

Gly Asn Pro Pro Val Ile Val Asp Glu Thr Ala Asp Ile Glu Lys Ala
 245 250 255

Ala Arg Asp Ile Val Ala Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys
 260 265 270

Ile Ala Glu Lys Glu Val Ile Ala Val Gly Ser Ile Ala Asp Arg Leu
 275 280 285

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

Ile Asp Arg Leu Leu Asp Val Ile Met Thr Val Gln Glu Glu Lys Ile
305 310 315 320

Ala Glu Gly Cys Thr Asp Lys Pro Lys Arg Ser Tyr Gly Ile Asn Lys
325 330 335

Asp Tyr Val Gly Lys Asp Ala Lys Tyr Leu Leu Ser Lys Ile Gly Ile
340 345 350

Asp Val Pro Asp Ser Val Lys Val Val Leu Cys Glu Thr Pro Ala Asp
355 360 365

His Pro Phe Val Ile Glu Glu Leu Met Met Pro Val Leu Pro Val Val
370 375 380

Gln Val Lys Asp Ile Asp Glu Ala Ile Glu Val Ala Val Arg Val Glu
385 390 395 400

His Gly Asn Arg His Thr Ala Ala Met His Ser Lys Asn Val Asp His
405 410 415

Leu Thr Arg Phe Ala Arg Ala Val Glu Thr Thr Ile Phe Val Lys Asn
420 425 430

Ala Pro Ser Tyr Ala Gly Ile Gly Val Gly Gly Glu Gly Phe Thr Ser
435 440 445

Phe Thr Leu Ala Gly Pro Thr Gly Glu Gly Ile Thr Ser Pro Arg Ser
450 455 460

Phe Thr Arg Gln Arg Arg Cys Val Leu Val Asp Ala Phe Ser Ile Val
465 470 475 480

<210> 118

<400> 118
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<210> 119

<400> 119
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<210> 120

<400> 120
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<210> 132

<400> 132
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<210> 133

<400> 133
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<210> 134

<211> 457

<212> PRT

<213> Clostridium sp. KLE

<400> 134

Met Val Gln Asp Ile Val Lys Glu Val Val Ala Arg Met Gln Leu Ser
1 5 10 15

Gly Thr Ala Gln Ser Ala Gln His Gly Val Phe Asn Asp Met Asn Gln
20 25 30

Ala Ile Glu Ala Ala Lys Glu Ala Glu Lys Thr Val Arg Arg Met Thr
35 40 45

Met Asp Gln Arg Glu Gln Ile Val Ser Asn Ile Arg Lys Lys Thr His
50 55 60

Glu Ala Ala Glu Ile Leu Ala Arg Met Gly Val Glu Glu Thr Gly Met
65 70 75 80

Gly Asn Val Gly Asp Lys Ile Leu Lys His His Leu Leu Ala Asp Lys
85 90 95

Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala Trp Ser Gly Asp Arg
100 105 110

Gly Leu Thr Leu Ile Glu Met Gly Pro Phe Gly Val Ile Gly Ala Ile
115 120 125

Thr Pro Cys Thr Asn Pro Ser Glu Thr Val Leu Cys Asn Ser Ile Gly
130 135 140

Met Ile Ala Ala Gly Asn Thr Val Val Phe Asn Pro His Pro Gln Ala
145 150 155 160

Ile Arg Thr Ser Ile Phe Ala Ile Asn Leu Val Asn Glu Ala Ser Leu
165 170 175

Glu Ala Gly Gly Pro Asp Asn Val Ala Cys Thr Val Phe Lys Pro Thr
180 185 190

Leu Glu Thr Ser Asn Ile Met Met Lys His Lys Asp Ile Pro Leu Ile
195 200 205

Ala Ala Thr Gly Gly Pro Gly Val Val Thr Ala Val Leu Ser Ser Gly
210 215 220

Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro Pro Ala Leu Val Asp
225 230 235 240

Glu Thr Ala Asp Ile Arg Lys Ala Ala Ala Asp Ile Val Asn Gly Cys
245 250 255

Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu Lys Glu Ile Val Ala
260 265 270

Val Asp Ser Ile Ala Asp Glu Leu Met Asn Tyr Met Ile Ser Glu Gln
275 280 285

Gly Cys Tyr Leu Ile Ser Lys Glu Glu Gln Asp Lys Leu Thr Ala Thr
290 295 300

Val Leu Thr Pro Lys Gly Leu Asn Arg Lys Cys Val Gly Arg Asp Ala
305 310 315 320

Arg Thr Leu Leu Ser Met Ile Gly Ile Gln Ala Pro Glu Asn Ile Arg
325 330 335

Cys Ile Val Phe Glu Gly Glu Lys Glu His Pro Leu Ile Ser Glu Glu
340 345 350

Leu Met Met Pro Ile Leu Gly Leu Val Arg Ala Lys Asp Phe Asp Asp
355 360 365

Ala Val Glu Lys Ala Val Trp Leu Glu His Gly Asn Arg His Ser Ala
370 375 380

His Ile His Ser Lys Asn Ile Asp Asn Ile Thr Lys Tyr Ala Arg Ala
385 390 395 400

Ile Asp Thr Ala Ile Leu Val Lys Asn Ala Pro Ser Tyr Ala Ala Leu
405 410 415

Gly Phe Gly Gly Glu Gly Phe Cys Thr Phe Thr Ile Ala Ser Arg Thr
420 425 430

Gly Glu Gly Leu Thr Ser Thr Ser Thr Phe Thr Lys Arg Arg Arg Cys
435 440 445

Val Met Ser Asp Ser Leu Cys Ile Arg
450 455

<210> 135
<211> 527
<212> PRT
<213> Caldalkalibacillus thermarum TA2.A1

<400> 135

Met Asn Met Thr Glu Lys Asp Ile Glu Lys Ile Val Gln Ser Val Leu
1 5 10 15

His Asn Val Glu Ser Ala Leu Gly Lys Ser Ala Ser Ala Ser Pro Ser
20 25 30

Val Ser Ala Val Ser Val Ala Ser Gly Glu Gly Ile Lys Pro Val Gln
35 40 45

Phe Lys Gln Val Pro Val Phe Gln Gln Glu Thr Val Lys Ser Pro Asn
50 55 60

Arg Asn Arg Asn Leu Gly Gly Ala Glu Glu Lys Trp Gly Val Phe Asn
65 70 75 80

His Met Glu Asp Ala Ile Glu Ala Ser Tyr Arg Ala Gln Met Glu Phe
85 90 95

Val Lys His Phe Gln Leu Lys Asp Arg Glu Lys Ile Ile Thr Ala Ile
100 105 110

Arg Glu Ala Val Leu Arg Glu Lys Glu Val Leu Ala Arg Lys Val Tyr
115 120 125

Glu Glu Thr Lys Ile Gly Arg Tyr Glu Asp Lys Val Ala Lys His Glu
130 135 140

Leu Ala Ala Leu Lys Thr Pro Gly Thr Glu Asp Leu Lys Thr Glu Ala
145 150 155 160

Phe Ser Gly Asp Asn Gly Leu Thr Ile Val Glu Arg Ala Pro Tyr Gly
165 170 175

Leu Ile Gly Ala Val Thr Pro Val Thr Asn Pro Thr Glu Thr Ile Ile
180 185 190

Asn Asn Ala Ile Gly Met Leu Ala Ala Gly Asn Ala Val Val Phe Asn
195 200 205

Val His Pro Ser Ser Lys Arg Ser Cys Ala Tyr Ala Val Gln Leu Ile
210 215 220

Asn Lys Ala Ile Thr Glu Ala Gly Gly Pro His His Leu Val Thr Met
225 230 235 240

Val Lys Glu Pro Thr Leu Asp Thr Leu Gln Thr Leu Ile Asp Ser Pro
245 250 255

Lys Val Lys Leu Leu Val Gly Thr Gly Gly Pro Gly Leu Val Gln Thr

260

265

270

Leu Leu Lys Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro
 275 280 285

Pro Val Ile Val Asp Asp Thr Ala Asp Leu Glu His Ala Ala Arg Ser
 290 295 300

Ile Ile Glu Gly Ala Ala Phe Asp Asn Asn Leu Leu Cys Ile Ala Glu
 305 310 315 320

Lys Glu Val Phe Val Leu Glu Ser Val Ala Asp Asp Leu Ile Phe His
 325 330 335

Met Leu Asn His Gly Ala Tyr Met Leu Gly Gln His Glu Val Glu Gln
 340 345 350

Val Met Ala Phe Ala Leu Glu Glu Gln Gly Asn Glu Gln Asn Arg Gly
 355 360 365

Cys Gly Phe Asn Pro Gln Arg His Tyr Gln Val Ser Lys Asp Trp Ile
 370 375 380

Gly Gln Asp Ala Arg Leu Phe Leu Glu His Ile Gly Val Gln Pro Pro
 385 390 395 400

Thr Glu Val Lys Leu Leu Ile Cys Asp Val Glu Phe Asp His Pro Phe
 405 410 415

Val Gln Leu Glu Gln Met Met Pro Val Leu Pro Ile Val Arg Val Lys
 420 425 430

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

Arg His Thr Ala Ile Met His Ser Lys Asn Val Asp His Leu Thr Lys
 450 455 460

Phe Ala Arg Ala Ile Gln Thr Thr Leu Phe Val Lys Asn Ala Ser Ser
 465 470 475 480

Leu Ala Gly Val Gly Tyr Gly Gly Glu Gly His Thr Thr Met Thr Ile
485 490 495

Ala Gly Pro Thr Gly Glu Gly Val Thr Ser Ala Lys Thr Phe Thr Arg
500 505 510

Glu Arg Arg Cys Val Leu Ala Glu Gly Gly Phe Arg Ile Ile Gly
515 520 525

<210> 136

<400> 136
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<210> 137

<211> 476

<212> PRT

<213> Caldalkalibacillus thermarum TA2.A1

<400> 137

Val Pro Val Phe Gln Gln Glu Thr Val Lys Ser Pro Asn Arg Asn Arg
1 5 10 15

Asn Leu Gly Gly Ala Glu Glu Lys Trp Gly Val Phe Asn His Met Glu
20 25 30

Asp Ala Ile Glu Ala Ser Tyr Arg Ala Gln Met Glu Phe Val Lys His
35 40 45

Phe Gln Leu Lys Asp Arg Glu Lys Ile Ile Thr Ala Ile Arg Glu Ala
50 55 60

Val Leu Arg Glu Lys Glu Val Leu Ala Arg Lys Val Tyr Glu Glu Thr
65 70 75 80

Lys Ile Gly Arg Tyr Glu Asp Lys Val Ala Lys His Glu Leu Ala Ala
85 90 95

Leu Lys Thr Pro Gly Thr Glu Asp Leu Lys Thr Glu Ala Phe Ser Gly
100 105 110

Asp Asn Gly Leu Thr Ile Val Glu Arg Ala Pro Tyr Gly Leu Ile Gly

115

120

125

Ala Val Thr Pro Val Thr Asn Pro Thr Glu Thr Ile Ile Asn Asn Ala
 130 135 140

Ile Gly Met Leu Ala Ala Gly Asn Ala Val Val Phe Asn Val His Pro
 145 150 155 160

Ser Ser Lys Arg Ser Cys Ala Tyr Ala Val Gln Leu Ile Asn Lys Ala
 165 170 175

Ile Thr Glu Ala Gly Gly Pro His His Leu Val Thr Met Val Lys Glu
 180 185 190

Pro Thr Leu Asp Thr Leu Gln Thr Leu Ile Asp Ser Pro Lys Val Lys
 195 200 205

Leu Leu Val Gly Thr Gly Gly Pro Gly Leu Val Gln Thr Leu Leu Lys
 210 215 220

Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile
 225 230 235 240

Val Asp Asp Thr Ala Asp Leu Glu His Ala Ala Arg Ser Ile Ile Glu
 245 250 255

Gly Ala Ala Phe Asp Asn Asn Leu Leu Cys Ile Ala Glu Lys Glu Val
 260 265 270

Phe Val Leu Glu Ser Val Ala Asp Asp Leu Ile Phe His Met Leu Asn
 275 280 285

His Gly Ala Tyr Met Leu Gly Gln His Glu Val Glu Gln Val Met Ala
 290 295 300

Phe Ala Leu Glu Glu Gln Gly Asn Glu Gln Asn Arg Gly Cys Gly Phe
 305 310 315 320

Asn Pro Gln Arg His Tyr Gln Val Ser Lys Asp Trp Ile Gly Gln Asp
 325 330 335

Ala Arg Leu Phe Leu Glu His Ile Gly Val Gln Pro Pro Thr Glu Val
340 345 350

Lys Leu Leu Ile Cys Asp Val Glu Phe Asp His Pro Phe Val Gln Leu
355 360 365

Glu Gln Met Met Pro Val Leu Pro Ile Val Arg Val Lys Thr Leu Asp
370 375 380

Glu Ala Ile Glu Lys Ala Val Met Ala Glu His Gly Asn Arg His Thr
385 390 395 400

Ala Ile Met His Ser Lys Asn Val Asp His Leu Thr Lys Phe Ala Arg
405 410 415

Ala Ile Gln Thr Thr Leu Phe Val Lys Asn Ala Ser Ser Leu Ala Gly
420 425 430

Val Gly Tyr Gly Gly Glu Gly His Thr Thr Met Thr Ile Ala Gly Pro
435 440 445

Thr Gly Glu Gly Val Thr Ser Ala Lys Thr Phe Thr Arg Glu Arg Arg
450 455 460

Cys Val Leu Ala Glu Gly Gly Phe Arg Ile Ile Gly
465 470 475

<210> 138

<400> 138
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<210> 139

<400> 139
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<210> 140

<400> 140
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<210> 141

<400> 141
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<210> 142

<400> 142
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<210> 143

<400> 143
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<210> 144

<400> 144
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<210> 145

<211> 462

<212> PRT

<213> *Blautia* sp. CAG:257

<400> 145

Met Pro Ile Ser Glu Asn Met Val Gln Glu Ile Val Gln Glu Val Met
1 5 10 15

Ala Lys Met Gln Ile Ala Glu Ala Pro Ala Gly Lys His Gly Ile Phe
20 25 30

Lys Asp Met Asn Asp Ala Ile Glu Ala Ala Lys Lys Ala Glu Leu Ile
35 40 45

Val Lys Arg Met Ser Met Asp Gln Arg Glu Lys Ile Ile Thr Cys Ile
50 55 60

Arg Lys Lys Ile Lys Glu Asn Ala Glu Val Leu Ala Arg Met Gly Val
65 70 75 80

Glu Glu Thr Gly Met Gly Asn Val Gly Asp Lys Ile Leu Lys His His
85 90 95

Leu Val Ala Asp Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala
100 105 110

Trp Ser Gly Asp Arg Gly Leu Thr Leu Ile Glu Met Gly Pro Phe Gly

115

120

125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Val Leu
 130 135 140

Cys Asn Thr Met Gly Met Leu Ala Gly Gly Asn Thr Val Val Phe Asn
 145 150 155 160

Pro His Pro Ala Ala Ile Lys Thr Ser Ile Tyr Ala Ile Asn Leu Leu
 165 170 175

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

Val Glu Lys Pro Thr Leu Glu Thr Ser Asp Ile Met Met Lys His Lys
 195 200 205

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

Val Leu Ser Ser Gly Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
 225 230 235 240

Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Gln Asp
 245 250 255

Ile Val Asn Gly Cys Thr Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
 260 265 270

Lys Glu Ile Val Ala Val Ser Ser Ile Ala Asp Glu Leu Met His Tyr
 275 280 285

Leu Ile Thr Glu Asn Asp Cys Tyr Leu Ala Ser Lys Glu Glu Gln Asp
 290 295 300

Lys Leu Thr Glu Val Val Leu Ala Gly Gly Lys Leu Asn Arg Lys Cys
 305 310 315 320

Val Gly Arg Asp Ala Arg Thr Leu Leu Ser Met Ile Gly Val Asp Ala
 325 330 335

Pro Ala Asn Ile Arg Cys Ile Val Phe Glu Gly Pro Lys Glu His Pro
340 345 350

Leu Ile Ala Glu Glu Leu Met Met Pro Ile Leu Gly Met Val Arg Ala
355 360 365

Arg Asp Phe Asp Asp Ala Val Glu Gln Ala Val Trp Leu Glu His Gly
370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Val Asp Asn Ile Thr
385 390 395 400

Lys Tyr Ala Arg Ala Ile Asp Thr Ala Ile Leu Val Lys Asn Gly Pro
405 410 415

Ser Tyr Ser Ala Leu Gly Phe Gly Gly Glu Gly Phe Cys Thr Phe Thr
420 425 430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Thr Phe Thr
435 440 445

Lys Arg Arg Arg Cys Val Met Ser Asp Ser Leu Cys Ile Arg
450 455 460

<210> 146
<211> 469
<212> PRT
<213> *Listeria marthii* FSL

<400> 146

Met Glu Ser Leu Glu Leu Glu Gln Leu Val Lys Lys Val Leu Leu Glu
1 5 10 15

Lys Leu Ala Glu Gln Lys Glu Ala Pro Ala Lys Pro Ile Thr Gln Gly
20 25 30

Ala Lys Ser Gly Ile Phe Asp Thr Val Asp Glu Ala Val Gln Ala Ala
35 40 45

Val Ile Ala Gln Asn Cys Tyr Lys Glu Lys Ser Leu Glu Glu Arg Arg
50 55 60

Asn Val Val Lys Ala Ile Arg Glu Thr Leu Tyr Pro Glu Ile Glu Thr
65 70 75 80

Ile Ala Thr Lys Ala Val Ala Glu Thr Gly Met Gly Asn Val Ala Asp
85 90 95

Lys Ile Leu Lys Asn Thr Leu Ala Ile Glu Lys Thr Pro Gly Val Glu
100 105 110

Asp Leu Tyr Thr Glu Val Ala Thr Gly Asp Asn Gly Met Thr Leu Tyr
115 120 125

Glu Leu Ser Pro Tyr Gly Val Ile Gly Ala Val Ala Pro Ser Thr Asn
130 135 140

Pro Thr Glu Thr Leu Ile Cys Asn Thr Ile Gly Met Leu Ala Ala Gly
145 150 155 160

Asn Ala Val Phe Tyr Ser Pro His Pro Gly Ala Lys Asn Ile Ser Leu
165 170 175

Trp Leu Ile Glu Lys Leu Asn Thr Ile Val Arg Glu Ser Cys Gly Ile
180 185 190

Asp Asn Leu Val Val Thr Val Glu Lys Pro Ser Ile Gln Ala Ala Gln
195 200 205

Glu Met Met Asn His Pro Lys Val Pro Leu Leu Val Ile Thr Gly Gly
210 215 220

Pro Gly Val Val Leu Gln Ala Met Gln Ser Gly Lys Lys Val Ile Gly
225 230 235 240

Ala Gly Ala Gly Asn Pro Pro Ser Ile Val Asp Glu Thr Ala Asn Ile
245 250 255

Glu Lys Ala Ala Ala Asp Ile Val Asp Gly Ala Ser Phe Asp His Asn
260 265 270

Ile Leu Cys Ile Ala Glu Lys Ser Ile Val Ala Val Glu Ser Ile Ala
275 280 285

Asp Phe Leu Leu Phe Gln Met Glu Lys Asn Gly Ala Leu His Val Thr
290 295 300

Asn Pro Ser Asp Ile Gln Lys Leu Glu Lys Val Ala Val Thr Asp Lys
305 310 315 320

Gly Val Thr Asn Lys Lys Leu Val Gly Lys Ser Ala Ala Glu Ile Leu
325 330 335

Lys Glu Ala Gly Ile Thr Cys Asp Phe Thr Pro Arg Leu Ile Ile Val
340 345 350

Glu Thr Thr Lys Thr His Pro Phe Ala Thr Val Glu Leu Leu Met Pro
355 360 365

Ile Val Pro Leu Val Arg Val Pro Asp Phe Asp Glu Ala Leu Glu Val
370 375 380

Ala Ile Glu Leu Glu Gln Gly Leu His His Thr Ala Thr Met His Ser
385 390 395 400

Gln Asn Ile Ser Arg Leu Asn Lys Ala Ala Arg Asp Met Gln Thr Ser
405 410 415

Ile Phe Val Lys Asn Gly Pro Ser Phe Ala Gly Leu Gly Phe Arg Gly
420 425 430

Glu Gly Ser Thr Thr Phe Thr Ile Ala Thr Pro Thr Gly Glu Gly Thr
435 440 445

Thr Thr Ala Arg His Phe Ala Arg Arg Arg Arg Cys Val Leu Thr Asp
450 455 460

Gly Phe Ser Ile Arg
465

<210> 147

<400> 147
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<210> 148
<211> 473
<212> PRT
<213> Clostridium methoxybenzovorans

<400> 148

Met Glu Ile Gly Ala Lys Glu Ile Glu Leu Ile Val Arg Glu Val Leu
1 5 10 15

Ala Gly Ile Glu Ser Arg Gly Ile Lys Pro Ser Tyr Thr Pro Ser Arg
20 25 30

Ser Glu Asp Gly Val Phe Glu Arg Val Glu Asp Ala Ile Glu Ala Ala
35 40 45

Tyr Ala Ala Gln Arg Glu Trp Val Glu His Tyr Arg Val Glu Asp Arg
50 55 60

Arg Arg Ile Ile Glu Ala Ile Arg Val Thr Ala Lys Ser His Ala Glu
65 70 75 80

Ser Leu Ala Lys Met Val Trp Glu Glu Thr Gly Met Gly Arg Phe Glu
85 90 95

Asp Lys Ile Gln Lys His Met Ala Val Ile Glu Lys Thr Pro Gly Val
100 105 110

Glu Cys Leu Thr Thr Glu Ala Ile Ser Gly Asp Gly Gly Leu Met Ile
115 120 125

Glu Glu Tyr Ala Pro Phe Gly Val Ile Gly Ala Ile Thr Pro Ser Thr
130 135 140

Asn Pro Thr Glu Thr Ile Ile Asn Asn Thr Ile Ser Met Ile Ala Gly
145 150 155 160

Gly Asn Ser Val Val Phe Asn Val His Pro Gly Ala Lys Arg Cys Cys
165 170 175

Ala His Cys Leu Lys Ile Leu His Gln Ala Ile Val Glu Asn Gly Gly
180 185 190

Pro Ala Ser Leu Ile Thr Met Gln Lys Glu Pro Asp Met Glu Ala Val
195 200 205

Ser Lys Leu Thr Ser Asp Pro Arg Ile Arg Leu Met Val Gly Thr Gly
210 215 220

Gly Met Pro Met Val Asn Ala Leu Leu Arg Ser Gly Lys Lys Thr Ile
225 230 235 240

Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val Asp Asp Thr Ala Asp
245 250 255

Val Ser Leu Ala Ala Arg Glu Ile Tyr Arg Gly Ala Ser Phe Asp Asn
260 265 270

Asn Ile Leu Cys Leu Ala Glu Lys Glu Val Phe Val Met Glu Arg Ala
275 280 285

Ala Asp Glu Leu Val Asn Lys Leu Ile Lys Glu Gly Ala Tyr Leu Leu
290 295 300

Ser Ser Met Glu Leu Ser Glu Ile Leu Lys Phe Ala Met Val Glu Lys
305 310 315 320

Asn Gly Ser Tyr Glu Val Asn Lys Lys Trp Val Gly Lys Asp Ala Gly
325 330 335

Gln Phe Leu Glu Ala Ile Gly Val Ser Gly His Lys Asp Val Arg Leu
340 345 350

Leu Ile Cys Glu Thr Asp Arg Ser His Pro Phe Val Met Val Glu Gln
355 360 365

Leu Met Pro Ile Leu Pro Ile Val Arg Leu Arg Thr Phe Glu Glu Cys
370 375 380

Val Glu Ser Ala Leu Ala Ala Glu Ser Gly Asn Arg His Thr Ala Ser
385 390 395 400

Met Phe Ser Arg Asn Val Glu Asn Met Thr Lys Phe Gly Lys Ile Ile
405 410 415

Glu Thr Thr Ile Phe Thr Lys Asn Gly Ser Thr Leu Lys Gly Val Gly
420 425 430

Ile Gly Gly Glu Gly His Thr Thr Met Thr Ile Ala Gly Pro Thr Gly
435 440 445

Glu Gly Leu Thr Cys Ala Arg Ser Phe Thr Arg Arg Arg Arg Cys Met
450 455 460

Leu Ala Glu Gly Gly Leu Arg Ile Ile
465 470

<210> 149
<211> 477
<212> PRT
<213> Bacillus sp. m3-13

<400> 149

Val Gln Ile Lys Glu Ser Asp Ile Lys Glu Met Val Ala Gln Val Leu
1 5 10 15

Ala Gln Leu Gly Asp Glu Ser Lys Gln Pro Ser Pro Ala Ser Glu Gln
20 25 30

Gly Ser Asn Glu Val Pro Leu Gly Asn Gly Val Phe Thr Thr Val Asp
35 40 45

Gln Ala Thr Glu Ala Ala Thr Glu Ala Trp Asp Lys Leu Arg Ala Thr
50 55 60

Ser Leu Glu Thr Arg Lys Asn Met Ile Glu Lys Met Arg Glu Val Ser
65 70 75 80

Arg Glu His Ala Lys Ala Leu Ala Glu Leu Ala Val Lys Glu Thr Gly
85 90 95

Leu Gly Arg Val Glu Asp Lys Val Ala Lys Asn Leu Leu Ala Ala Asp

100

105

110

Lys Thr Pro Gly Val Glu Asp Ile Val Ala Thr Thr Tyr Ser Gly Asp
 115 120 125

Gly Gly Leu Thr Leu Val Glu Tyr Ser Pro Val Gly Val Tyr Gly Ala
 130 135 140

Ile Thr Pro Ser Thr Asn Pro Ala Ala Thr Ile Ile Asn Asn Ser Ile
 145 150 155 160

Ser Leu Val Ala Ala Gly Asn Ala Val Val Phe Asn Pro His Pro Ser
 165 170 175

Ala Lys Gln Val Ser Ile Lys Thr Met Gln Leu Leu Asn Glu Ala Ile
 180 185 190

Val Ala Ala Gly Gly Pro Ala Asn Thr Leu Thr Ser Val Ala Ser Pro
 195 200 205

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

Leu Val Val Thr Gly Gly Gly Ile Val Val Gln Ala Ala Met Ser Ala
 225 230 235 240

Gly Lys Lys Val Ile Ala Ala Gly Pro Gly Asn Pro Pro Val Val Val
 245 250 255

Asp Glu Thr Ala Ile Ile Ser Lys Ala Ala Lys Asp Ile Val Thr Gly
 260 265 270

Ala Ser Phe Asp Asn Asn Val Leu Cys Thr Ala Glu Lys Glu Val Phe
 275 280 285

Val Val Glu Lys Val Ala Asn Thr Leu Lys Ser Glu Met Thr Lys Asn
 290 295 300

Gly Ala Val Glu Leu Lys Gly Tyr Gln Leu Glu Lys Leu Leu Gly Lys
 305 310 315 320

Ile Leu Val Lys Lys Gly Glu Lys Tyr Tyr Pro Asn Arg Asp Phe Ile
325 330 335

Gly Lys Asp Ala Ser Val Leu Leu Glu Ala Ala Gly Ile Arg Ser Asp
340 345 350

Ser Asn Val Lys Leu Ile Ile Ala Glu Thr Lys Glu Asp His Pro Leu
355 360 365

Val His Thr Glu Met Leu Met Pro Ile Leu Pro Ile Val Arg Val Ser
370 375 380

Asp Val Asp Lys Ala Ile Ser Leu Ala Val Lys Ala Glu Lys Gly Asn
385 390 395 400

Arg His Thr Ala Ile Met His Ser Gln Asn Val Thr Asn Leu Thr Lys
405 410 415

Met Ala Lys Glu Ile Gln Ala Thr Ile Phe Val Lys Asn Gly Pro Ser
420 425 430

Val Ala Gly Leu Gly Tyr Gln Ser Glu Gly Phe Thr Thr Leu Thr Ile
435 440 445

Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys Thr Phe Thr Arg
450 455 460

Gln Arg Arg Cys Val Leu Val Asp Gly Phe Arg Ile Ile
465 470 475

<210> 150
<211> 472
<212> PRT
<213> bacterium CG2_30_54_10

<400> 150

Met Ser Val Ser Lys Asp Glu Ile Asn Val Ile Val Gln Glu Val Leu
1 5 10 15

Lys Ala Ile Glu Thr Ser Gly Gly Leu Pro Ser Ala Ala Ser Ser Val
20 25 30

Gly Arg Ile Ser Gln Lys Gly Val Phe Glu Asn Leu Asp Asp Ala Ile
35 40 45

Lys Ala Ala Gly Gln Ala Gln Lys Lys Leu Val Glu Leu Pro Leu Lys
50 55 60

Thr Arg Gly Glu Ile Ile Ala Asn Met Arg Arg Arg Ala Ala Glu Asn
65 70 75 80

Val Glu Glu Ile Ser Arg Leu Gly His Glu Glu Thr Gly Tyr Gly Arg
85 90 95

Ile Ala Asp Lys Ile Gln Lys Asn Met Leu Ala Ile Thr Lys Thr Pro
100 105 110

Gly Ile Glu Asp Leu Gln Pro Val Ala Tyr Ser Gly Asp His Gly Leu
115 120 125

Thr Ile Val Glu Gln Ala Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro
130 135 140

Ser Thr Asn Pro Ser Glu Thr Val Ile Cys Asn Ser Ile Gly Met Ile
145 150 155 160

Ala Ala Gly Asn Ala Val Val Phe Gly Pro His Pro Ser Ala Ala Gln
165 170 175

Val Cys Leu Leu Ala Ile Ser Val Leu Asn Asp Ala Val Val Glu Ala
180 185 190

Gly Gly Pro Glu Asn Leu Met Val Ser Val Ser Lys Pro Ser Ile Gln
195 200 205

Thr Ala Gln Ala Leu Met Ala His Pro Asp Ile Arg Leu Leu Val Val
210 215 220

Thr Gly Gly Pro Ala Val Val Ala Ala Ala Lys Ser Gly Lys Lys
225 230 235 240

Phe Ile Ala Ala Gly Pro Gly Asn Pro Pro Ala Val Val Asp Glu Thr
245 250 255

Ala Asp Leu Lys Lys Ala Ala Arg Asp Ile Ile Ser Gly Ala Thr Leu
260 265 270

Asp Asn Asn Ile Leu Cys Ile Ala Glu Lys Glu Ile Ile Val Val Glu
275 280 285

Ser Val Ala Asp Glu Leu Lys Arg His Leu Cys Asn Ser Gly Ala Tyr
290 295 300

Glu Ala Ser Ala Arg Glu Ile Leu Gln Leu Glu Lys Leu Val Ile Asp
305 310 315 320

Pro Arg Thr His Gly Pro Asn Arg Ser Phe Ile Gly Lys Asn Ala Ser
325 330 335

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

Val Leu Cys Glu Val Gly Pro Asp His Pro Phe Val Val Glu Glu Met
355 360 365

Met Met Pro Val Val Pro Leu Val Arg Val Arg Asp Val His Thr Ala
370 375 380

Val Asp Phe Ala Val Lys Ile Glu His Gly Cys Arg His Thr Ala Ile
385 390 395 400

Met His Ser Lys Asn Leu Asp Asn Leu His Leu Met Ala Thr Arg Cys
405 410 415

Asn Cys Ser Ile Phe Val Lys Asn Gly Pro Ser Tyr Ala Gly Leu Gly
420 425 430

Leu Gly Gly Glu Gly Phe Thr Thr Phe Thr Ile Ala Ser Pro Thr Gly
435 440 445

Glu Gly Leu Thr Ser Ala Arg Thr Phe Thr Arg Gln Arg Arg Cys Val
450 455 460

Leu Val Asp Tyr Phe Arg Ile Val
465 470

<210> 151

<400> 151
000

<210> 152
<211> 475
<212> PRT
<213> Candidatus Izimaplasma sp

<400> 152

Met Ser Thr Asn Asp Leu Ile Lys Gln Leu Thr Glu Glu Met Glu Arg
1 5 10 15

Lys Tyr Gly Asn Asp Val Val Thr Lys Pro Asn Thr Pro Thr Asn Ser
20 25 30

Tyr Asn Thr Gly Tyr Val Gly Ile Phe Glu Asn Val Glu Asp Ala Ile
35 40 45

Leu Ala Ala Lys Glu Ser Gln Lys Gln Leu Met Glu Leu Ser Met Lys
50 55 60

Lys Arg Lys Glu Ile Ile Glu Ala Met Arg Lys Ala Ser Leu Glu Asn
65 70 75 80

Ala Glu Lys Leu Ala Ile Met Ala His Glu Glu Thr Gly Phe Gly Arg
85 90 95

Val Ala Asp Lys Ile Ile Lys Asn Val Leu Ala Ala Glu Lys Thr Pro
100 105 110

Gly Thr Glu Asp Leu Ser Ser Ser Thr Phe Thr Gly Asp Asp Gly Met
115 120 125

Thr Leu Val Glu Leu Ala Pro Tyr Gly Val Ile Gly Ser Ile Thr Pro
130 135 140

Ser Thr Asn Pro Ser Ser Thr Ile Ile Asn Asn Ser Ile Ser Met Val
145 150 155 160

Ala Ala Gly Asn Gly Val Val Tyr Asn Pro His Pro Ser Ala Lys Lys
165 170 175

Val Thr Ser Glu Thr Ile Ser Ile Leu Asn Lys Ala Ile Ser Ser Val
180 185 190

Gly Gly Pro Arg Glu Leu Leu Thr Ala Pro Leu Thr Pro Thr Met Asp
195 200 205

Thr Ser Lys Val Ile Met Thr His Lys Asp Val Arg Ile Leu Val Val
210 215 220

Thr Gly Gly Glu Ala Val Val Gly Val Ala Met Lys Ser Gly Lys Lys
225 230 235 240

Val Ile Ala Ala Gly Pro Gly Asn Pro Pro Val Ile Val Asp Glu Thr
245 250 255

Ala Asn Ile Lys Lys Ala Ala Asn Asp Val Phe Arg Gly Ala Ser Phe
260 265 270

Asp Asn Asn Ile Leu Cys Ile Ala Glu Lys Glu Ala Phe Val Ile Asn
275 280 285

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

Glu Leu Lys Arg His Glu Ile Asp Leu Val Thr Glu Glu Val Phe Thr
305 310 315 320

Lys Asn Lys Asn Gly Asp Thr Val Val Asn Arg Lys His Val Gly Lys
325 330 335

Ser Ala Val Glu Ile Leu Lys Ala Cys Asn Ile Met Val His Gln Asp
340 345 350

Ile Arg Leu Ile Thr Ala Glu Val Ser Glu Asn His Pro Phe Ile Thr
355 360 365

Val Glu Met Leu Met Pro Val Leu Gly Ile Val Arg Val Tyr Ser Ile
370 375 380

Asp Glu Ala Ile Glu Lys Ala Val Ile Ala Glu Asp Gly Cys Leu His
385 390 395 400

Thr Ala Ile Met His Ser Glu Ser Val Ser Asn Leu Thr Lys Ala Ala
405 410 415

Arg Ala Leu Asn Thr Ser Ile Phe Val Lys Asn Ala Pro Ser Phe Ala
420 425 430

Gly Leu Gly Ile Glu Gly Glu Gly Phe Thr Thr Leu Thr Ile Ala Thr
435 440 445

Pro Thr Gly Glu Gly Leu Thr Ser Ala Arg Ser Phe Thr Arg Ile Arg
450 455 460

Arg Cys Thr Leu Ser Gly Gly Phe Arg Ile Val
465 470 475

<210> 153

<400> 153
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<210> 154

<400> 154
000

<210> 155

<400> 155
000

<210> 156

<400> 156
000

<210> 157

<211> 462

<212> PRT

<213> Firmicutes bacterium CAG:41

<400> 157

Val Pro Ile Asn Glu Asn Met Val Gln Asp Ile Val Gln Glu Val Leu
1 5 10 15

Ala Lys Met Gln Ile Gln Glu Ala Pro Thr Gly Lys His Gly Val Phe
20 25 30

Lys Asp Met Asn Glu Ala Ile Glu Ala Ala Lys Lys Ala Gln Gln Thr
35 40 45

Val Lys Lys Met Ser Met Asp Gln Arg Glu Lys Ile Leu Ser Ile Ile
50 55 60

Arg Lys Lys Ile Cys Glu Asn Ala Glu Thr Met Ala Arg Met Gly Val
65 70 75 80

Glu Glu Thr Gly Met Gly Asn Val Gly Asp Lys Ile Leu Lys His Arg
85 90 95

Leu Val Ala Glu Lys Thr Pro Gly Thr Glu Asp Ile Thr Thr Thr Ala
100 105 110

Trp Ser Gly Asp Arg Gly Leu Thr Leu Val Glu Met Gly Pro Phe Gly
115 120 125

Val Ile Gly Ala Ile Thr Pro Cys Thr Asn Pro Ser Glu Thr Val Leu
130 135 140

Cys Asn Thr Met Gly Met Leu Ala Gly Gly Asn Thr Val Val Phe Asn
145 150 155 160

Pro His Pro Ala Ala Ile Lys Thr Ser Ile Phe Ala Ile Asn Leu Leu
165 170 175

Asn Glu Ala Ser Leu Glu Gly Gly Gly Pro Asp Asn Ile Ala Cys Thr
180 185 190

Val Glu Asn Pro Thr Leu Glu Thr Ser Asn Ile Met Met Lys His Lys
195 200 205

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

Val Leu Ser Ser Gly Lys Arg Gly Ile Gly Ala Gly Ala Gly Asn Pro
225 230 235 240

Pro Ala Leu Val Asp Glu Thr Ala Asp Ile Arg Lys Ala Ala Gln Asp
245 250 255

Ile Val Asn Gly Cys Val Phe Asp Asn Asn Leu Pro Cys Ile Ala Glu
260 265 270

Lys Glu Ile Val Ala Val Ser Ser Val Val Asp Glu Leu Met His Tyr
275 280 285

Met Val Thr Glu Gln Gly Cys Tyr Leu Ala Ser Lys Glu Glu Gln Asp
290 295 300

Ala Leu Thr Ala Val Val Leu Ala Gly Gly Arg Leu Asn Arg Lys Cys
305 310 315 320

Val Gly Arg Asp Ala Arg Thr Leu Leu Ser Met Ile Gly Val Asp Ala
325 330 335

Pro Ala Asn Ile Arg Cys Ile Thr Phe Glu Gly Pro Lys Glu His Pro
340 345 350

Leu Ile Ala Glu Glu Leu Met Met Pro Ile Leu Gly Val Val Arg Ala
355 360 365

Lys Asp Phe Glu Asp Ala Val Glu Gln Ala Val Trp Leu Glu His Gly
370 375 380

Asn Arg His Ser Ala His Ile His Ser Lys Asn Ile Asp Asn Ile Thr
385 390 395 400

Thr Tyr Ala Lys Ala Ile Asp Thr Ala Ile Leu Val Lys Asn Ala Pro
405 410 415

Ser Tyr Ala Ala Leu Gly Phe Gly Gly Glu Gly Tyr Cys Thr Phe Thr

420

425

430

Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser Ala Ser Thr Phe Thr
 435 440 445

Lys Arg Arg Arg Cys Val Met Ser Asp Ser Leu Cys Ile Arg
 450 455 460

<210> 158

<211> 465

<212> PRT

<213> Fusobacterium nucleatum subsp.

<400> 158

Met Glu Phe Glu Val Asn Asn Ile Glu Glu Ile Val Glu Leu Ile Met
 1 5 10 15

Lys Lys Met Ala Glu Ser Asn Ile Ser Thr Ala Gly Asn Ser Lys Asn
 20 25 30

Gly Val Phe Asp Asn Val Asp Gly Ala Ile Glu Glu Ala Lys Lys Ala
 35 40 45

Gln Ala Ile Leu Phe Ser Ser Lys Leu Glu Leu Arg Glu Lys Ile Ile
 50 55 60

Ala Ser Ile Arg Asp Thr Leu Lys Asn His Val Thr Glu Leu Ala Glu
 65 70 75 80

Leu Ala Val Lys Glu Thr Gly Met Gly Arg Val Ala Asp Lys Glu Leu
 85 90 95

Lys Asn Lys Ile Ala Ile Glu Lys Thr Pro Gly Leu Glu Asp Leu Lys
 100 105 110

Ala Phe Ala Phe Ser Gly Asp Asp Gly Leu Thr Val Met Glu Leu Ser
 115 120 125

Pro Tyr Gly Val Ile Gly Ala Ile Thr Pro Ser Thr Asn Pro Ser Glu
 130 135 140

Thr Val Ile Cys Asn Ser Ile Gly Met Ile Ala Ala Gly Asn Ala Val
145 150 155 160

Ile Phe Ala Pro His Pro Gly Ala Lys Arg Thr Ser Ile Arg Thr Val
165 170 175

Glu Leu Ile Asn Glu Ala Ile Arg Lys Val Gly Gly Pro Asp Asn Leu
180 185 190

Ile Val Thr Ile Arg Glu Pro Ser Ile Glu Asn Thr Glu Lys Ile Ile
195 200 205

Ala Asn Pro Asn Ile Lys Met Leu Val Ala Thr Gly Gly Pro Gly Val
210 215 220

Val Lys Thr Val Met Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala
225 230 235 240

Gly Asn Pro Pro Val Leu Val Asp Glu Thr Ala Asp Ile Glu Lys Ala
245 250 255

Ala Lys Asp Ile Ile Ala Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys
260 265 270

Thr Ala Glu Lys Glu Val Val Ala Val Asp Ser Ile Val Asn Tyr Leu
275 280 285

Ile Phe Glu Met Gln Lys Asn Gly Ala Tyr Leu Leu Lys Asp Lys Glu
290 295 300

Leu Ile Glu Lys Leu Leu Ser Leu Val Leu Lys Asn Asn Ser Pro Asp
305 310 315 320

Arg Lys Tyr Val Gly Arg Asp Ala Lys Tyr Leu Leu Lys Gln Ile Gly
325 330 335

Ile Glu Val Gly Asp Glu Ile Lys Val Ile Ile Val Glu Thr Asp Lys
340 345 350

Asn His Pro Phe Ala Val Glu Glu Leu Leu Met Pro Ile Leu Pro Ile
355 360 365

Val Lys Val Lys Asp Ala Leu Glu Gly Ile Lys Val Ala Lys Glu Leu
370 375 380

Glu Arg Gly Leu Arg His Thr Ala Val Ile His Ser Lys Asn Ile Asp
385 390 395 400

Ile Leu Thr Lys Tyr Ala Arg Glu Met Glu Thr Thr Ile Leu Val Lys
405 410 415

Asn Gly Pro Ser Tyr Ala Gly Ile Gly Ile Gly Gly Glu Gly His Val
420 425 430

Thr Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys
435 440 445

Ser Phe Ala Arg Asn Arg Arg Cys Val Leu Val Gly Gly Phe Ser Ile
450 455 460

Lys
465

<210> 159
<211> 467
<212> PRT
<213> Thermoanaerobacterium xylanolyticum LX-11

<400> 159

Met Lys Val Lys Glu Glu Asp Ile Glu Ala Ile Val Lys Lys Val Leu
1 5 10 15

Ser Glu Phe Asn Leu Glu Lys Thr Thr Ser Lys Tyr Gly Asp Val Gly
20 25 30

Ile Phe Gln Asp Met Asn Asp Ala Ile Ser Ala Ala Lys Asp Ala Gln
35 40 45

Lys Lys Leu Arg Asn Met Pro Met Glu Ser Arg Glu Lys Ile Ile Gln
50 55 60

Asn Ile Arg Lys Lys Ile Met Glu Asn Lys Lys Ile Leu Ala Glu Met

65		70		75		80									
Gly	Val	Arg	Glu	Thr	Gly	Met	Gly	Arg	Val	Glu	His	Lys	Ile	Val	Lys
			85						90					95	
His	Glu	Leu	Val	Ala	Leu	Lys	Thr	Pro	Gly	Thr	Glu	Asp	Ile	Thr	Thr
			100					105					110		
Thr	Ala	Trp	Ser	Gly	Asp	Lys	Gly	Leu	Thr	Leu	Val	Glu	Met	Gly	Pro
		115					120					125			
Phe	Gly	Val	Ile	Gly	Ala	Ile	Thr	Pro	Ser	Thr	Asn	Pro	Ser	Glu	Thr
	130					135					140				
Val	Leu	Cys	Asn	Ser	Ile	Gly	Met	Ile	Ala	Ala	Gly	Asn	Ser	Val	Val
145					150					155					160
Phe	Asn	Pro	His	Pro	Gly	Ala	Val	Asn	Val	Ser	Asn	Tyr	Ala	Val	Lys
				165				170						175	
Leu	Val	Asn	Glu	Ala	Ala	Met	Glu	Ala	Gly	Gly	Pro	Glu	Asn	Leu	Val
			180					185					190		
Val	Ser	Val	Glu	Lys	Pro	Thr	Leu	Glu	Thr	Gly	Asn	Val	Met	Phe	Lys
		195					200					205			
Ser	Ser	Asp	Val	Ser	Leu	Leu	Val	Ala	Thr	Gly	Gly	Pro	Gly	Val	Val
	210					215					220				
Thr	Ala	Val	Leu	Ser	Ser	Gly	Lys	Arg	Ala	Ile	Gly	Ala	Gly	Ala	Gly
225					230					235					240
Asn	Pro	Pro	Val	Val	Val	Asp	Glu	Thr	Ala	Asp	Ile	Lys	Lys	Ala	Ala
				245					250					255	
Lys	Asp	Ile	Ile	Asp	Gly	Ala	Thr	Phe	Asp	Asn	Asn	Leu	Pro	Cys	Ile
			260					265					270		
Ala	Glu	Lys	Glu	Val	Val	Ser	Val	Asp	Lys	Ile	Thr	Asp	Glu	Leu	Ile
		275					280					285			

Tyr Tyr Met Gln Lys Asn Gly Cys Tyr Lys Ile Glu Gly Arg Glu Ile
290 295 300

Glu Lys Leu Ile Glu Leu Val Leu Asp His Glu Gly Gly Lys Thr Thr
305 310 315 320

Leu Asn Arg Lys Trp Val Gly Lys Asp Ala His Leu Ile Leu Lys Ala
325 330 335

Ile Gly Ile Asp Ala Asp Glu Ser Val Arg Cys Ile Ile Phe Glu Ala
340 345 350

Glu Lys Asp Asn Pro Leu Val Val Glu Glu Leu Met Met Pro Ile Leu
355 360 365

Gly Ile Val Arg Ala Lys Asn Val Asp Glu Ala Ile Met Ile Ala Thr
370 375 380

Glu Leu Glu His Gly Asn Arg His Ser Ala His Met His Ser Lys Asn
385 390 395 400

Ile Asp Asn Leu Thr Lys Phe Gly Lys Ile Ile Asp Thr Ala Ile Phe
405 410 415

Val Lys Asn Ala Pro Ser Tyr Ala Ala Leu Gly Tyr Gly Gly Glu Gly
420 425 430

Tyr Cys Thr Phe Thr Ile Ala Ser Arg Thr Gly Glu Gly Leu Thr Ser
435 440 445

Ala Arg Thr Phe Thr Lys Ser Arg Arg Cys Val Leu Ala Asp Gly Leu
450 455 460

Ser Ile Arg
465

<210> 160

<400> 160
000

<210> 161

<400> 161
000

<210> 162

<400> 162
000

<210> 163

<400> 163
000

<210> 164

<211> 441

<212> PRT

<213> *Listeria monocytogenes*

<400> 164

Met Thr Lys Gly Ala Lys Ser Gly Val Phe Asp Thr Val Asp Glu Ala
1 5 10 15

Val Gln Ala Ala Val Ile Ala Gln Asn Ser Tyr Lys Glu Lys Ser Leu
20 25 30

Glu Glu Arg Arg Asn Val Val Lys Ala Ile Arg Glu Ala Leu Tyr Pro
35 40 45

Glu Ile Glu Ser Ile Ala Ala Arg Ala Val Ala Glu Thr Gly Met Gly
50 55 60

Asn Val Ala Asp Lys Ile Leu Lys Asn Thr Leu Ala Ile Glu Lys Thr
65 70 75 80

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

Met Thr Leu Tyr Glu Leu Ser Pro Tyr Gly Val Ile Gly Ala Val Ala
100 105 110

Pro Ser Thr Asn Pro Thr Glu Thr Leu Ile Cys Asn Thr Ile Gly Met
115 120 125

Leu Ala Ala Gly Asn Ala Val Phe Tyr Ser Pro His Pro Gly Ala Lys
130 135 140

Asn Ile Ser Leu Trp Leu Ile Glu Lys Leu Asn Thr Ile Val Arg Glu
145 150 155 160

Ser Cys Gly Val Asp Asn Leu Val Val Thr Val Glu Lys Pro Ser Ile
165 170 175

Gln Ala Ala Gln Glu Met Met Asn His Pro Lys Val Pro Leu Leu Val
180 185 190

Ile Thr Gly Gly Pro Gly Val Val Leu Gln Ala Met Gln Ser Gly Lys
195 200 205

Lys Val Ile Gly Ala Gly Ala Gly Asn Pro Pro Ser Ile Val Asp Glu
210 215 220

Thr Ala Asn Ile Glu Lys Ala Ala Ala Asp Ile Val Asp Gly Ala Ser
225 230 235 240

Phe Asp His Asn Ile Leu Cys Ile Ala Glu Lys Ser Val Val Ala Val
245 250 255

Asp Ser Ile Ala Asp Phe Leu Met Phe Gln Met Glu Lys Asn Gly Ala
260 265 270

Leu His Val Thr Asn Pro Ser Asp Ile Gln Lys Leu Glu Lys Val Ala
275 280 285

Val Thr Asp Lys Gly Val Thr Asn Lys Lys Leu Val Gly Lys Ser Ala
290 295 300

Ser Glu Ile Leu Lys Glu Ala Gly Ile Ala Cys Asp Phe Ser Pro Arg
305 310 315 320

Leu Ile Ile Val Glu Thr Glu Lys Thr His Pro Phe Ala Thr Val Glu
325 330 335

Leu Leu Met Pro Ile Val Pro Val Val Arg Val Pro Asn Phe Glu Glu
340 345 350

Ala Leu Glu Val Ala Ile Glu Leu Glu Gln Gly Leu His His Thr Ala
355 360 365

Thr Met His Ser Gln Asn Ile Ser Arg Leu Asn Lys Ala Ala Arg Asp
370 375 380

Met Gln Thr Ser Ile Phe Val Lys Asn Gly Pro Ser Phe Ala Gly Leu
385 390 395 400

Gly Phe Arg Gly Glu Gly Ser Thr Thr Phe Thr Ile Ala Thr Pro Thr
405 410 415

Gly Glu Gly Thr Thr Thr Ala Arg His Phe Ala Arg Arg Arg Arg Cys
420 425 430

Val Leu Thr Asp Gly Phe Ser Ile Arg
435 440

<210> 165
<211> 481
<212> PRT
<213> Clostridium lavalense

<400> 165

Met Glu Ile Glu Thr Arg Asp Ile Glu Arg Ile Val Arg Gln Val Met
1 5 10 15

Ala Val Met Glu Gln Gln Gly Thr Ile Ala Gly Gly Ala Tyr Pro Pro
20 25 30

Ala Pro Gly Thr Pro Ala Pro Arg Gly Asp Asn Gly Val Phe Glu Arg
35 40 45

Val Glu Asp Ala Ile Asp Ala Ala Tyr Ala Ala Gly Arg Glu Trp Ala
50 55 60

Phe His Tyr Lys Val Glu Asp Arg Arg Arg Val Ile Glu Ala Ile Arg
65 70 75 80

Val Met Ala Arg Glu Asn Ala Arg Thr Leu Ala Gln Met Val Arg Asp

85

90

95

Glu Thr Gly Met Gly Arg Met Glu Asp Lys Val Glu Lys His Leu Ala
 100 105 110

Val Ala Asp Lys Thr Pro Gly Val Glu Cys Leu Thr Thr Asp Ala Ile
 115 120 125

Ser Gly Asp Gly Gly Leu Met Ile Glu Glu Tyr Ala Pro Phe Gly Val
 130 135 140

Ile Gly Ala Ile Thr Pro Ser Thr Asn Pro Thr Glu Thr Val Ile His
 145 150 155 160

Asn Thr Ile Ser Met Ile Ala Gly Gly Asn Ser Val Val Phe Asn Val
 165 170 175

His Pro Gly Ala Lys Lys Cys Cys Ala Phe Cys Leu Gln Leu Leu His
 180 185 190

Lys Thr Ile Val Glu Asn Gly Gly Pro Ala Asn Leu Ile Thr Met Gln
 195 200 205

Arg Glu Pro Thr Met Asp Ala Val Asn Lys Met Thr Ser Ser Pro Lys
 210 215 220

Ile Arg Leu Met Val Gly Thr Gly Gly Met Gly Met Val Asn Ala Leu
 225 230 235 240

Leu Arg Ser Gly Lys Lys Thr Ile Gly Ala Gly Ala Gly Asn Pro Pro
 245 250 255

Val Ile Val Asp Asp Thr Ala Asp Val Lys Leu Ala Ala Arg Glu Leu
 260 265 270

Tyr Trp Gly Ala Ser Phe Asp Asn Asn Leu Phe Cys Phe Ala Glu Lys
 275 280 285

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

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

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

Lys Trp Val Gly Lys Asp Ala Gly Leu Phe Leu Lys Ala Ile Gly Val
340 345 350

Ser Gly His Glu Asn Thr Arg Leu Leu Ile Cys Asp Val Pro Lys Cys
355 360 365

His Pro Tyr Val Met Val Glu Gln Leu Met Pro Val Leu Pro Ile Val
370 375 380

Arg Cys Arg Thr Phe Asp Glu Cys Ile Gln Cys Ser Val Glu Ala Glu
385 390 395 400

Gln Gly Asn Arg His Thr Ser Ser Ile Phe Ser Thr Asn Val Tyr Asn
405 410 415

Met Thr Lys Phe Gly Lys Glu Ile Glu Thr Thr Ile Tyr Val Lys Asn
420 425 430

Gly Ala Thr Leu Arg Gly Leu Gly Ile Gly Gly Glu Gly His Thr Thr
435 440 445

Met Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Cys Ala Arg Ser
450 455 460

Phe Thr Arg Arg Arg Arg Cys Met Leu Ala Glu Gly Gly Leu Arg Ile
465 470 475 480

Ile

<210> 166
<211> 474
<212> PRT
<213> Acetanaerobacterium elongatum

<400> 166

Met Glu Phe Ala Val Asn Glu Ile Ser Met Ile Val Glu Gln Val Leu
1 5 10 15

Lys Asn Leu Asp Leu Ser Lys Val Ser Ala Gly Asn Ala Pro Ala Ser
20 25 30

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

Ala Ala Tyr Gln Ala Gln Lys Ile Tyr Leu Asp Lys Phe Gln Val Lys
50 55 60

Asp Arg Gln Arg Ile Ile Ala Ala Ile Arg Lys Val Cys Arg Glu Asn
65 70 75 80

Ala Glu Thr Leu Ala Arg Met Val Arg Glu Glu Ser Lys Met Gly Arg
85 90 95

Tyr Glu Asp Lys Ile Gln Lys His Leu Ala Val Ile Asp Asn Thr Pro
100 105 110

Gly Pro Glu Cys Leu Thr Thr Asp Ala Ile Ser Gly Asp Ser Gly Leu
115 120 125

Met Leu Glu Glu Tyr Ala Pro Phe Gly Leu Ile Gly Ala Ile Thr Pro
130 135 140

Val Thr Asn Pro Thr Glu Thr Ile Ile Asn Asn Thr Ile Ser Met Ile
145 150 155 160

Ser Gly Gly Asn Ser Val Val Phe Asn Val His Pro Ser Ala Lys Asn
165 170 175

Val Cys Ala Tyr Cys Leu Arg Leu Ile Asn Lys Thr Ile Ile Asp Asn
180 185 190

Gly Gly Pro Ala Asn Leu Ile Thr Met Ala Lys Glu Pro Thr Met Asp
195 200 205

Thr Val Lys Ala Ile Ser Ser Ser Pro Lys Val Arg Leu Met Val Gly
210 215 220

Thr Gly Gly Met Pro Met Val Asn Ala Leu Leu Arg Ser Gly Lys Lys
225 230 235 240

Val Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile Val Asp Asn Thr
245 250 255

Ala Asp Ile Lys Lys Ala Ala Lys Asp Ile Tyr Tyr Gly Ala Ser Phe
260 265 270

Asp Asn Asn Leu Leu Cys Leu Ala Glu Lys Glu Val Phe Val Leu Asp
275 280 285

Glu Val Ala Asn Gln Phe Ile Tyr Asn Met Val Glu Glu Gly Ala Tyr
290 295 300

Leu Leu Asn Gly Val Gln Leu Glu Lys Ile Leu Asn Leu Val Phe Lys
305 310 315 320

Phe Asp Gly Lys Tyr Asp Val Asn Lys Lys Trp Val Gly Gln Asp Ala
325 330 335

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

Leu Leu Ile Cys Glu Val Pro His Asp His Pro Phe Val Met Val Glu
355 360 365

Gln Leu Met Pro Val Leu Pro Ile Val Arg Cys Arg Asn Leu Asp Glu
370 375 380

Ala Ile Glu Tyr Ala Tyr Ile Ala Glu Ser Gly Asn Arg His Thr Ala
385 390 395 400

Ser Met Phe Ser Lys Asn Val Asp Asn Met Thr Arg Phe Ala Arg Lys
405 410 415

Ile Glu Thr Thr Ile Phe Val Lys Asn Gly Pro Thr Leu Asn Gly Val
420 425 430

Gly Ile Gly Gly Glu Gly Tyr Ala Thr Met Thr Ile Ala Gly Pro Thr
435 440 445

Gly Glu Gly Leu Thr Cys Ala Lys Ser Phe Thr Arg Arg Arg Arg Cys
450 455 460

Met Leu Ser Asp Gly Gly Leu Arg Val Ile
465 470

<210> 167
<211> 464
<212> PRT
<213> Alkaliphilus peptidifermentans DSM

<400> 167

Met Val Glu Glu Leu Lys Ile Glu Glu Ile Ile Arg Arg Val Met Lys
1 5 10 15

Glu Ile Ser Ser Lys Asn Glu Thr Gly Glu Glu Gly Ala Tyr Gly Ile
20 25 30

Phe Gln Asp Met Asn Asp Ala Val Asp Ala Ala Tyr Ile Ala Gln Lys
35 40 45

Glu Leu Ile Gly Phe Asn Leu Glu Thr Arg Gly Lys Phe Ile Glu Ala
50 55 60

Met Arg Gln Ala Ala Arg Gln Asn Val Glu Leu Leu Ser Lys Met Ala
65 70 75 80

His Glu Glu Thr Asp Met Gly Arg Tyr Glu Asp Lys Ile Leu Lys Asn
85 90 95

Arg Leu Ala Ile Glu Lys Thr Pro Gly Ile Glu Asp Leu Gly Ser Glu
100 105 110

Val Phe Thr Gly Asp Asp Gly Leu Thr Leu Ile Glu Leu Ser Pro Tyr
115 120 125

Gly Val Ile Gly Ser Ile Ser Pro Val Thr Asn Pro Ser Glu Thr Ile

130

135

140

Ile Cys Asn Ala Ile Gly Met Ile Ala Ala Gly Asn Ala Val Ala Phe
 145 150 155 160

Ser Pro His Pro Ser Ala Lys Lys Thr Ser Leu Lys Thr Ile Glu Ile
 165 170 175

Leu Asn Lys Gly Ile Ile Glu Ala Gly Gly Pro Lys Asn Leu Ile Val
 180 185 190

Ala Val Glu Asn Pro Ser Ile Glu Gln Ala Glu Ala Met Met Lys His
 195 200 205

Lys Lys Ile Asn Met Leu Val Ala Thr Gly Gly Pro Gly Val Val Lys
 210 215 220

Ser Val Leu Ser Ser Gly Lys Lys Ala Ile Gly Ala Gly Ala Gly Asn
 225 230 235 240

Pro Pro Ala Val Val Asp Glu Thr Ala Asp Ile Glu Lys Ala Ala Arg
 245 250 255

Asp Ile Ile Ala Gly Cys Ser Phe Asp Asn Asn Leu Pro Cys Val Ala
 260 265 270

Glu Lys Glu Val Ile Val Val Asp Ser Val Ala Asp Tyr Leu Ile Phe
 275 280 285

Asn Met Lys Lys Asn Gly Ala Tyr Glu Leu Lys Glu Lys Asp Leu Ile
 290 295 300

Glu Gln Leu Glu Lys Leu Val Val Asn Glu Lys Gly Tyr Pro Val Lys
 305 310 315 320

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

Lys Cys Asp Asp Ser Ile Arg Ala Ile Ile Val Glu Val Pro Lys Ser
 340 345 350

His Pro Phe Val Val Gly Glu Leu Met Met Pro Val Leu Pro Ile Val
355 360 365

Arg Val Asn Asp Val Glu Glu Ala Ile Lys Leu Ala Val Glu Val Glu
370 375 380

His Gly Phe Lys His Thr Ala Ile Met His Ser Lys Asn Ile Asp Arg
385 390 395 400

Leu Ser Lys Phe Ala Lys Glu Ile Gln Thr Thr Ile Phe Val Lys Asn
405 410 415

Gly Pro Ser Phe Ala Gly Ile Gly Val Gly Gly Glu Gly Tyr Ala Thr
420 425 430

Phe Thr Ile Ala Gly Pro Thr Gly Glu Gly Leu Thr Ser Ala Lys Ser
435 440 445

Phe Ala Arg Arg Arg Arg Cys Thr Leu Val Gly Gly Phe Ser Ile Lys
450 455 460

<210> 168

<400> 168
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<210> 169

<400> 169
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<210> 170

<400> 170
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<210> 171

<400> 171
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<210> 172

<400> 172
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<210> 173

<400> 173
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<210> 174

<400> 174
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<210> 175

<400> 175
000

<210> 176

<211> 481

<212> PRT

<213> Clostridium populeti

<400> 176

Met Asp Ile Ser Ser Gln Glu Ile Glu Ala Ile Val Arg Lys Val Ile
1 5 10 15

Ala Gly Ile Asn Pro Ala Thr Asn Val Thr Pro Asp Ile Pro Ala Ile
20 25 30

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

Glu Ala Val Glu Ala Ala Trp Lys Ala Gln Arg Asp Trp Val Thr Asn
50 55 60

Tyr Lys Val Glu Asp Arg His Arg Ile Val Glu Ala Ile Arg Arg Cys
65 70 75 80

Gly Arg Asp His Val Glu Glu Trp Ser His Leu Ile Val Glu Glu Thr
85 90 95

Gln Met Gly Arg Tyr Glu Asp Lys Val Glu Lys His Leu Ala Val Ile
100 105 110

Asn Lys Thr Pro Gly Pro Glu Cys Leu Thr Thr Glu Ala Ile Ser Gly
115 120 125

Asp Ala Gly Leu Met Ile Glu Glu Tyr Ala Pro Phe Gly Val Ile Gly
130 135 140

Ser Ile Thr Pro Thr Thr Asn Pro Thr Glu Thr Met Ile His Asn Thr
145 150 155 160

Ile Ser Met Ile Ser Gly Gly Asn Ser Ile Val Phe Asn Val His Pro
165 170 175

Arg Ala Lys Arg Val Cys Ala Glu Cys Leu Gln Ala Leu His Lys Ala
180 185 190

Ile Val Asp Ala Gly Gly Pro Ala Asn Leu Ile Thr Met Leu Arg Glu
195 200 205

Pro Thr Met Asp Thr Val Asp Met Leu Thr Ser Asn Pro Lys Val Arg
210 215 220

Leu Met Thr Gly Thr Gly Gly Met Gly Met Val Asn Ala Leu Leu Arg
225 230 235 240

Ser Gly Lys Lys Cys Ile Gly Ala Gly Ala Gly Asn Pro Pro Val Ile
245 250 255

Val Asp Glu Thr Ala Asp Val Glu Leu Ala Ala Arg Lys Ile Tyr Glu
260 265 270

Gly Ala Ser Phe Asp Asn Asn Ile Leu Cys Phe Ala Glu Lys Glu Val
275 280 285

Phe Val Val Ser Pro Asn Tyr Glu Gly Phe Ile His Asn Ile Gln Lys
290 295 300

Gln Gly Ala Tyr Leu Leu Asn Asn Ser Gln Val Glu Ala Leu Val Lys
305 310 315 320

Ile Cys Leu Glu Pro Asn Lys Asn Gln Ser Gly Tyr Glu Val Asn Lys
325 330 335

Lys Trp Val Gly Lys Asn Ala Ala Leu Ile Leu Ala Gln Ile Gly Val
340 345 350

Gln Val Glu Asp Ser Cys Arg Leu Ala Val Cys Glu Val Pro Ala Asp
355 360 365

His Pro Phe Val Leu Val Glu Gln Met Met Pro Val Leu Pro Ile Val
370 375 380

Arg Cys Ser Thr Phe Glu Glu Ala Met Glu Lys Ala Val Ile Ala Glu
385 390 395 400

Gln Gly Asn Arg His Thr Ser Ser Ile Phe Ser Lys Asp Val Asp His
405 410 415

Met Thr Arg Phe Ala Arg Leu Ile Glu Thr Thr Ile Tyr Val Lys Asn
420 425 430

Ser Cys Thr Lys Ala Gly Val Gly Ile Gly Gly Glu Gly His Cys Thr
435 440 445

Met Thr Ile Ala Gly Pro Thr Gly Glu Gly Ile Thr Asn Ala Lys Ser
450 455 460

Phe Cys Arg Arg Arg Arg Cys Met Leu Ala Glu Gly Gly Leu Arg Ile
465 470 475 480

Ile

<210> 177

<400> 177
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<210> 178

<400> 178
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<210> 179

<400> 179
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<210> 180

<400> 180
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<210> 181

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<210> 182

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<210> 183

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<400> 184
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<210> 185

<400> 185
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<210> 186

<400> 186
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<210> 187

<211> 450

<212> PRT

<213> Candidatus Bacteroides periocalifornicus

<400> 187

Met Thr Ile Ala Glu Met Val Ala Lys Ala Arg Val Ala Gln Ala Glu
1 5 10 15

Phe Glu Lys Asn Phe Asp Gln Ala Lys Thr Asp Ala Val Val Arg Glu
20 25 30

Ile Gly Lys Thr Val Phe Asp Asn Ala Glu Met Leu Ala Lys Met Ala
35 40 45

Val Glu Glu Thr Arg Met Gly Val Tyr Glu Asp Lys Val Ala Lys Asn

50

55

60

Lys Gly Lys Ala Arg Gly Val Trp Tyr Asp Leu Lys Gly Lys Lys Ser
65 70 75 80

Met Gly Val Leu Ser Val Asp Pro Glu Thr Asp Leu Ile Thr Met Leu
85 90 95

Lys Pro Val Gly Val Val Ala Ala Ile Thr Pro Thr Thr Asn Pro Ile
100 105 110

Val Thr Pro Met Ser Lys Ser Met Phe Ala Val Lys Gly Lys Asn Ala
115 120 125

Ile Ile Val Ala Pro His Pro Arg Ser Lys Lys Cys Thr Ala Lys Thr
130 135 140

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

Leu Ile Gln Val Ile Glu Glu Pro Ser Ile Pro Leu Thr Gln Glu Leu
165 170 175

Met Ala Ser Cys Asp Val Val Leu Ala Thr Gly Gly Met Gly Met Val
180 185 190

Lys Ala Ala Tyr Ser Ser Gly Lys Pro Ser Tyr Gly Val Gly Ala Gly
195 200 205

Asn Val Gln Val Ile Ile Asp Arg Gly Val Asp Tyr Asp Lys Ala Ala
210 215 220

Ala Thr Ile Ile Lys Gly Arg Ile Phe Asp Asn Gly Ile Ile Cys Ser
225 230 235 240

Gly Glu Gln Ser Phe Ile Tyr Pro Lys Asp Glu Lys Ala Lys Val Phe
245 250 255

Asp Ala Phe Lys Lys Asn Gly Ala Tyr Ile Val Ala Asp Ala Asp His
260 265 270

Asp Lys Val Val Asn Ala Leu Phe Glu Asp Gly His Ile Ala Gly Asp
275 280 285

Val Val Gly Gln Ser Val Gln Phe Val Ala Lys Lys Ala Gly Leu Asn
290 295 300

Val Pro Ala Asp Ala Arg Val Ile Val Val Glu Ala Lys Gly Val Gly
305 310 315 320

Ala Gln Asp Pro Ile Cys Lys Glu Lys Met Cys Pro Val Leu Ala Ala
325 330 335

Phe Gly Tyr Asp Lys Phe Glu Glu Ala Ile Gln Ile Ala Lys Thr Asn
340 345 350

Leu Leu Asn Glu Gly Asn Gly His Ser Ala Gly Ile His Ser Asn Asn
355 360 365

Glu Glu His Ile Arg Met Val Gly Glu Gly Leu Thr Val Ser Arg Val
370 375 380

Val Val Asn Ala Pro Val Ser Thr Thr Ala Gly Gly Ala Ile Gly Ser
385 390 395 400

Gly Leu Ala Val Thr Asn Thr Leu Gly Cys Gly Thr Trp Gly Asn Asn
405 410 415

Thr Leu Ser Glu Asn Leu Thr Tyr Lys His Leu Leu Asn Thr Thr Arg
420 425 430

Val Ala Arg Ile Ser Pro Lys Val His Gln Pro Thr Asp Glu Glu Leu
435 440 445

Trp Gly
450

<210> 188
<211> 480
<212> PRT
<213> Anaerocolumna aminovalerica

<400> 188

Met Glu Phe Gly Thr Lys Glu Ile Ser Met Ile Val Glu Gln Val Leu
1 5 10 15

Lys Asn Leu Glu Glu Asn Asn Leu Ile Ser Thr Lys Lys Thr Ser Asn
20 25 30

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

Glu Asp Ala Ile Asp Ala Ala Tyr Glu Ala Gln Lys Ile Tyr Leu Asp
50 55 60

Asn Phe Lys Ile Lys Asp Arg Gln Arg Leu Ile Ala Ala Ile Arg Lys
65 70 75 80

Val Ser Ile Glu Asn Ala Glu Thr Leu Ala Arg Met Ile Val Glu Glu
85 90 95

Ser Lys Met Gly Arg Val Glu Asp Lys Val Lys Lys His Leu Ala Val
100 105 110

Ile Glu Asn Thr Pro Gly Pro Glu Cys Leu Thr Thr Asp Ala Ile Thr
115 120 125

Gly Asp Gly Gly Leu Met Ile Glu Glu Tyr Ala Pro Phe Gly Leu Ile
130 135 140

Gly Ala Ile Thr Pro Val Thr Asn Pro Thr Glu Thr Ile Ile Asn Asn
145 150 155 160

Thr Ile Ser Met Ile Ser Gly Gly Asn Gly Ile Val Phe Asn Val His
165 170 175

Pro Ser Ala Lys Lys Val Cys Ala Tyr Cys Leu Gln Phe Ile Asn Lys
180 185 190

Thr Ile Ile Glu Asn Gly Gly Pro Ala Asn Leu Ile Thr Met Val Lys
195 200 205

Glu Pro Thr Met Glu Thr Cys Asn Ile Ile Thr Gln Ser Pro Lys Val
210 215 220

Arg Leu Met Val Gly Thr Gly Gly Met Gly Met Val Asn Ser Leu Leu
225 230 235 240

Arg Ser Gly Lys Lys Thr Ile Gly Ala Gly Ala Gly Asn Pro Pro Val
245 250 255

Ile Val Asp Glu Thr Ala Asp Ile Lys Lys Ala Ala Lys Asp Ile Tyr
260 265 270

Tyr Gly Ala Ser Phe Asp Asn Asn Leu Leu Cys Leu Ala Glu Lys Glu
275 280 285

Val Phe Val Leu Glu Glu Val Ala Asn Asp Phe Ile Tyr Asn Met Val
290 295 300

Asp Glu Gly Ala Phe Leu Leu Asn Gly Ala Gln Leu Glu Ala Ile Thr
305 310 315 320

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

Trp Val Gly Gln Asp Ala Gly Lys Met Leu Glu Ala Ile Gly Ile Thr
340 345 350

Gly Lys Ser Asp Thr Arg Leu Leu Ile Cys Asp Val Pro Tyr Asp Asn
355 360 365

Pro Phe Val Leu Leu Glu Gln Leu Met Pro Val Leu Pro Ile Val Arg
370 375 380

Cys Lys Asn Leu Asn Gln Ala Ile Asp Tyr Ala Met Ile Ala Glu Ser
385 390 395 400

Gly Asn Arg His Thr Ala Ser Met Phe Ser Lys Asn Val Asp Asn Met
405 410 415

Thr Arg Phe Ala Arg Lys Ile Glu Thr Thr Ile Phe Val Lys Asn Gly
420 425 430

Cys Thr Leu Glu Gly Val Gly Ile Gly Gly Glu Gly Tyr Thr Thr Met
435 440 445

Thr Ile Ala Gly Pro Thr Gly Glu Gly Ile Thr Cys Ala Lys Ser Phe
450 455 460

Thr Arg Arg Arg Arg Cys Met Leu Ala Asp Gly Gly Leu Arg Ile Ile
465 470 475 480

<210> 189
<211> 364
<212> PRT
<213> *Candida tropicalis*

<400> 189

Met Ile Thr Ala Gln Ala Val Leu Tyr Thr Gln His Gly Glu Pro Lys
1 5 10 15

Asp Val Leu Phe Thr Gln Ser Phe Glu Ile Asp Asp Asp Asn Leu Ala
20 25 30

Pro Asn Glu Val Ile Val Lys Thr Leu Gly Ser Pro Val Asn Pro Ser
35 40 45

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

Thr Gly Phe Gly Thr Thr Glu Pro Ala Ala Pro Cys Gly Asn Glu Gly
65 70 75 80

Leu Phe Glu Val Ile Lys Val Gly Ser Asn Val Leu Ser Leu Glu Ala
85 90 95

Gly Asp Trp Val Ile Pro Ser His Val Asn Phe Gly Thr Trp Arg Thr
100 105 110

His Ala Leu Gly Asn Asp Asp Asp Phe Ile Lys Leu Pro Asn Pro Ala
115 120 125

Gln Ser Lys Ala Asn Gly Lys Pro Asn Gly Leu Thr Ile Asn Gln Gly

130

135

140

Ala Thr Ile Ser Val Asn Pro Leu Thr Ala Tyr Leu Met Leu Thr His
 145 150 155 160

Tyr Val Lys Leu Thr Pro Gly Lys Asp Trp Phe Ile Gln Asn Gly Gly
 165 170 175

Thr Ser Ala Val Gly Lys Tyr Ala Ser Gln Ile Gly Lys Leu Leu Asn
 180 185 190

Phe Asn Ser Ile Ser Val Ile Arg Asp Arg Pro Asn Leu Asp Glu Val
 195 200 205

Val Ala Ser Leu Lys Glu Leu Gly Ala Thr Gln Val Ile Thr Glu Asp
 210 215 220

Gln Asn Asn Ser Arg Glu Phe Gly Pro Thr Ile Lys Glu Trp Ile Lys
 225 230 235 240

Gln Ser Gly Gly Glu Ala Lys Leu Ala Leu Asn Cys Val Gly Gly Lys
 245 250 255

Ser Ser Thr Gly Ile Ala Arg Lys Leu Asn Asn Asn Gly Leu Met Leu
 260 265 270

Thr Tyr Gly Gly Met Ser Phe Gln Pro Val Thr Ile Pro Thr Ser Leu
 275 280 285

Tyr Ile Phe Lys Asn Phe Thr Ser Ala Gly Phe Trp Val Thr Glu Leu
 290 295 300

Leu Lys Asn Asn Lys Glu Leu Lys Thr Leu Thr Leu Asn Gln Ile Ile
 305 310 315 320

Ala Trp Tyr Glu Glu Gly Lys Leu Thr Asp Ala Lys Ser Ile Glu Thr
 325 330 335

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

Ala Asn Ser Lys Asp Gly Lys Gln Leu Ile Thr Tyr
355 360

<210> 190
<211> 405
<212> PRT
<213> *Euglena gracilis*

<400> 190

Met Ala Met Phe Thr Thr Thr Ala Lys Val Ile Gln Pro Lys Ile Arg
1 5 10 15

Gly Phe Ile Cys Thr Thr Thr His Pro Ile Gly Cys Glu Lys Arg Val
20 25 30

Gln Glu Glu Ile Ala Tyr Ala Arg Ala His Pro Pro Thr Ser Pro Gly
35 40 45

Pro Lys Arg Val Leu Val Ile Gly Cys Ser Thr Gly Tyr Gly Leu Ser
50 55 60

Thr Arg Ile Thr Ala Ala Phe Gly Tyr Gln Ala Ala Thr Leu Gly Val
65 70 75 80

Phe Leu Ala Gly Pro Pro Thr Lys Gly Arg Pro Ala Ala Ala Gly Trp
85 90 95

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

Ala Arg Ser Leu Asn Gly Asp Ala Phe Asp Ser Thr Thr Lys Ala Arg
115 120 125

Thr Val Glu Ala Ile Lys Arg Asp Leu Gly Thr Val Asp Leu Val Val
130 135 140

Tyr Ser Ile Ala Ala Pro Lys Arg Thr Asp Pro Ala Thr Gly Val Leu
145 150 155 160

His Lys Ala Cys Leu Lys Pro Ile Gly Ala Thr Tyr Thr Asn Arg Thr
165 170 175

Val Asn Thr Asp Lys Ala Glu Val Thr Asp Val Ser Ile Glu Pro Ala
180 185 190

Ser Pro Glu Glu Ile Ala Asp Thr Val Lys Val Met Gly Gly Glu Asp
195 200 205

Trp Glu Leu Trp Ile Gln Ala Leu Ser Glu Ala Gly Val Leu Ala Glu
210 215 220

Gly Ala Lys Thr Val Ala Tyr Ser Tyr Ile Gly Pro Glu Met Thr Trp
225 230 235 240

Pro Val Tyr Trp Ser Gly Thr Ile Gly Glu Ala Lys Lys Asp Val Glu
245 250 255

Lys Ala Ala Lys Arg Ile Thr Gln Gln Tyr Gly Cys Pro Ala Tyr Pro
260 265 270

Val Val Ala Lys Ala Leu Val Thr Gln Ala Ser Ser Ala Ile Pro Val
275 280 285

Val Pro Leu Tyr Ile Cys Leu Leu Tyr Arg Val Met Lys Glu Lys Gly
290 295 300

Thr His Glu Gly Cys Ile Glu Gln Met Val Arg Leu Leu Thr Thr Lys
305 310 315 320

Leu Tyr Pro Glu Asn Gly Ala Pro Ile Val Asp Glu Ala Gly Arg Val
325 330 335

Arg Val Asp Asp Trp Glu Met Ala Glu Asp Val Gln Gln Ala Val Lys
340 345 350

Asp Leu Trp Ser Gln Val Ser Thr Ala Asn Leu Lys Asp Ile Ser Asp
355 360 365

Phe Ala Gly Tyr Gln Thr Glu Phe Leu Arg Leu Phe Gly Phe Gly Ile
370 375 380

Asp	Gly	Val	Asp	Tyr	Asp	Gln	Pro	Val	Asp	Val	Glu	Ala	Asp	Leu	Pro
385					390					395					400

Ser	Ala	Ala	Gln	Gln
				405