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<120> Tools for Glycan Analysis

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<150> GB1708471.6

<151> 2017-05-26

<150> GB1708476.5

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<150> GB1806655.5

<151> 2018-04-24

<160> 13

<170> PatentIn version 3.5

<210> 1

<211> 419

<212> PRT

<213> Akkermansia muciniphila

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		20						25					30		

Ala	Leu	Pro	Ala	Phe	Gly	Gln	Glu	Glu	Lys	Thr	Gly	Phe	Pro	Thr	Asp
		35					40					45			

Arg	Ala	Val	Thr	Val	Phe	Ser	Ala	Gly	Glu	Gly	Asn	Pro	Tyr	Ala	Ser
	50					55					60				

Ile	Arg	Ile	Pro	Ala	Leu	Leu	Ser	Ile	Gly	Lys	Gly	Gln	Leu	Leu	Ala
65					70					75					80

Phe	Ala	Glu	Gly	Arg	Tyr	Lys	Asn	Thr	Asp	Gln	Gly	Glu	Asn	Asp	Ile
				85					90					95	

Ile	Met	Ser	Val	Ser	Lys	Asn	Gly	Gly	Lys	Thr	Trp	Ser	Arg	Pro	Arg
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100

105

110

Ala Ile Ala Lys Ala His Gly Ala Thr Phe Asn Asn Pro Cys Pro Val
 115 120 125

Tyr Asp Ala Lys Thr Arg Thr Val Thr Val Val Phe Gln Arg Tyr Pro
 130 135 140

Ala Gly Val Lys Glu Arg Gln Pro Asn Ile Pro Asp Gly Trp Asp Asp
 145 150 155 160

Glu Lys Cys Ile Arg Asn Phe Met Ile Gln Ser Arg Asn Gly Gly Ser
 165 170 175

Ser Trp Thr Lys Pro Gln Glu Ile Thr Lys Thr Thr Lys Arg Pro Ser
 180 185 190

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

Ser Gly Ala His Lys Gly Arg Leu Val Ile Pro Met Asn Glu Gly Pro
 210 215 220

Phe Gly Lys Trp Val Ile Ser Cys Ile Tyr Ser Asp Asp Gly Gly Lys
 225 230 235 240

Ser Trp Lys Leu Gly Gln Pro Thr Ala Asn Met Lys Gly Met Val Asn
 245 250 255

Glu Thr Ser Ile Ala Glu Thr Asp Asn Gly Gly Val Val Met Val Ala
 260 265 270

Arg His Trp Gly Ala Gly Asn Cys Arg Arg Ile Ala Trp Ser Gln Asp
 275 280 285

Gly Gly Glu Thr Trp Gly Gln Val Glu Asp Ala Pro Glu Leu Phe Cys
 290 295 300

Asp Ser Thr Gln Asn Ser Leu Met Thr Tyr Ser Leu Ser Asp Gln Pro
 305 310 315 320

Ala Tyr Gly Gly Lys Ser Arg Ile Leu Phe Ser Gly Pro Ser Ala Gly
325 330 335

Arg Arg Ile Lys Gly Gln Val Ala Met Ser Tyr Asp Asn Gly Lys Thr
340 345 350

Trp Pro Val Lys Lys Leu Leu Gly Glu Gly Gly Phe Ala Tyr Ser Ser
355 360 365

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

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

Leu Thr Asp Gly Glu Asp Thr Gly Leu Ala Pro Gly Lys Lys Ala Pro
405 410 415

Val Leu Lys

<210> 2

<211> 381

<212> PRT

<213> Akkermansia muciniphila

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20 25 30

Leu Ser Ile Gly Lys Gly Gln Leu Leu Ala Phe Ala Glu Gly Arg Tyr
35 40 45

Lys Asn Thr Asp Gln Gly Glu Asn Asp Ile Ile Met Ser Val Ser Lys
50 55 60

Asn Gly Gly Lys Thr Trp Ser Arg Pro Arg Ala Ile Ala Lys Ala His
 65 70 75 80

Gly Ala Thr Phe Asn Asn Pro Cys Pro Val Tyr Asp Ala Lys Thr Arg
 85 90 95

Thr Val Thr Val Val Phe Gln Arg Tyr Pro Ala Gly Val Lys Glu Arg
 100 105 110

Gln Pro Asn Ile Pro Asp Gly Trp Asp Asp Glu Lys Cys Ile Arg Asn
 115 120 125

Phe Met Ile Gln Ser Arg Asn Gly Gly Ser Ser Trp Thr Lys Pro Gln
 130 135 140

Glu Ile Thr Lys Thr Thr Lys Arg Pro Ser Gly Val Asp Ile Met Ala
 145 150 155 160

Ser Gly Pro Asn Ala Gly Thr Gln Leu Lys Ser Gly Ala His Lys Gly
 165 170 175

Arg Leu Val Ile Pro Met Asn Glu Gly Pro Phe Gly Lys Trp Val Ile
 180 185 190

Ser Cys Ile Tyr Ser Asp Asp Gly Gly Lys Ser Trp Lys Leu Gly Gln
 195 200 205

Pro Thr Ala Asn Met Lys Gly Met Val Asn Glu Thr Ser Ile Ala Glu
 210 215 220

Thr Asp Asn Gly Gly Val Val Met Val Ala Arg His Trp Gly Ala Gly
 225 230 235 240

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

Gln Val Glu Asp Ala Pro Glu Leu Phe Cys Asp Ser Thr Gln Asn Ser
 260 265 270

Leu Met Thr Tyr Ser Leu Ser Asp Gln Pro Ala Tyr Gly Gly Lys Ser

275

280

285

Arg Ile Leu Phe Ser Gly Pro Ser Ala Gly Arg Arg Ile Lys Gly Gln
 290 295 300

Val Ala Met Ser Tyr Asp Asn Gly Lys Thr Trp Pro Val Lys Lys Leu
 305 310 315 320

Leu Gly Glu Gly Gly Phe Ala Tyr Ser Ser Leu Ala Met Val Glu Pro
 325 330 335

Gly Ile Val Gly Val Leu Tyr Glu Glu Asn Gln Glu His Ile Lys Lys
 340 345 350

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

Thr Gly Leu Ala Pro Gly Lys Lys Ala Pro Val Leu Lys
 370 375 380

<210> 3

<211> 393

<212> PRT

<213> Artificial Sequence

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<223> sialidase, Am0707 - with additional N terminal methionine and C
 terminal linker + His6 tag

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Phe Ser Ala Gly Glu Gly Asn Pro Tyr Ala Ser Ile Arg Ile Pro Ala
 20 25 30

Leu Leu Ser Ile Gly Lys Gly Gln Leu Leu Ala Phe Ala Glu Gly Arg
 35 40 45

Tyr Lys Asn Thr Asp Gln Gly Glu Asn Asp Ile Ile Met Ser Val Ser
 50 55 60

Lys Asn Gly Gly Lys Thr Trp Ser Arg Pro Arg Ala Ile Ala Lys Ala
65 70 75 80

His Gly Ala Thr Phe Asn Asn Pro Cys Pro Val Tyr Asp Ala Lys Thr
85 90 95

Arg Thr Val Thr Val Val Phe Gln Arg Tyr Pro Ala Gly Val Lys Glu
100 105 110

Arg Gln Pro Asn Ile Pro Asp Gly Trp Asp Asp Glu Lys Cys Ile Arg
115 120 125

Asn Phe Met Ile Gln Ser Arg Asn Gly Gly Ser Ser Trp Thr Lys Pro
130 135 140

Gln Glu Ile Thr Lys Thr Thr Lys Arg Pro Ser Gly Val Asp Ile Met
145 150 155 160

Ala Ser Gly Pro Asn Ala Gly Thr Gln Leu Lys Ser Gly Ala His Lys
165 170 175

Gly Arg Leu Val Ile Pro Met Asn Glu Gly Pro Phe Gly Lys Trp Val
180 185 190

Ile Ser Cys Ile Tyr Ser Asp Asp Gly Gly Lys Ser Trp Lys Leu Gly
195 200 205

Gln Pro Thr Ala Asn Met Lys Gly Met Val Asn Glu Thr Ser Ile Ala
210 215 220

Glu Thr Asp Asn Gly Gly Val Val Met Val Ala Arg His Trp Gly Ala
225 230 235 240

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

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

Ser Leu Met Thr Tyr Ser Leu Ser Asp Gln Pro Ala Tyr Gly Gly Lys
 275 280 285

Ser Arg Ile Leu Phe Ser Gly Pro Ser Ala Gly Arg Arg Ile Lys Gly
 290 295 300

Gln Val Ala Met Ser Tyr Asp Asn Gly Lys Thr Trp Pro Val Lys Lys
 305 310 315 320

Leu Leu Gly Glu Gly Gly Phe Ala Tyr Ser Ser Leu Ala Met Val Glu
 325 330 335

Pro Gly Ile Val Gly Val Leu Tyr Glu Glu Asn Gln Glu His Ile Lys
 340 345 350

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

Asp Thr Gly Leu Ala Pro Gly Lys Lys Ala Pro Val Leu Lys Gly Ser
 370 375 380

Gly Leu Glu His His His His His His
 385 390

<210> 4

<211> 595

<212> PRT

<213> Akkermansia muciniphila

<400> 4

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 20 25 30

Thr Pro Pro Ala Asp Ala Gly Arg Gly Leu Ile Arg Val Asp Ser Arg
 35 40 45

Glu Ile Arg His Tyr Ser Gly Thr Arg Lys Glu Pro Asp Tyr Leu Val
 50 55 60

Ser Arg Asp Asn Gly Lys Thr Trp Glu Met Lys Ala Ala Pro Ala Gly
65 70 75 80

Tyr Pro Pro Asn Tyr Gly Gly Ile Pro Lys Glu Ser Pro Ala Ile Val
85 90 95

Arg Asn Pro Leu Thr Arg Glu Phe Ile Arg Val Gln Pro Ile Gly Gly
100 105 110

Phe Val Phe Leu Ser Arg Gly Gly Leu Asp Gly Lys Trp Leu Ala Val
115 120 125

Thr Asn Asp Gly Lys Leu Glu Glu Asp Trp Lys Asp Pro Glu Lys Arg
130 135 140

Lys Asn Leu Lys Lys Leu Gly Gly Ile Met Arg Thr Pro Val Phe Val
145 150 155 160

Asn Lys Gly Arg Arg Val Ile Val Pro Phe His Asn Met Gly Gly Gly
165 170 175

Thr Lys Phe His Ile Ser Asp Asp Gly Gly Leu Thr Trp His Val Ser
180 185 190

Arg Asn Gly Val Thr Ser Pro Arg His Glu Ala Arg Pro Pro His Gln
195 200 205

Gly Val Arg Trp Phe Asn Asn Ala Val Glu Ala Thr Val Leu Glu Met
210 215 220

Lys Asp Gly Thr Leu Trp Ala Leu Ala Arg Thr Ser Gln Asp Gln Ala
225 230 235 240

Trp Gln Ala Phe Ser Lys Asp Tyr Gly Glu Thr Trp Ser Lys Pro Glu
245 250 255

Pro Ser Arg Phe Phe Gly Thr Leu Thr Met Asn Thr Leu Gly Arg Leu
260 265 270

Asp Asp Gly Thr Ile Val Ser Leu Trp Thr Asn Thr Met Ala Leu Pro
275 280 285

Glu Asn Ala Thr Ala Gly Asn Gly Thr Trp Glu Asp Val Phe Thr Asn
290 295 300

Arg Asp Ser His His Ile Ala Met Ser Gly Asp Glu Gly Lys Thr Trp
305 310 315 320

Tyr Gly Phe Arg Glu Ile Ile Leu Asp Glu His Arg Asn His Pro Gly
325 330 335

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

Met Val Gln Leu Asp Lys Asn Arg Ile Leu Ile Ser Leu Gly Gln His
355 360 365

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

Lys Thr Arg Ala Thr Gln Thr Gly Lys Asp Leu Asp Ser Gln Trp Thr
385 390 395 400

Ile His Thr Tyr Ile Pro Gln Lys Lys Gly His Cys Ser Tyr Asn Arg
405 410 415

Lys Pro Ser Ala Glu Leu Val Gln Asp Pro Ser Gly Gly Thr Lys Lys
420 425 430

Val Leu Gln Ile Lys Arg Leu Asp Asp Pro Glu Leu Val Asn Glu Lys
435 440 445

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

Gly Thr Thr Gly Leu Val Lys Phe Arg Phe Arg Val Val Asp Gly Glu
465 470 475 480

Asn Ala Cys Asp Ser Thr Thr Lys Asp Tyr Ala Leu Phe Thr Phe Pro
500 505 510

Ile Arg Leu Lys Pro Ala Pro His Leu Leu Leu Gly Met Lys Lys Val
515 520 525

Pro Phe Thr Pro Gly Ala Trp His Glu Ile Ser Leu Leu Trp Gln Gly
530 535 540

Gly Gln Ala Val Val Ser Leu Asp Gly Lys Lys Ala Gly Thr Leu Lys
545 550 555 560

Met Ala Asn Lys Ser Pro Asn Gly Ala Ser Tyr Ile His Phe Ile Ser
565 570 575

Thr Gly Ser Gln Pro Asp Ala Gly Ile Leu Leu Asp Thr Val Asn Ala
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Arg Val Lys
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<213> Akkermansia muciniphila
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Pro Ala Asp Ala Gly Arg Gly Leu Ile Arg Val Asp Ser Arg Glu Ile
20 25 30

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

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

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

Pro Leu Thr Arg Glu Phe Ile Arg Val Gln Pro Ile Gly Gly Phe Val
85 90 95

Phe Leu Ser Arg Gly Gly Leu Asp Gly Lys Trp Leu Ala Val Thr Asn
100 105 110

Asp Gly Lys Leu Glu Glu Asp Trp Lys Asp Pro Glu Lys Arg Lys Asn
115 120 125

Leu Lys Lys Leu Gly Gly Ile Met Arg Thr Pro Val Phe Val Asn Lys
130 135 140

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

Phe His Ile Ser Asp Asp Gly Gly Leu Thr Trp His Val Ser Arg Asn
165 170 175

Gly Val Thr Ser Pro Arg His Glu Ala Arg Pro Pro His Gln Gly Val
180 185 190

Arg Trp Phe Asn Asn Ala Val Glu Ala Thr Val Leu Glu Met Lys Asp
195 200 205

Gly Thr Leu Trp Ala Leu Ala Arg Thr Ser Gln Asp Gln Ala Trp Gln
210 215 220

Ala Phe Ser Lys Asp Tyr Gly Glu Thr Trp Ser Lys Pro Glu Pro Ser
225 230 235 240

Arg Phe Phe Gly Thr Leu Thr Met Asn Thr Leu Gly Arg Leu Asp Asp
245 250 255

Gly Thr Ile Val Ser Leu Trp Thr Asn Thr Met Ala Leu Pro Glu Asn
260 265 270

Ala Thr Ala Gly Asn Gly Thr Trp Glu Asp Val Phe Thr Asn Arg Asp
 275 280 285

Ser His His Ile Ala Met Ser Gly Asp Glu Gly Lys Thr Trp Tyr Gly
 290 295 300

Phe Arg Glu Ile Ile Leu Asp Glu His Arg Asn His Pro Gly Tyr Ala
 305 310 315 320

Thr Leu Asp Gly Pro Glu Asp Arg Gly Lys His Gln Ser Glu Met Val
 325 330 335

Gln Leu Asp Lys Asn Arg Ile Leu Ile Ser Leu Gly Gln His Lys Asn
 340 345 350

His Arg Arg Leu Val Ile Val Asp Arg Arg Trp Val Gly Ala Lys Thr
 355 360 365

Arg Ala Thr Gln Thr Gly Lys Asp Leu Asp Ser Gln Trp Thr Ile His
 370 375 380

Thr Tyr Ile Pro Gln Lys Lys Gly His Cys Ser Tyr Asn Arg Lys Pro
 385 390 395 400

Ser Ala Glu Leu Val Gln Asp Pro Ser Gly Gly Thr Lys Lys Val Leu
 405 410 415

Gln Ile Lys Arg Leu Asp Asp Pro Glu Leu Val Asn Glu Lys Ser Asn
 420 425 430

Val Asp Tyr Arg Asn Gly Gly Ala Thr Trp Asn Phe Pro Asn Gly Thr
 435 440 445

Thr Gly Leu Val Lys Phe Arg Phe Arg Val Val Asp Gly Glu Gln Ala
 450 455 460

Asp Asp Ser Gly Leu Gln Val Ser Leu Thr Asp Arg Leu Phe Asn Ala
 465 470 475 480

Leu Lys Pro Ala Pro His Leu Leu Leu Gly Met Lys Lys Val Pro Phe
500 505 510

Thr Pro Gly Ala Trp His Glu Ile Ser Leu Leu Trp Gln Gly Gly Gln
515 520 525

Ala Val Val Ser Leu Asp Gly Lys Lys Ala Gly Thr Leu Lys Met Ala
530 535 540

Asn Lys Ser Pro Asn Gly Ala Ser Tyr Ile His Phe Ile Ser Thr Gly
545 550 555 560

Ser Gln Pro Asp Ala Gly Ile Leu Leu Asp Thr Val Asn Ala Arg Val
565 570 575

Lys

$\langle 210 \rangle$	6
$\langle 211 \rangle$	589
$\langle 212 \rangle$	PRT
$\langle 213 \rangle$	Artificial Sequence

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<223> sialidase, Am1757 - with additional N terminal methionine and C
terminal linker + His6 tag
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Met Gln Gln Lys Ala Ala Pro Val Pro Glu Pro Glu Val Val Ala Thr
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Pro Pro Ala Asp Ala Gly Arg Gly Leu Ile Arg Val Asp Ser Arg Glu
20 25 30

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

Arg Asp Asn Gly Lys Thr Trp Glu Met Lys Ala Ala Pro Ala Gly Tyr
50 55 60

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

Asn Pro Leu Thr Arg Glu Phe Ile Arg Val Gln Pro Ile Gly Gly Phe
85 90 95

Val Phe Leu Ser Arg Gly Gly Leu Asp Gly Lys Trp Leu Ala Val Thr
100 105 110

Asn Asp Gly Lys Leu Glu Glu Asp Trp Lys Asp Pro Glu Lys Arg Lys
115 120 125

Asn Leu Lys Lys Leu Gly Gly Ile Met Arg Thr Pro Val Phe Val Asn
130 135 140

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

Lys Phe His Ile Ser Asp Asp Gly Gly Leu Thr Trp His Val Ser Arg
165 170 175

Asn Gly Val Thr Ser Pro Arg His Glu Ala Arg Pro Pro His Gln Gly
180 185 190

Val Arg Trp Phe Asn Asn Ala Val Glu Ala Thr Val Leu Glu Met Lys
195 200 205

Asp Gly Thr Leu Trp Ala Leu Ala Arg Thr Ser Gln Asp Gln Ala Trp
210 215 220

Gln Ala Phe Ser Lys Asp Tyr Gly Glu Thr Trp Ser Lys Pro Glu Pro
225 230 235 240

Ser Arg Phe Phe Gly Thr Leu Thr Met Asn Thr Leu Gly Arg Leu Asp
245 250 255

Asp Gly Thr Ile Val Ser Leu Trp Thr Asn Thr Met Ala Leu Pro Glu
260 265 270

Asn Ala Thr Ala Gly Asn Gly Thr Trp Glu Asp Val Phe Thr Asn Arg
 275 280 285

Asp Ser His His Ile Ala Met Ser Gly Asp Glu Gly Lys Thr Trp Tyr
 290 295 300

Gly Phe Arg Glu Ile Ile Leu Asp Glu His Arg Asn His Pro Gly Tyr
 305 310 315 320

Ala Thr Leu Asp Gly Pro Glu Asp Arg Gly Lys His Gln Ser Glu Met
 325 330 335

Val Gln Leu Asp Lys Asn Arg Ile Leu Ile Ser Leu Gly Gln His Lys
 340 345 350

Asn His Arg Arg Leu Val Ile Val Asp Arg Arg Trp Val Gly Ala Lys
 355 360 365

Thr Arg Ala Thr Gln Thr Gly Lys Asp Leu Asp Ser Gln Trp Thr Ile
 370 375 380

His Thr Tyr Ile Pro Gln Lys Lys Gly His Cys Ser Tyr Asn Arg Lys
 385 390 395 400

Pro Ser Ala Glu Leu Val Gln Asp Pro Ser Gly Gly Thr Lys Lys Val
 405 410 415

Leu Gln Ile Lys Arg Leu Asp Asp Pro Glu Leu Val Asn Glu Lys Ser
 420 425 430

Asn Val Asp Tyr Arg Asn Gly Gly Ala Thr Trp Asn Phe Pro Asn Gly
 435 440 445

Thr Thr Gly Leu Val Lys Phe Arg Phe Arg Val Val Asp Gly Glu Gln
 450 455 460

Ala Asp Asp Ser Gly Leu Gln Val Ser Leu Thr Asp Arg Leu Phe Asn
 465 470 475 480

Arg Leu Lys Pro Ala Pro His Leu Leu Leu Gly Met Lys Lys Val Pro
500 505 510

Phe Thr Pro Gly Ala Trp His Glu Ile Ser Leu Leu Trp Gln Gly Gly
515 520 525

Gln Ala Val Val Ser Leu Asp Gly Lys Lys Ala Gly Thr Leu Lys Met
530 535 540

Ala Asn Lys Ser Pro Asn Gly Ala Ser Tyr Ile His Phe Ile Ser Thr
545 550 555 560

Gly Ser Gln Pro Asp Ala Gly Ile Leu Leu Asp Thr Val Asn Ala Arg
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Val Lys Gly Ser Gly Leu Glu His His His His His His
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<211> 2122
<212> PRT
<213> Streptococcus oralis
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<400> 7

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35 40 45

Leu Pro Ser Glu Leu Ala Asp Leu Asp Lys Lys Ala Ser Asp Glu Gly
50 55 60

His Asp Phe Asp Lys Glu Ala Ala Ala Gln Asn Pro Gly Ser Ala Glu
65 70 75 80

Thr Thr Glu Gly Pro Gln Thr Glu Glu Glu Leu Leu Ala Gln Glu Lys
85 90 95

Glu Lys Ser Glu Lys Pro Ser Asn Leu Pro Lys Glu Leu Glu Asp Lys
100 105 110

Leu Glu Lys Ala Glu Asp Asn Gly Arg Glu Val Asp Lys Asp Gln Leu
115 120 125

Ala Gln Asp Thr Gly Lys Leu Val Pro Glu Asp Val Ala Lys Thr Thr
130 135 140

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

Gly Glu Gly Ser Gly Ile Val Val Ala Lys Asp Leu Val Leu Thr Val
165 170 175

Ser His Asn Phe Ile Lys Asp Ser Gln Glu Gly Asn Ile Arg Lys Val
180 185 190

Val Asp Asn Asp Gln Gly Asp Gly Asp Ile Tyr Ser Ile Ser Tyr Pro
195 200 205

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

Arg Glu Gly Tyr Leu Lys Gly Phe Lys Asn Asp Leu Ala Leu Val Arg
225 230 235 240

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

Val Val Lys Lys Ile Gly Asp Lys Leu His Val Phe Gly Tyr Pro Glu
260 265 270

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

Tyr Gly Glu Gly Val Gln Gly Ile Gly Tyr Gln Gly Gly Lys Pro Gly
 290 295 300

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

His Gln Asn Gly Val Val Gly Lys Arg Ser Gly Gly Ile Leu Phe Ser
 325 330 335

Pro Ala Gln Leu Lys Trp Ile Gln Asp His Met Gln Gly Ile Ser Ser
 340 345 350

Val Lys Pro Ala Asp Leu Glu Glu Lys Glu Lys Pro Ala Glu Glu Lys
 355 360 365

Pro Lys Glu Asp Lys Pro Ala Ala Ala Lys Pro Glu Thr Pro Lys Ala
 370 375 380

Val Thr Pro Glu Trp Gln Thr Val Ala Asn Lys Glu Gln Gln Gly Thr
 385 390 395 400

Val Thr Ile Arg Glu Glu Lys Gly Val Arg Tyr Asn Gln Leu Ser Ser
 405 410 415

Thr Ala Gln Asn Asp Asn Asp Gly Lys Pro Ala Leu Phe Glu Lys Gln
 420 425 430

Gly Leu Thr Val Asp Ala Asn Gly Asn Ala Thr Val Asp Leu Thr Phe
 435 440 445

Lys Asp Asp Ser Glu Lys Gly Lys Ser Arg Phe Gly Val Phe Leu Lys
 450 455 460

Phe Lys Asp Thr Lys Asn Asn Val Phe Val Gly Tyr Asp Gln Gly Gly
 465 470 475 480

Trp Phe Trp Glu Tyr Lys Thr Pro Gly Asn Ser Thr Trp Tyr Lys Gly
 485 490 495

Asn Arg Val Ala Ala Pro Glu Pro Gly Ser Val Asn Arg Leu Ser Ile
 500 505 510

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

Leu Phe Asp Thr Val Thr Leu Pro Gly Ala Val Asn Glu Asn Leu Lys
 530 535 540

Asn Glu Lys Lys Ile Leu Leu Lys Ala Gly Thr Tyr Ser Asn Asp Arg
 545 550 555 560

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

Asp Thr Pro Ala Gln Lys Glu Thr Gly Pro Ala Val Asp Asp Ser Lys
 580 585 590

Val Thr Tyr Asp Thr Ile Gln Ser Lys Val Leu Lys Ala Val Ile Asp
 595 600 605

Gln Ala Phe Pro Arg Val Lys Glu Tyr Thr Leu Asn Gly His Thr Leu
 610 615 620

Pro Gly Gln Val Gln Gln Phe Asn Gln Val Phe Ile Asn Asn His Arg
 625 630 635 640

Ile Thr Pro Glu Val Thr Tyr Lys Lys Ile Asn Glu Thr Thr Ala Glu
 645 650 655

Tyr Leu Met Lys Leu Arg Asp Asp Ala His Leu Ile Asn Ala Glu Met
 660 665 670

Thr Val Arg Leu Gln Val Val Asp Asn Gln Leu His Phe Asp Val Thr
 675 680 685

Lys Ile Val Asn His Asn Gln Val Thr Pro Gly Gln Lys Ile Asp Asp
 690 695 700

Glu Arg Lys Leu Leu Ser Thr Ile Ser Phe Leu Gly Asn Ala Leu Val

705		710		715		720
Ser	Val	Ser	Ser	Asp	Gln	Ala
				725		
					Ala	Gly
						Ala
						Lys
						730
						Phe
						Asp
						Gly
						Ala
						Thr
						Met
						735
Ser	Asn	Asn	Thr	His	Val	Ser
			740			
						Gly
						Asp
						745
						Asp
						His
						Ile
						Asp
						Val
						Thr
						Asn
						750
Pro	Met	Lys	Asp	Leu	Ala	Lys
		755				
						Gly
						760
						Tyr
						Met
						Tyr
						Gly
						Phe
						Val
						Ser
						Thr
						765
Asp	Lys	Leu	Ala	Ala	Gly	Val
	770					
						Trp
						775
						Ser
						Asn
						Ser
						Gln
						Asn
						Ser
						Tyr
						Gly
						780
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						790
						Tyr
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						Ser
						Glu
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						Glu
						810
						Thr
						Lys
						Glu
						Leu
						Pro
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Lys	Ala	Tyr	Lys	Gly	Ile	Val
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						Pro
						820
						Glu
						Tyr
						Thr
						Lys
						Glu
						Leu
						Pro
						825
Ser	Ala	Lys	Val	Val	Ile	Thr
						Glu
						830
						Asp
						Ala
						Asn
						Ala
						Asp
						835
						Asn
						Lys
						Val
						840
Asp	Trp	Gln	Asp	Gly	Ala	Ile
						Ala
						Tyr
						Arg
						Ser
						Ile
						Met
						Asn
						Asn
						Pro
						845
Gln	Gly	Trp	Glu	Lys	Val	Lys
						Asp
						Ile
						Thr
						Ala
						850
						Tyr
						Arg
						Ile
						Met
						Asn
						Asn
						Pro
						855
Gln	Gly	Trp	Glu	Lys	Val	Lys
						Asp
						Ile
						Thr
						Ala
						860
						Tyr
						Arg
						Ile
						Ala
						Met
						865
Asn	Phe	Gly	Ser	Gln	Ala	Gln
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						Pro
						Phe
						870
						Leu
						Met
						Thr
						Leu
						Asp
						Gly
						875
Ile	Lys	Lys	Ile	Asn	Leu	His
						Thr
						Asp
						Gly
						Leu
						Gly
						Gln
						Gly
						Val
						Leu
						900
Leu	Lys	Gly	Tyr	Gly	Ser	Glu
						Gly
						His
						Asp
						Ser
						Gly
						His
						Leu
						Asn
						Tyr
						905
						910
						915
						920
						925

Ala Asp Ile Gly Lys Arg Ile Gly Gly Val Glu Asp Phe Lys Thr Leu
 930 935 940

Ile Glu Lys Ala Lys Lys Tyr Gly Ala His Leu Gly Ile His Val Asn
 945 950 955 960

Ala Ser Glu Thr Tyr Pro Glu Ser Lys Tyr Phe Asn Glu Asn Ile Leu
 965 970 975

Arg Lys Asn Pro Asp Gly Ser Tyr Ser Tyr Gly Trp Asn Trp Leu Asp
 980 985 990

Gln Gly Ile Asn Ile Asp Ala Ala Tyr Asp Leu Ala His Gly Arg Leu
 995 1000 1005

Ala Arg Trp Glu Asp Leu Lys Lys Lys Leu Gly Glu Gly Leu Asp
 1010 1015 1020

Phe Ile Tyr Val Asp Val Trp Gly Asn Gly Gln Ser Gly Asp Asn
 1025 1030 1035

Gly Ala Trp Ala Thr His Val Leu Ala Lys Glu Ile Asn Lys Gln
 1040 1045 1050

Gly Trp Arg Phe Ala Ile Glu Trp Gly His Gly Gly Glu Tyr Asp
 1055 1060 1065

Ser Thr Phe Gln His Trp Ala Ala Asp Leu Thr Tyr Gly Gly Tyr
 1070 1075 1080

Thr Asn Lys Gly Ile Asn Ser Ala Ile Thr Arg Phe Ile Arg Asn
 1085 1090 1095

His Gln Lys Asp Ser Trp Val Gly Asp Tyr Arg Ser Tyr Gly Gly
 1100 1105 1110

Ala Ala Asn Tyr Pro Leu Leu Gly Gly Tyr Ser Met Lys Asp Phe
 1115 1120 1125

Glu Gly Trp Gln Gly Arg Ser Asp Tyr Asn Gly Tyr Val Thr Asn
 1130 1135 1140

Leu Phe Ala His Asp Val Met Thr Lys Tyr Phe Gln His Phe Thr
 1145 1150 1155

Val Ser Lys Trp Glu Asn Gly Thr Pro Val Thr Met Thr Asp Asn
 1160 1165 1170

Gly Ser Thr Tyr Lys Trp Thr Pro Glu Met Lys Val Glu Leu Val
 1175 1180 1185

Asp Ala Ala Gly Asn Lys Val Val Val Thr Arg Lys Ser Asn Asp
 1190 1195 1200

Val Asn Ser Pro Gln Tyr Arg Glu Arg Thr Val Thr Leu Asn Gly
 1205 1210 1215

Arg Val Ile Gln Asp Gly Ser Ala Tyr Leu Thr Pro Trp Asn Trp
 1220 1225 1230

Asp Ala Asn Gly Lys Lys Leu Pro Thr Glu Lys Glu Lys Met Tyr
 1235 1240 1245

Tyr Phe Asn Thr Gln Ala Gly Ala Thr Thr Trp Thr Leu Pro Ser
 1250 1255 1260

Asp Trp Ala Asn Ser Lys Val Tyr Leu Tyr Lys Leu Thr Asp Gln
 1265 1270 1275

Gly Lys Thr Glu Glu Gln Glu Leu Thr Val Thr Asp Gly Lys Ile
 1280 1285 1290

Thr Leu Asp Leu Leu Ala Asn Gln Pro Tyr Val Leu Tyr Arg Ser
 1295 1300 1305

Lys Gln Thr Asn Pro Glu Met Ser Trp Ser Glu Gly Met His Ile
 1310 1315 1320

Tyr	Asp	Gln	Gly	Phe	Asn	Ser	Gly	Thr	Leu	Lys	His	Trp	Thr	Ile
1325						1330					1335			
Ser	Gly	Asp	Ala	Ser	Lys	Ala	Glu	Ile	Val	Lys	Ser	Gln	Gly	Ala
1340						1345					1350			
Asn	Glu	Met	Leu	Arg	Ile	Gln	Gly	Asn	Lys	Ser	Lys	Val	Ser	Leu
1355						1360					1365			
Thr	Gln	Lys	Leu	Thr	Gly	Leu	Lys	Pro	Asn	Thr	Lys	Tyr	Ala	Val
1370						1375					1380			
Tyr	Val	Gly	Val	Asp	Asn	Arg	Ser	Asn	Ala	Lys	Ala	Ser	Ile	Thr
1385						1390					1395			
Val	Asn	Thr	Gly	Glu	Lys	Glu	Val	Thr	Thr	Tyr	Thr	Asn	Lys	Ser
1400						1405					1410			
Leu	Ala	Leu	Asn	Tyr	Ile	Lys	Ala	Tyr	Ala	His	Asn	Asn	Arg	Arg
1415						1420					1425			
Glu	Asn	Ala	Thr	Val	Asp	Asp	Thr	Ser	Tyr	Phe	Gln	Asn	Met	Tyr
1430						1435					1440			
Ala	Phe	Phe	Thr	Thr	Gly	Ser	Asp	Val	Ser	Asn	Val	Thr	Leu	Thr
1445						1450					1455			
Leu	Ser	Arg	Glu	Ala	Gly	Asp	Glu	Ala	Thr	Tyr	Phe	Asp	Glu	Ile
1460						1465					1470			
Arg	Thr	Phe	Glu	Asn	Asn	Ser	Ser	Met	Tyr	Gly	Asp	Lys	His	Asp
1475						1480					1485			
Thr	Gly	Gln	Gly	Thr	Phe	Lys	Gln	Asp	Phe	Glu	Asn	Val	Ala	Gln
1490						1495					1500			
Gly	Ile	Phe	Pro	Phe	Val	Val	Gly	Gly	Val	Glu	Gly	Val	Glu	Asp
1505						1510					1515			
Asn	Arg	Thr	His	Leu	Ser	Glu	Lys	His	Asp	Pro	Tyr	Thr	Gln	Arg

1520

1525

1530

Gly Trp Asn Gly Lys Lys Val Asp Asp Val Ile Glu Gly Asn Trp
 1535 1540 1545

Ser Leu Lys Thr Asn Gly Leu Val Ser Arg Arg Asn Leu Val Tyr
 1550 1555 1560

Gln Thr Ile Pro Gln Asn Phe Arg Phe Glu Ala Gly Lys Thr Tyr
 1565 1570 1575

Arg Val Thr Phe Glu Tyr Glu Ala Gly Ser Asp Asn Thr Tyr Ala
 1580 1585 1590

Phe Val Val Gly Lys Gly Glu Phe Gln Ser Gly Arg Arg Gly Thr
 1595 1600 1605

Gln Ala Ser Asn Leu Glu Met His Glu Leu Pro Asn Thr Trp Thr
 1610 1615 1620

Asp Ser Lys Lys Ala Lys Lys Val Thr Phe Leu Val Thr Gly Ala
 1625 1630 1635

Glu Thr Gly Asp Thr Trp Val Gly Ile Tyr Ser Thr Gly Asn Ala
 1640 1645 1650

Ser Asn Thr Arg Gly Asp Ala Gly Gly Asn Ala Asn Phe Arg Gly
 1655 1660 1665

Tyr Asn Asp Phe Met Met Asp Asn Leu Gln Ile Glu Glu Ile Thr
 1670 1675 1680

Leu Thr Gly Lys Met Leu Thr Glu Asn Ala Leu Lys Asn Tyr Leu
 1685 1690 1695

Pro Thr Val Ala Met Thr Asn Tyr Thr Lys Glu Ser Met Asp Ala
 1700 1705 1710

Leu Lys Glu Ala Val Phe Asn Leu Ser Gln Ala Asp Asp Asp Ile
 1715 1720 1725

Ser Val Glu Glu Ala Arg Ala Glu Ile Ala Lys Ile Glu Ala Leu
1730 1735 1740

Lys Asn Ala Leu Val Gln Lys Lys Thr Ala Leu Val Ala Glu Asp
1745 1750 1755

Phe Glu Ser Leu Asp Ala Pro Ala Gln Pro Gly Glu Gly Leu Glu
1760 1765 1770

Asn Ala Phe Asp Gly Asn Val Ser Ser Leu Trp His Thr Ser Trp
1775 1780 1785

Asn Gly Gly Asp Val Gly Lys Pro Ala Thr Met Val Leu Lys Glu
1790 1795 1800

Pro Thr Glu Ile Thr Gly Leu Arg Tyr Val Pro Arg Ala Ser Asp
1805 1810 1815

Ser Asn Gly Asn Leu Arg Asp Val Lys Leu Val Val Thr Asp Glu
1820 1825 1830

Ser Gly Lys Glu His Thr Phe Asn Val Thr Asp Trp Pro Asn Asn
1835 1840 1845

Asn Lys Pro Lys Asp Ile Asp Phe Gly Lys Thr Ile Lys Ala Lys
1850 1855 1860

Lys Ile Val Leu Thr Gly Thr Lys Thr Tyr Gly Asp Gly Gly Asp
1865 1870 1875

Lys Tyr Gln Ser Ala Ala Glu Leu Ile Phe Thr Arg Pro Gln Val
1880 1885 1890

Ala Glu Thr Pro Leu Asp Leu Ser Gly Tyr Glu Ala Ala Leu Ala
1895 1900 1905

Lys Ala Gln Lys Leu Thr Asp Lys Asp Asn Gln Glu Glu Val Ala
1910 1915 1920

Ser	Val	Gln	Ala	Ser	Met	Lys	Tyr	Ala	Thr	Asp	Asn	His	Leu	Leu
	1925					1930					1935			
Thr	Glu	Arg	Met	Val	Ala	Tyr	Phe	Ala	Asp	Tyr	Leu	Asn	Gln	Leu
	1940					1945					1950			
Lys	Asp	Ser	Ala	Thr	Lys	Pro	Asp	Ala	Pro	Thr	Ser	Ser	Lys	Gly
	1955					1960					1965			
Glu	Glu	Gln	Pro	Pro	Val	Leu	Asp	Val	Pro	Glu	Phe	Lys	Gly	Gly
	1970					1975					1980			
Val	Asn	Ala	Thr	Glu	Ala	Ala	Val	His	Glu	Val	Pro	Glu	Phe	Lys
	1985					1990					1995			
Gly	Gly	Val	Asn	Ala	Val	Gln	Ala	Leu	Val	His	Glu	Leu	Pro	Glu
	2000					2005					2010			
Tyr	Lys	Gly	Gly	Ala	Asn	Ala	Val	Leu	Ala	Ala	Ala	Asn	Glu	Val
	2015					2020					2025			
Pro	Glu	Tyr	Lys	Gly	Gly	Ala	Asn	Ala	Val	Glu	Ala	Leu	Val	Asn
	2030					2035					2040			
Glu	Lys	Pro	Ala	Tyr	Thr	Gly	Val	Leu	Ala	Thr	Ala	Gly	Asp	Gln
	2045					2050					2055			
Ala	Ala	Pro	Thr	Val	Glu	Lys	Pro	Glu	Tyr	Pro	Leu	Thr	Pro	Ser
	2060					2065					2070			
Pro	Val	Ala	Asp	Thr	Lys	Thr	Pro	Gly	Ala	Lys	Asp	Glu	Glu	Lys
	2075					2080					2085			
Leu	Pro	Ala	Thr	Gly	Glu	His	Ser	Ser	Glu	Val	Ala	Leu	Phe	Leu
	2090					2095					2100			
Ala	Ser	Val	Ser	Ile	Ala	Leu	Ser	Ala	Ala	Val	Leu	Ala	Thr	Lys
	2105					2110					2115			

Arg Lys Glu Glu
2120

<210> 8

<211> 2084

<212> PRT

<213> Streptococcus oralis

<400> 8

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Asp Leu Asp Lys Lys Ala Ser Asp Glu Gly His Asp Phe Asp Lys Glu
20 25 30

Ala Ala Ala Gln Asn Pro Gly Ser Ala Glu Thr Thr Glu Gly Pro Gln
35 40 45

Thr Glu Glu Glu Leu Leu Ala Gln Glu Lys Glu Lys Ser Glu Lys Pro
50 55 60

Ser Asn Leu Pro Lys Glu Leu Glu Asp Lys Leu Glu Lys Ala Glu Asp
65 70 75 80

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

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

Gly Ala Thr Val Lys Ile Lys Thr Pro Ser Gly Glu Gly Ser Gly Ile
115 120 125

Val Val Ala Lys Asp Leu Val Leu Thr Val Ser His Asn Phe Ile Lys
130 135 140

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

Asp Gly Asp Ile Tyr Ser Ile Ser Tyr Pro Gly Leu Pro Asp Val Lys
165 170 175

Phe Ser Lys Lys Asp Ile Ile His Trp Asp Arg Glu Gly Tyr Leu Lys
180 185 190

Gly Phe Lys Asn Asp Leu Ala Leu Val Arg Leu Arg Thr Val Leu Glu
195 200 205

Asn Thr Pro Val Glu Val Thr Lys Lys Pro Val Val Lys Lys Ile Gly
210 215 220

Asp Lys Leu His Val Phe Gly Tyr Pro Glu Gly Lys Leu Asn Pro Ile
225 230 235 240

Val Asn Thr Thr Val Asp Phe Ala Glu Pro Tyr Gly Glu Gly Val Gln
245 250 255

Gly Ile Gly Tyr Gln Gly Gly Lys Pro Gly Ala Ser Gly Gly Gly Ile
260 265 270

Phe Asp Thr Glu Gly Lys Leu Val Gly Val His Gln Asn Gly Val Val
275 280 285

Gly Lys Arg Ser Gly Gly Ile Leu Phe Ser Pro Ala Gln Leu Lys Trp
290 295 300

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

Glu Glu Lys Glu Lys Pro Ala Glu Glu Lys Pro Lys Glu Asp Lys Pro
325 330 335

Ala Ala Ala Lys Pro Glu Thr Pro Lys Ala Val Thr Pro Glu Trp Gln
340 345 350

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

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

Asp Gly Lys Pro Ala Leu Phe Glu Lys Gln Gly Leu Thr Val Asp Ala
 385 390 395 400

Asn Gly Asn Ala Thr Val Asp Leu Thr Phe Lys Asp Asp Ser Glu Lys
 405 410 415

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

Asn Val Phe Val Gly Tyr Asp Gln Gly Gly Trp Phe Trp Glu Tyr Lys
 435 440 445

Thr Pro Gly Asn Ser Thr Trp Tyr Lys Gly Asn Arg Val Ala Ala Pro
 450 455 460

Glu Pro Gly Ser Val Asn Arg Leu Ser Ile Thr Leu Lys Ser Asp Gly
 465 470 475 480

Gln Leu Asn Ala Ser Asn Asn Asp Val Asn Leu Phe Asp Thr Val Thr
 485 490 495

Leu Pro Gly Ala Val Asn Glu Asn Leu Lys Asn Glu Lys Lys Ile Leu
 500 505 510

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

Thr Asp Asn Gln Glu Gly Val Lys Ala Asp Asp Thr Pro Ala Gln Lys
 530 535 540

Glu Thr Gly Pro Ala Val Asp Asp Ser Lys Val Thr Tyr Asp Thr Ile
 545 550 555 560

Gln Ser Lys Val Leu Lys Ala Val Ile Asp Gln Ala Phe Pro Arg Val
 565 570 575

Lys Glu Tyr Thr Leu Asn Gly His Thr Leu Pro Gly Gln Val Gln Gln
 580 585 590

Phe Asn Gln Val Phe Ile Asn Asn His Arg Ile Thr Pro Glu Val Thr
 595 600 605

Tyr Lys Lys Ile Asn Glu Thr Thr Ala Glu Tyr Leu Met Lys Leu Arg
 610 615 620

Asp Asp Ala His Leu Ile Asn Ala Glu Met Thr Val Arg Leu Gln Val
 625 630 635 640

Val Asp Asn Gln Leu His Phe Asp Val Thr Lys Ile Val Asn His Asn
 645 650 655

Gln Val Thr Pro Gly Gln Lys Ile Asp Asp Glu Arg Lys Leu Leu Ser
 660 665 670

Thr Ile Ser Phe Leu Gly Asn Ala Leu Val Ser Val Ser Ser Asp Gln
 675 680 685

Ala Gly Ala Lys Phe Asp Gly Ala Thr Met Ser Asn Asn Thr His Val
 690 695 700

Ser Gly Asp Asp His Ile Asp Val Thr Asn Pro Met Lys Asp Leu Ala
 705 710 715 720

Lys Gly Tyr Met Tyr Gly Phe Val Ser Thr Asp Lys Leu Ala Ala Gly
 725 730 735

Val Trp Ser Asn Ser Gln Asn Ser Tyr Gly Gly Gly Ser Asn Asp Trp
 740 745 750

Thr Arg Leu Thr Ala Tyr Lys Glu Thr Val Gly Asn Ala Asn Tyr Val
 755 760 765

Gly Ile His Ser Ser Glu Trp Gln Trp Glu Lys Ala Tyr Lys Gly Ile
 770 775 780

Val Phe Pro Glu Tyr Thr Lys Glu Leu Pro Ser Ala Lys Val Val Ile
 785 790 795 800

Thr Glu Asp Ala Asn Ala Asp Asn Lys Val Asp Trp Gln Asp Gly Ala

805

810

815

Ile Ala Tyr Arg Ser Ile Met Asn Asn Pro Gln Gly Trp Glu Lys Val
 820 825 830

Lys Asp Ile Thr Ala Tyr Arg Ile Ala Met Asn Phe Gly Ser Gln Ala
 835 840 845

Gln Asn Pro Phe Leu Met Thr Leu Asp Gly Ile Lys Lys Ile Asn Leu
 850 855 860

His Thr Asp Gly Leu Gly Gln Gly Val Leu Leu Lys Gly Tyr Gly Ser
 865 870 875 880

Glu Gly His Asp Ser Gly His Leu Asn Tyr Ala Asp Ile Gly Lys Arg
 885 890 895

Ile Gly Gly Val Glu Asp Phe Lys Thr Leu Ile Glu Lys Ala Lys Lys
 900 905 910

Tyr Gly Ala His Leu Gly Ile His Val Asn Ala Ser Glu Thr Tyr Pro
 915 920 925

Glu Ser Lys Tyr Phe Asn Glu Asn Ile Leu Arg Lys Asn Pro Asp Gly
 930 935 940

Ser Tyr Ser Tyr Gly Trp Asn Trp Leu Asp Gln Gly Ile Asn Ile Asp
 945 950 955 960

Ala Ala Tyr Asp Leu Ala His Gly Arg Leu Ala Arg Trp Glu Asp Leu
 965 970 975

Lys Lys Lys Leu Gly Glu Gly Leu Asp Phe Ile Tyr Val Asp Val Trp
 980 985 990

Gly Asn Gly Gln Ser Gly Asp Asn Gly Ala Trp Ala Thr His Val Leu
 995 1000 1005

Ala Lys Glu Ile Asn Lys Gln Gly Trp Arg Phe Ala Ile Glu Trp
 1010 1015 1020

Gly His Gly Gly Glu Tyr Asp Ser Thr Phe Gln His Trp Ala Ala
 1025 1030 1035

Asp Leu Thr Tyr Gly Gly Tyr Thr Asn Lys Gly Ile Asn Ser Ala
 1040 1045 1050

Ile Thr Arg Phe Ile Arg Asn His Gln Lys Asp Ser Trp Val Gly
 1055 1060 1065

Asp Tyr Arg Ser Tyr Gly Gly Ala Ala Asn Tyr Pro Leu Leu Gly
 1070 1075 1080

Gly Tyr Ser Met Lys Asp Phe Glu Gly Trp Gln Gly Arg Ser Asp
 1085 1090 1095

Tyr Asn Gly Tyr Val Thr Asn Leu Phe Ala His Asp Val Met Thr
 1100 1105 1110

Lys Tyr Phe Gln His Phe Thr Val Ser Lys Trp Glu Asn Gly Thr
 1115 1120 1125

Pro Val Thr Met Thr Asp Asn Gly Ser Thr Tyr Lys Trp Thr Pro
 1130 1135 1140

Glu Met Lys Val Glu Leu Val Asp Ala Ala Gly Asn Lys Val Val
 1145 1150 1155

Val Thr Arg Lys Ser Asn Asp Val Asn Ser Pro Gln Tyr Arg Glu
 1160 1165 1170

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

Tyr Leu Thr Pro Trp Asn Trp Asp Ala Asn Gly Lys Lys Leu Pro
 1190 1195 1200

Thr Glu Lys Glu Lys Met Tyr Tyr Phe Asn Thr Gln Ala Gly Ala
 1205 1210 1215

Thr	Thr	Trp	Thr	Leu	Pro	Ser	Asp	Trp	Ala	Asn	Ser	Lys	Val	Tyr
1220						1225					1230			
Leu	Tyr	Lys	Leu	Thr	Asp	Gln	Gly	Lys	Thr	Glu	Glu	Gln	Glu	Leu
1235						1240					1245			
Thr	Val	Thr	Asp	Gly	Lys	Ile	Thr	Leu	Asp	Leu	Leu	Ala	Asn	Gln
1250						1255					1260			
Pro	Tyr	Val	Leu	Tyr	Arg	Ser	Lys	Gln	Thr	Asn	Pro	Glu	Met	Ser
1265						1270					1275			
Trp	Ser	Glu	Gly	Met	His	Ile	Tyr	Asp	Gln	Gly	Phe	Asn	Ser	Gly
1280						1285					1290			
Thr	Leu	Lys	His	Trp	Thr	Ile	Ser	Gly	Asp	Ala	Ser	Lys	Ala	Glu
1295						1300					1305			
Ile	Val	Lys	Ser	Gln	Gly	Ala	Asn	Glu	Met	Leu	Arg	Ile	Gln	Gly
1310						1315					1320			
Asn	Lys	Ser	Lys	Val	Ser	Leu	Thr	Gln	Lys	Leu	Thr	Gly	Leu	Lys
1325						1330					1335			
Pro	Asn	Thr	Lys	Tyr	Ala	Val	Tyr	Val	Gly	Val	Asp	Asn	Arg	Ser
1340						1345					1350			
Asn	Ala	Lys	Ala	Ser	Ile	Thr	Val	Asn	Thr	Gly	Glu	Lys	Glu	Val
1355						1360					1365			
Thr	Thr	Tyr	Thr	Asn	Lys	Ser	Leu	Ala	Leu	Asn	Tyr	Ile	Lys	Ala
1370						1375					1380			
Tyr	Ala	His	Asn	Asn	Arg	Arg	Glu	Asn	Ala	Thr	Val	Asp	Asp	Thr
1385						1390					1395			
Ser	Tyr	Phe	Gln	Asn	Met	Tyr	Ala	Phe	Phe	Thr	Thr	Gly	Ser	Asp
1400						1405					1410			

Val	Ser	Asn	Val	Thr	Leu	Thr	Leu	Ser	Arg	Glu	Ala	Gly	Asp	Glu
1415						1420					1425			
Ala	Thr	Tyr	Phe	Asp	Glu	Ile	Arg	Thr	Phe	Glu	Asn	Asn	Ser	Ser
1430						1435					1440			
Met	Tyr	Gly	Asp	Lys	His	Asp	Thr	Gly	Gln	Gly	Thr	Phe	Lys	Gln
1445						1450					1455			
Asp	Phe	Glu	Asn	Val	Ala	Gln	Gly	Ile	Phe	Pro	Phe	Val	Val	Gly
1460						1465					1470			
Gly	Val	Glu	Gly	Val	Glu	Asp	Asn	Arg	Thr	His	Leu	Ser	Glu	Lys
1475						1480					1485			
His	Asp	Pro	Tyr	Thr	Gln	Arg	Gly	Trp	Asn	Gly	Lys	Lys	Val	Asp
1490						1495					1500			
Asp	Val	Ile	Glu	Gly	Asn	Trp	Ser	Leu	Lys	Thr	Asn	Gly	Leu	Val
1505						1510					1515			
Ser	Arg	Arg	Asn	Leu	Val	Tyr	Gln	Thr	Ile	Pro	Gln	Asn	Phe	Arg
1520						1525					1530			
Phe	Glu	Ala	Gly	Lys	Thr	Tyr	Arg	Val	Thr	Phe	Glu	Tyr	Glu	Ala
1535						1540					1545			
Gly	Ser	Asp	Asn	Thr	Tyr	Ala	Phe	Val	Val	Gly	Lys	Gly	Glu	Phe
1550						1555					1560			
Gln	Ser	Gly	Arg	Arg	Gly	Thr	Gln	Ala	Ser	Asn	Leu	Glu	Met	His
1565						1570					1575			
Glu	Leu	Pro	Asn	Thr	Trp	Thr	Asp	Ser	Lys	Lys	Ala	Lys	Lys	Val
1580						1585					1590			
Thr	Phe	Leu	Val	Thr	Gly	Ala	Glu	Thr	Gly	Asp	Thr	Trp	Val	Gly
1595						1600					1605			
Ile	Tyr	Ser	Thr	Gly	Asn	Ala	Ser	Asn	Thr	Arg	Gly	Asp	Ala	Gly

1610						1615						1620			
Gly	Asn	Ala	Asn	Phe	Arg	Gly	Tyr	Asn	Asp	Phe	Met	Met	Asp	Asn	
1625						1630					1635				
Leu	Gln	Ile	Glu	Glu	Ile	Thr	Leu	Thr	Gly	Lys	Met	Leu	Thr	Glu	
1640						1645					1650				
Asn	Ala	Leu	Lys	Asn	Tyr	Leu	Pro	Thr	Val	Ala	Met	Thr	Asn	Tyr	
1655						1660					1665				
Thr	Lys	Glu	Ser	Met	Asp	Ala	Leu	Lys	Glu	Ala	Val	Phe	Asn	Leu	
1670						1675					1680				
Ser	Gln	Ala	Asp	Asp	Asp	Ile	Ser	Val	Glu	Glu	Ala	Arg	Ala	Glu	
1685						1690					1695				
Ile	Ala	Lys	Ile	Glu	Ala	Leu	Lys	Asn	Ala	Leu	Val	Gln	Lys	Lys	
1700						1705					1710				
Thr	Ala	Leu	Val	Ala	Glu	Asp	Phe	Glu	Ser	Leu	Asp	Ala	Pro	Ala	
1715						1720					1725				
Gln	Pro	Gly	Glu	Gly	Leu	Glu	Asn	Ala	Phe	Asp	Gly	Asn	Val	Ser	
1730						1735					1740				
Ser	Leu	Trp	His	Thr	Ser	Trp	Asn	Gly	Gly	Asp	Val	Gly	Lys	Pro	
1745						1750					1755				
Ala	Thr	Met	Val	Leu	Lys	Glu	Pro	Thr	Glu	Ile	Thr	Gly	Leu	Arg	
1760						1765					1770				
Tyr	Val	Pro	Arg	Ala	Ser	Asp	Ser	Asn	Gly	Asn	Leu	Arg	Asp	Val	
1775						1780					1785				
Lys	Leu	Val	Val	Thr	Asp	Glu	Ser	Gly	Lys	Glu	His	Thr	Phe	Asn	
1790						1795					1800				
Val	Thr	Asp	Trp	Pro	Asn	Asn	Asn	Lys	Pro	Lys	Asp	Ile	Asp	Phe	
1805						1810					1815				

Gly Lys Thr Ile Lys Ala Lys Lys Ile Val Leu Thr Gly Thr Lys
1820 1825 1830

Thr Tyr Gly Asp Gly Gly Asp Lys Tyr Gln Ser Ala Ala Glu Leu
1835 1840 1845

Ile Phe Thr Arg Pro Gln Val Ala Glu Thr Pro Leu Asp Leu Ser
1850 1855 1860

Gly Tyr Glu Ala Ala Leu Ala Lys Ala Gln Lys Leu Thr Asp Lys
1865 1870 1875

Asp Asn Gln Glu Glu Val Ala Ser Val Gln Ala Ser Met Lys Tyr
1880 1885 1890

Ala Thr Asp Asn His Leu Leu Thr Glu Arg Met Val Ala Tyr Phe
1895 1900 1905

Ala Asp Tyr Leu Asn Gln Leu Lys Asp Ser Ala Thr Lys Pro Asp
1910 1915 1920

Ala Pro Thr Ser Ser Lys Gly Glu Glu Gln Pro Pro Val Leu Asp
1925 1930 1935

Val Pro Glu Phe Lys Gly Gly Val Asn Ala Thr Glu Ala Ala Val
1940 1945 1950

His Glu Val Pro Glu Phe Lys Gly Gly Val Asn Ala Val Gln Ala
1955 1960 1965

Leu Val His Glu Leu Pro Glu Tyr Lys Gly Gly Ala Asn Ala Val
1970 1975 1980

Leu Ala Ala Ala Asn Glu Val Pro Glu Tyr Lys Gly Gly Ala Asn
1985 1990 1995

Ala Val Glu Ala Leu Val Asn Glu Lys Pro Ala Tyr Thr Gly Val
2000 2005 2010

Leu Ala Thr Ala Gly Asp Gln Ala Ala Pro Thr Val Glu Lys Pro
2015 2020 2025

Glu Tyr Pro Leu Thr Pro Ser Pro Val Ala Asp Thr Lys Thr Pro
2030 2035 2040

Gly Ala Lys Asp Glu Glu Lys Leu Pro Ala Thr Gly Glu His Ser
2045 2050 2055

Ser Glu Val Ala Leu Phe Leu Ala Ser Val Ser Ile Ala Leu Ser
2060 2065 2070

Ala Ala Val Leu Ala Thr Lys Arg Lys Glu Glu
2075 2080

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<213> Streptococcus oralis

<400> 9

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Asp Leu Asp Lys Lys Ala Ser Asp Glu Gly His Asp Phe Asp Lys Glu
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Ala Ala Ala Gln Asn Pro Gly Ser Ala Glu Thr Thr Glu Gly Pro Gln
35 40 45

Thr Glu Glu Glu Leu Leu Ala Gln Glu Lys Glu Lys Ser Glu Lys Pro
50 55 60

Ser Asn Leu Pro Lys Glu Leu Glu Asp Lys Leu Glu Lys Ala Glu Asp
65 70 75 80

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

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

100

105

110

Gly Ala Thr Val Lys Ile Lys Thr Pro Ser Gly Glu Gly Ser Gly Ile
 115 120 125

Val Val Ala Lys Asp Leu Val Leu Thr Val Ser His Asn Phe Ile Lys
 130 135 140

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

Asp Gly Asp Ile Tyr Ser Ile Ser Tyr Pro Gly Leu Pro Asp Val Lys
 165 170 175

Phe Ser Lys Lys Asp Ile Ile His Trp Asp Arg Glu Gly Tyr Leu Lys
 180 185 190

Gly Phe Lys Asn Asp Leu Ala Leu Val Arg Leu Arg Thr Val Leu Glu
 195 200 205

Asn Thr Pro Val Glu Val Thr Lys Lys Pro Val Val Lys Lys Ile Gly
 210 215 220

Asp Lys Leu His Val Phe Gly Tyr Pro Glu Gly Lys Leu Asn Pro Ile
 225 230 235 240

Val Asn Thr Thr Val Asp Phe Ala Glu Pro Tyr Gly Glu Gly Val Gln
 245 250 255

Gly Ile Gly Tyr Gln Gly Gly Lys Pro Gly Ala Ser Gly Gly Gly Ile
 260 265 270

Phe Asp Thr Glu Gly Lys Leu Val Gly Val His Gln Asn Gly Val Val
 275 280 285

Gly Lys Arg Ser Gly Gly Ile Leu Phe Ser Pro Ala Gln Leu Lys Trp
 290 295 300

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

Glu Glu Lys Glu Lys Pro Ala Glu Glu Lys Pro Lys Glu Asp Lys Pro
 325 330 335

Ala Ala Ala Lys Pro Glu Thr Pro Lys Ala Val Thr Pro Glu Trp Gln
 340 345 350

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

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

Asp Gly Lys Pro Ala Leu Phe Glu Lys Gln Gly Leu Thr Val Asp Ala
 385 390 395 400

Asn Gly Asn Ala Thr Val Asp Leu Thr Phe Lys Asp Asp Ser Glu Lys
 405 410 415

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

Asn Val Phe Val Gly Tyr Asp Gln Gly Gly Trp Phe Trp Glu Tyr Lys
 435 440 445

Thr Pro Gly Asn Ser Thr Trp Tyr Lys Gly Asn Arg Val Ala Ala Pro
 450 455 460

Glu Pro Gly Ser Val Asn Arg Leu Ser Ile Thr Leu Lys Ser Asp Gly
 465 470 475 480

Gln Leu Asn Ala Ser Asn Asn Asp Val Asn Leu Phe Asp Thr Val Thr
 485 490 495

Leu Pro Gly Ala Val Asn Glu Asn Leu Lys Asn Glu Lys Lys Ile Leu
 500 505 510

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

Thr Asp Asn Gln Glu Gly Val Lys Ala Asp Asp Thr Pro Ala Gln Lys
 530 535 540

Glu Thr Gly Pro Ala Val Asp Asp Ser Lys Val Thr Tyr Asp Thr Ile
 545 550 555 560

Gln Ser Lys Val Leu Lys Ala Val Ile Asp Gln Ala Phe Pro Arg Val
 565 570 575

Lys Glu Tyr Thr Leu Asn Gly His Thr Leu Pro Gly Gln Val Gln Gln
 580 585 590

Phe Asn Gln Val Phe Ile Asn Asn His Arg Ile Thr Pro Glu Val Thr
 595 600 605

Tyr Lys Lys Ile Asn Glu Thr Thr Ala Glu Tyr Leu Met Lys Leu Arg
 610 615 620

Asp Asp Ala His Leu Ile Asn Ala Glu Met Thr Val Arg Leu Gln Val
 625 630 635 640

Val Asp Asn Gln Leu His Phe Asp Val Thr Lys Ile Val Asn His Asn
 645 650 655

Gln Val Thr Pro Gly Gln Lys Ile Asp Asp Glu Arg Lys Leu Leu Ser
 660 665 670

Thr Ile Ser Phe Leu Gly Asn Ala Leu Val Ser Val Ser Ser Asp Gln
 675 680 685

Ala Gly Ala Lys Phe Asp Gly Ala Thr Met Ser Asn Asn Thr His Val
 690 695 700

Ser Gly Asp Asp His Ile Asp Val Thr Asn Pro Met Lys Asp Leu Ala
 705 710 715 720

Lys Gly Tyr Met Tyr Gly Phe Val Ser Thr Asp Lys Leu Ala Ala Gly
 725 730 735

Val Trp Ser Asn Ser Gln Asn Ser Tyr Gly Gly Gly Ser Asn Asp Trp
 740 745 750

Thr Arg Leu Thr Ala Tyr Lys Glu Thr Val Gly Asn Ala Asn Tyr Val
 755 760 765

Gly Ile His Ser Ser Glu Trp Gln Trp Glu Lys Ala Tyr Lys Gly Ile
 770 775 780

Val Phe Pro Glu Tyr Thr Lys Glu Leu Pro Ser Ala Lys Val Val Ile
 785 790 795 800

Thr Glu Asp Ala Asn Ala Asp Asn Lys Val Asp Trp Gln Asp Gly Ala
 805 810 815

Ile Ala Tyr Arg Ser Ile Met Asn Asn Pro Gln Gly Trp Glu Lys Val
 820 825 830

Lys Asp Ile Thr Ala Tyr Arg Ile Ala Met Asn Phe Gly Ser Gln Ala
 835 840 845

Gln Asn Pro Phe Leu Met Thr Leu Asp Gly Ile Lys Lys Ile Asn Leu
 850 855 860

His Thr Asp Gly Leu Gly Gln Gly Val Leu Leu Lys Gly Tyr Gly Ser
 865 870 875 880

Glu Gly His Asp Ser Gly His Leu Asn Tyr Ala Asp Ile Gly Lys Arg
 885 890 895

Ile Gly Gly Val Glu Asp Phe Lys Thr Leu Ile Glu Lys Ala Lys Lys
 900 905 910

Tyr Gly Ala His Leu Gly Ile His Val Asn Ala Ser Glu Thr Tyr Pro
 915 920 925

Glu Ser Lys Tyr Phe Asn Glu Asn Ile Leu Arg Lys Asn Pro Asp Gly
 930 935 940

Ser Tyr Ser Tyr Gly Trp Asn Trp Leu Asp Gln Gly Ile Asn Ile Asp

945		950		955		960									
Ala	Ala	Tyr	Asp	Leu	Ala	His	Gly	Arg	Leu	Ala	Arg	Trp	Glu	Asp	Leu
			965						970					975	
Lys	Lys	Lys	Leu	Gly	Glu	Gly	Leu	Asp	Phe	Ile	Tyr	Val	Asp	Val	Trp
			980					985					990		
Gly	Asn	Gly	Gln	Ser	Gly	Asp	Asn	Gly	Ala	Trp	Ala	Thr	His	Val	Leu
		995					1000					1005			
Ala	Lys	Glu	Ile	Asn	Lys	Gln	Gly	Trp	Arg	Phe	Ala	Ile	Glu	Trp	
	1010					1015					1020				
Gly	His	Gly	Gly	Glu	Tyr	Asp	Ser	Thr	Phe	Gln	His	Trp	Ala	Ala	
	1025					1030					1035				
Asp	Leu	Thr	Tyr	Gly	Gly	Tyr	Thr	Asn	Lys	Gly	Ile	Asn	Ser	Ala	
	1040					1045					1050				
Ile	Thr	Arg	Phe	Ile	Arg	Asn	His	Gln	Lys	Asp	Ser	Trp	Val	Gly	
	1055					1060					1065				
Asp	Tyr	Arg	Ser	Tyr	Gly	Gly	Ala	Ala	Asn	Tyr	Pro	Leu	Leu	Gly	
	1070					1075					1080				
Gly	Tyr	Ser	Met	Lys	Asp	Phe	Glu	Gly	Trp	Gln	Gly	Arg	Ser	Asp	
	1085					1090					1095				
Tyr	Asn	Gly	Tyr	Val	Thr	Asn	Leu	Phe	Ala	His	Asp	Val	Met	Thr	
	1100					1105					1110				
Lys	Tyr	Phe	Gln	His	Phe	Thr	Val	Ser	Lys	Trp	Glu	Asn	Gly	Thr	
	1115					1120					1125				
Pro	Val	Thr	Met	Thr	Asp	Asn	Gly	Ser	Thr	Tyr	Lys	Trp	Thr	Pro	
	1130					1135					1140				
Glu	Met	Lys	Val	Glu	Leu	Val	Asp	Ala	Ala	Gly	Asn	Lys	Val	Val	
	1145					1150					1155				

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

Asn Ala Lys Ala Ser Ile Thr Val Asn Thr Gly Glu Lys Glu Val
 1355 1360 1365

Thr Thr Tyr Thr Asn Lys Ser Leu Ala Leu Asn Tyr Ile Lys Ala
 1370 1375 1380

Tyr Ala His Asn Asn Arg Arg Glu Asn Ala Thr Val Asp Asp Thr
 1385 1390 1395

Ser Tyr Phe Gln Asn Met Tyr Ala Phe Phe Thr Thr Gly Ser Asp
 1400 1405 1410

Val Ser Asn Val Thr Leu Thr Leu Ser Arg Glu Ala Gly Asp Glu
 1415 1420 1425

Ala Thr Tyr Phe Asp Glu Ile Arg Thr Phe Glu Asn Asn Ser Ser
 1430 1435 1440

Met Tyr Gly Asp Lys His Asp Thr Gly Gln Gly Thr Phe Lys Gln
 1445 1450 1455

Asp Phe Glu Asn Val Ala Gln Gly Ile Phe Pro Phe Val Val Gly
 1460 1465 1470

Gly Val Glu Gly Val Glu Asp Asn Arg Thr His Leu Ser Glu Lys
 1475 1480 1485

His Asp Pro Tyr Thr Gln Arg Gly Trp Asn Gly Lys Lys Val Asp
 1490 1495 1500

Asp Val Ile Glu Gly Asn Trp Ser Leu Lys Thr Asn Gly Leu Val
 1505 1510 1515

Ser Arg Arg Asn Leu Val Tyr Gln Thr Ile Pro Gln Asn Phe Arg
 1520 1525 1530

Phe Glu Ala Gly Lys Thr Tyr Arg Val Thr Phe Glu Tyr Glu Ala
 1535 1540 1545

Gly Ser Asp Asn Thr Tyr Ala Phe Val Val Gly Lys Gly Glu Phe
 1550 1555 1560

Gln Ser Gly Arg Arg Gly Thr Gln Ala Ser Asn Leu Glu Met His
 1565 1570 1575

Glu Leu Pro Asn Thr Trp Thr Asp Ser Lys Lys Ala Lys Lys Val
 1580 1585 1590

Thr Phe Leu Val Thr Gly Ala Glu Thr Gly Asp Thr Trp Val Gly
 1595 1600 1605

Ile Tyr Ser Thr Gly Asn Ala Ser Asn Thr Arg Gly Asp Ala Gly
 1610 1615 1620

Gly Asn Ala Asn Phe Arg Gly Tyr Asn Asp Phe Met Met Asp Asn
 1625 1630 1635

Leu Gln Ile Glu Glu Ile Thr Leu Thr Gly Lys Met Leu Thr Glu
 1640 1645 1650

Asn Ala Leu Lys Asn Tyr Leu Pro Thr Val Ala Met Thr Asn Tyr
 1655 1660 1665

Thr Lys Glu Ser Met Asp Ala Leu Lys Glu Ala Val Phe Asn Leu
 1670 1675 1680

Ser Gln Ala Asp Asp Asp Ile Ser Val Glu Glu Ala Arg Ala Glu
 1685 1690 1695

Ile Ala Lys Ile Glu Ala Leu Lys Asn Ala Leu Val Gln Lys Lys
 1700 1705 1710

Thr Ala Leu Val Ala Glu Asp Phe Glu Ser Leu Asp Ala Pro Ala
 1715 1720 1725

Gln Pro Gly Glu Gly Leu Glu Asn Ala Phe Asp Gly Asn Val Ser
 1730 1735 1740

Ser Leu Trp His Thr Ser Trp Asn Gly Gly Asp Val Gly Lys Pro

1745						1750						1755			
Ala	Thr	Met	Val	Leu	Lys	Glu	Pro	Thr	Glu	Ile	Thr	Gly	Leu	Arg	
1760						1765					1770				
Tyr	Val	Pro	Arg	Ala	Ser	Asp	Ser	Asn	Gly	Asn	Leu	Arg	Asp	Val	
1775						1780					1785				
Lys	Leu	Val	Val	Thr	Asp	Glu	Ser	Gly	Lys	Glu	His	Thr	Phe	Asn	
1790						1795					1800				
Val	Thr	Asp	Trp	Pro	Asn	Asn	Asn	Lys	Pro	Lys	Asp	Ile	Asp	Phe	
1805						1810					1815				
Gly	Lys	Thr	Ile	Lys	Ala	Lys	Lys	Ile	Val	Leu	Thr	Gly	Thr	Lys	
1820						1825					1830				
Thr	Tyr	Gly	Asp	Gly	Gly	Asp	Lys	Tyr	Gln	Ser	Ala	Ala	Glu	Leu	
1835						1840					1845				
Ile	Phe	Thr	Arg	Pro	Gln	Val	Ala	Glu	Thr	Pro	Leu	Asp	Leu	Ser	
1850						1855					1860				
Gly	Tyr	Glu	Ala	Ala	Leu	Ala	Lys	Ala	Gln	Lys	Leu	Thr	Asp	Lys	
1865						1870					1875				
Asp	Asn	Gln	Glu	Glu	Val	Ala	Ser	Val	Gln	Ala	Ser	Met	Lys	Tyr	
1880						1885					1890				
Ala	Thr	Asp	Asn	His	Leu	Leu	Thr	Glu	Arg	Met	Val	Ala	Tyr	Phe	
1895						1900					1905				
Ala	Asp	Tyr	Leu	Asn	Gln	Leu	Lys	Asp	Ser	Ala	Thr	Lys	Pro	Asp	
1910						1915					1920				
Ala	Pro	Thr	Ser	Ser	Lys	Gly	Glu	Glu	Gln	Pro	Pro	Val	Leu	Asp	
1925						1930					1935				
Val	Pro	Glu	Phe	Lys	Gly	Gly	Val	Asn	Ala	Thr	Glu	Ala	Ala	Val	
1940						1945					1950				

His Glu Val Pro Glu Phe Lys Gly Gly Val Asn Ala Val Gln Ala
1955 1960 1965

Leu Val His Glu Leu Pro Glu Tyr Lys Gly Gly Ala Asn Ala Val
1970 1975 1980

Leu Ala Ala Ala Asn Glu Val Pro Glu Tyr Lys Gly Gly Ala Asn
1985 1990 1995

Ala Val Glu Ala Leu Val Asn Glu Lys Pro Ala Tyr Thr Gly Val
2000 2005 2010

Leu Ala Thr Ala Gly Asp Gln Ala Ala Pro Thr Val Glu Lys Pro
2015 2020 2025

Glu Tyr Pro Leu Thr Pro Ser Pro Val Ala Asp Thr Lys Thr Pro
2030 2035 2040

Gly Ala Lys Asp Glu Glu Lys Leu Pro Ala
2045 2050

<210> 10

<211> 2065

<212> PRT

<213> Artificial Sequence

<220>

<223> O-glycosidase from *S. oralis* with additional N terminal Met, C terminal GSGLE-His6tag, and signal sequence and C terminal element of LPXTG cell wall anchor motif removed

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Met Asp Gln Ala Arg Val Gly Ser Thr Asp Asn Leu Pro Ser Glu Leu
1 5 10 15

Ala Asp Leu Asp Lys Lys Ala Ser Asp Glu Gly His Asp Phe Asp Lys
20 25 30

Glu Ala Ala Ala Gln Asn Pro Gly Ser Ala Glu Thr Thr Glu Gly Pro
35 40 45

Gln Thr Glu Glu Glu Leu Leu Ala Gln Glu Lys Glu Lys Ser Glu Lys
50 55 60

Pro Ser Asn Leu Pro Lys Glu Leu Glu Asp Lys Leu Glu Lys Ala Glu
65 70 75 80

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

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

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

Ile Val Val Ala Lys Asp Leu Val Leu Thr Val Ser His Asn Phe Ile
130 135 140

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

Gly Asp Gly Asp Ile Tyr Ser Ile Ser Tyr Pro Gly Leu Pro Asp Val
165 170 175

Lys Phe Ser Lys Lys Asp Ile Ile His Trp Asp Arg Glu Gly Tyr Leu
180 185 190

Lys Gly Phe Lys Asn Asp Leu Ala Leu Val Arg Leu Arg Thr Val Leu
195 200 205

Glu Asn Thr Pro Val Glu Val Thr Lys Lys Pro Val Val Lys Lys Ile
210 215 220

Gly Asp Lys Leu His Val Phe Gly Tyr Pro Glu Gly Lys Leu Asn Pro
225 230 235 240

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

Gln Gly Ile Gly Tyr Gln Gly Gly Lys Pro Gly Ala Ser Gly Gly Gly
 260 265 270

Ile Phe Asp Thr Glu Gly Lys Leu Val Gly Val His Gln Asn Gly Val
 275 280 285

Val Gly Lys Arg Ser Gly Gly Ile Leu Phe Ser Pro Ala Gln Leu Lys
 290 295 300

Trp Ile Gln Asp His Met Gln Gly Ile Ser Ser Val Lys Pro Ala Asp
 305 310 315 320

Leu Glu Glu Lys Glu Lys Pro Ala Glu Glu Lys Pro Lys Glu Asp Lys
 325 330 335

Pro Ala Ala Ala Lys Pro Glu Thr Pro Lys Ala Val Thr Pro Glu Trp
 340 345 350

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

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

Asn Asp Gly Lys Pro Ala Leu Phe Glu Lys Gln Gly Leu Thr Val Asp
 385 390 395 400

Ala Asn Gly Asn Ala Thr Val Asp Leu Thr Phe Lys Asp Asp Ser Glu
 405 410 415

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

Asn Asn Val Phe Val Gly Tyr Asp Gln Gly Gly Trp Phe Trp Glu Tyr
 435 440 445

Lys Thr Pro Gly Asn Ser Thr Trp Tyr Lys Gly Asn Arg Val Ala Ala
 450 455 460

Pro Glu Pro Gly Ser Val Asn Arg Leu Ser Ile Thr Leu Lys Ser Asp

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

Gln Ala Gly Ala Lys Phe Asp Gly Ala Thr Met Ser Asn Asn Thr His
 690 695 700

Val Ser Gly Asp Asp His Ile Asp Val Thr Asn Pro Met Lys Asp Leu
 705 710 715 720

Ala Lys Gly Tyr Met Tyr Gly Phe Val Ser Thr Asp Lys Leu Ala Ala
 725 730 735

Gly Val Trp Ser Asn Ser Gln Asn Ser Tyr Gly Gly Gly Ser Asn Asp
 740 745 750

Trp Thr Arg Leu Thr Ala Tyr Lys Glu Thr Val Gly Asn Ala Asn Tyr
 755 760 765

Val Gly Ile His Ser Ser Glu Trp Gln Trp Glu Lys Ala Tyr Lys Gly
 770 775 780

Ile Val Phe Pro Glu Tyr Thr Lys Glu Leu Pro Ser Ala Lys Val Val
 785 790 795 800

Ile Thr Glu Asp Ala Asn Ala Asp Asn Lys Val Asp Trp Gln Asp Gly
 805 810 815

Ala Ile Ala Tyr Arg Ser Ile Met Asn Asn Pro Gln Gly Trp Glu Lys
 820 825 830

Val Lys Asp Ile Thr Ala Tyr Arg Ile Ala Met Asn Phe Gly Ser Gln
 835 840 845

Ala Gln Asn Pro Phe Leu Met Thr Leu Asp Gly Ile Lys Lys Ile Asn
 850 855 860

Leu His Thr Asp Gly Leu Gly Gln Gly Val Leu Leu Lys Gly Tyr Gly
 865 870 875 880

Ser Glu Gly His Asp Ser Gly His Leu Asn Tyr Ala Asp Ile Gly Lys
 885 890 895

Arg Ile Gly Gly Val Glu Asp Phe Lys Thr Leu Ile Glu Lys Ala Lys
900 905 910

Lys Tyr Gly Ala His Leu Gly Ile His Val Asn Ala Ser Glu Thr Tyr
915 920 925

Pro Glu Ser Lys Tyr Phe Asn Glu Asn Ile Leu Arg Lys Asn Pro Asp
930 935 940

Gly Ser Tyr Ser Tyr Gly Trp Asn Trp Leu Asp Gln Gly Ile Asn Ile
945 950 955 960

Asp Ala Ala Tyr Asp Leu Ala His Gly Arg Leu Ala Arg Trp Glu Asp
965 970 975

Leu Lys Lys Lys Leu Gly Glu Gly Leu Asp Phe Ile Tyr Val Asp Val
980 985 990

Trp Gly Asn Gly Gln Ser Gly Asp Asn Gly Ala Trp Ala Thr His Val
995 1000 1005

Leu Ala Lys Glu Ile Asn Lys Gln Gly Trp Arg Phe Ala Ile Glu
1010 1015 1020

Trp Gly His Gly Gly Glu Tyr Asp Ser Thr Phe Gln His Trp Ala
1025 1030 1035

Ala Asp Leu Thr Tyr Gly Gly Tyr Thr Asn Lys Gly Ile Asn Ser
1040 1045 1050

Ala Ile Thr Arg Phe Ile Arg Asn His Gln Lys Asp Ser Trp Val
1055 1060 1065

Gly Asp Tyr Arg Ser Tyr Gly Gly Ala Ala Asn Tyr Pro Leu Leu
1070 1075 1080

Gly Gly Tyr Ser Met Lys Asp Phe Glu Gly Trp Gln Gly Arg Ser
1085 1090 1095

Asp Tyr Asn Gly Tyr Val Thr Asn Leu Phe Ala His Asp Val Met
 1100 1105 1110

Thr Lys Tyr Phe Gln His Phe Thr Val Ser Lys Trp Glu Asn Gly
 1115 1120 1125

Thr Pro Val Thr Met Thr Asp Asn Gly Ser Thr Tyr Lys Trp Thr
 1130 1135 1140

Pro Glu Met Lys Val Glu Leu Val Asp Ala Ala Gly Asn Lys Val
 1145 1150 1155

Val Val Thr Arg Lys Ser Asn Asp Val Asn Ser Pro Gln Tyr Arg
 1160 1165 1170

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

Ala Tyr Leu Thr Pro Trp Asn Trp Asp Ala Asn Gly Lys Lys Leu
 1190 1195 1200

Pro Thr Glu Lys Glu Lys Met Tyr Tyr Phe Asn Thr Gln Ala Gly
 1205 1210 1215

Ala Thr Thr Trp Thr Leu Pro Ser Asp Trp Ala Asn Ser Lys Val
 1220 1225 1230

Tyr Leu Tyr Lys Leu Thr Asp Gln Gly Lys Thr Glu Glu Gln Glu
 1235 1240 1245

Leu Thr Val Thr Asp Gly Lys Ile Thr Leu Asp Leu Leu Ala Asn
 1250 1255 1260

Gln Pro Tyr Val Leu Tyr Arg Ser Lys Gln Thr Asn Pro Glu Met
 1265 1270 1275

Ser Trp Ser Glu Gly Met His Ile Tyr Asp Gln Gly Phe Asn Ser
 1280 1285 1290

Gly Thr Leu Lys His Trp Thr Ile Ser Gly Asp Ala Ser Lys Ala

1295

1300

1305

Glu Ile Val Lys Ser Gln Gly Ala Asn Glu Met Leu Arg Ile Gln
 1310 1315 1320

Gly Asn Lys Ser Lys Val Ser Leu Thr Gln Lys Leu Thr Gly Leu
 1325 1330 1335

Lys Pro Asn Thr Lys Tyr Ala Val Tyr Val Gly Val Asp Asn Arg
 1340 1345 1350

Ser Asn Ala Lys Ala Ser Ile Thr Val Asn Thr Gly Glu Lys Glu
 1355 1360 1365

Val Thr Thr Tyr Thr Asn Lys Ser Leu Ala Leu Asn Tyr Ile Lys
 1370 1375 1380

Ala Tyr Ala His Asn Asn Arg Arg Glu Asn Ala Thr Val Asp Asp
 1385 1390 1395

Thr Ser Tyr Phe Gln Asn Met Tyr Ala Phe Phe Thr Thr Gly Ser
 1400 1405 1410

Asp Val Ser Asn Val Thr Leu Thr Leu Ser Arg Glu Ala Gly Asp
 1415 1420 1425

Glu Ala Thr Tyr Phe Asp Glu Ile Arg Thr Phe Glu Asn Asn Ser
 1430 1435 1440

Ser Met Tyr Gly Asp Lys His Asp Thr Gly Gln Gly Thr Phe Lys
 1445 1450 1455

Gln Asp Phe Glu Asn Val Ala Gln Gly Ile Phe Pro Phe Val Val
 1460 1465 1470

Gly Gly Val Glu Gly Val Glu Asp Asn Arg Thr His Leu Ser Glu
 1475 1480 1485

Lys His Asp Pro Tyr Thr Gln Arg Gly Trp Asn Gly Lys Lys Val
 1490 1495 1500

Asp	Asp	Val	Ile	Glu	Gly	Asn	Trp	Ser	Leu	Lys	Thr	Asn	Gly	Leu
1505						1510					1515			
Val	Ser	Arg	Arg	Asn	Leu	Val	Tyr	Gln	Thr	Ile	Pro	Gln	Asn	Phe
1520						1525					1530			
Arg	Phe	Glu	Ala	Gly	Lys	Thr	Tyr	Arg	Val	Thr	Phe	Glu	Tyr	Glu
1535						1540					1545			
Ala	Gly	Ser	Asp	Asn	Thr	Tyr	Ala	Phe	Val	Val	Gly	Lys	Gly	Glu
1550						1555					1560			
Phe	Gln	Ser	Gly	Arg	Arg	Gly	Thr	Gln	Ala	Ser	Asn	Leu	Glu	Met
1565						1570					1575			
His	Glu	Leu	Pro	Asn	Thr	Trp	Thr	Asp	Ser	Lys	Lys	Ala	Lys	Lys
1580						1585					1590			
Val	Thr	Phe	Leu	Val	Thr	Gly	Ala	Glu	Thr	Gly	Asp	Thr	Trp	Val
1595						1600					1605			
Gly	Ile	Tyr	Ser	Thr	Gly	Asn	Ala	Ser	Asn	Thr	Arg	Gly	Asp	Ala
1610						1615					1620			
Gly	Gly	Asn	Ala	Asn	Phe	Arg	Gly	Tyr	Asn	Asp	Phe	Met	Met	Asp
1625						1630					1635			
Asn	Leu	Gln	Ile	Glu	Glu	Ile	Thr	Leu	Thr	Gly	Lys	Met	Leu	Thr
1640						1645					1650			
Glu	Asn	Ala	Leu	Lys	Asn	Tyr	Leu	Pro	Thr	Val	Ala	Met	Thr	Asn
1655						1660					1665			
Tyr	Thr	Lys	Glu	Ser	Met	Asp	Ala	Leu	Lys	Glu	Ala	Val	Phe	Asn
1670						1675					1680			
Leu	Ser	Gln	Ala	Asp	Asp	Asp	Ile	Ser	Val	Glu	Glu	Ala	Arg	Ala
1685						1690					1695			

Glu Ile Ala Lys Ile Glu Ala Leu Lys Asn Ala Leu Val Gln Lys
1700 1705 1710

Lys Thr Ala Leu Val Ala Glu Asp Phe Glu Ser Leu Asp Ala Pro
1715 1720 1725

Ala Gln Pro Gly Glu Gly Leu Glu Asn Ala Phe Asp Gly Asn Val
1730 1735 1740

Ser Ser Leu Trp His Thr Ser Trp Asn Gly Gly Asp Val Gly Lys
1745 1750 1755

Pro Ala Thr Met Val Leu Lys Glu Pro Thr Glu Ile Thr Gly Leu
1760 1765 1770

Arg Tyr Val Pro Arg Ala Ser Asp Ser Asn Gly Asn Leu Arg Asp
1775 1780 1785

Val Lys Leu Val Val Thr Asp Glu Ser Gly Lys Glu His Thr Phe
1790 1795 1800

Asn Val Thr Asp Trp Pro Asn Asn Asn Lys Pro Lys Asp Ile Asp
1805 1810 1815

Phe Gly Lys Thr Ile Lys Ala Lys Lys Ile Val Leu Thr Gly Thr
1820 1825 1830

Lys Thr Tyr Gly Asp Gly Gly Asp Lys Tyr Gln Ser Ala Ala Glu
1835 1840 1845

Leu Ile Phe Thr Arg Pro Gln Val Ala Glu Thr Pro Leu Asp Leu
1850 1855 1860

Ser Gly Tyr Glu Ala Ala Leu Ala Lys Ala Gln Lys Leu Thr Asp
1865 1870 1875

Lys Asp Asn Gln Glu Glu Val Ala Ser Val Gln Ala Ser Met Lys
1880 1885 1890

Tyr Ala Thr Asp Asn His Leu Leu Thr Glu Arg Met Val Ala Tyr
1895 1900 1905

Phe Ala Asp Tyr Leu Asn Gln Leu Lys Asp Ser Ala Thr Lys Pro
1910 1915 1920

Asp Ala Pro Thr Ser Ser Lys Gly Glu Glu Gln Pro Pro Val Leu
1925 1930 1935

Asp Val Pro Glu Phe Lys Gly Gly Val Asn Ala Thr Glu Ala Ala
1940 1945 1950

Val His Glu Val Pro Glu Phe Lys Gly Gly Val Asn Ala Val Gln
1955 1960 1965

Ala Leu Val His Glu Leu Pro Glu Tyr Lys Gly Gly Ala Asn Ala
1970 1975 1980

Val Leu Ala Ala Ala Asn Glu Val Pro Glu Tyr Lys Gly Gly Ala
1985 1990 1995

Asn Ala Val Glu Ala Leu Val Asn Glu Lys Pro Ala Tyr Thr Gly
2000 2005 2010

Val Leu Ala Thr Ala Gly Asp Gln Ala Ala Pro Thr Val Glu Lys
2015 2020 2025

Pro Glu Tyr Pro Leu Thr Pro Ser Pro Val Ala Asp Thr Lys Thr
2030 2035 2040

Pro Gly Ala Lys Asp Glu Glu Lys Leu Pro Ala Gly Ser Gly Leu
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Glu His His His His His His
2060 2065

<210> 11

<211> 361

<212> PRT

<213> Akkermansia muciniphila

<400> 11

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 20 25 30

Pro Val Pro Asp Tyr Glu Arg Arg Leu Ser Glu Leu Leu Tyr Leu
 35 40 45

Gln Gln Phe Tyr Gly Lys Glu Met Gln Arg His Gly Tyr Gly Ala Arg
 50 55 60

Ser Phe Gly Leu Asp Ile Lys Ser Pro Gly Arg Val Asn Ile Ile Glu
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Tyr Lys Ala Lys Asn Pro Ala Ala His Tyr Pro Tyr Glu Asn Gly Gly
 85 90 95

Gly Trp Lys Ala Ala Gln Glu Leu Asp Glu Phe Phe Lys Ala His Pro
 100 105 110

Asp Arg Lys Lys Ser Gln His Thr Leu Ile Ile Met Pro Thr Trp Asn
 115 120 125

Asp Glu Lys Asn Gly Pro Asp Asn Pro Gly Gly Val Pro Phe Tyr Gly
 130 135 140

Met Gly Arg Asn Cys Phe Ala Leu Asp Tyr Pro Ala Phe Asp Ile Lys
 145 150 155 160

His Leu Gly Gln Lys Thr Arg Glu Gly Arg Leu Leu Thr Lys Trp Tyr
 165 170 175

Gly Gly Met Ala His Glu Leu Gly His Gly Leu Asn Leu Pro His Asn
 180 185 190

His Gln Thr Ala Ser Asp Gly Lys Lys Tyr Gly Thr Ala Leu Met Gly
 195 200 205

Ser Gly Asn Tyr Thr Phe Gly Thr Ser Pro Thr Phe Leu Thr Pro Ala
 210 215 220

Ser Cys Ala Leu Leu Asp Ala Cys Glu Val Phe Ser Val Thr Pro Ser
 225 230 235 240

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

Ile Ser Phe Lys Gly Asp Gln Ile Leu Val Ser Gly Asn Tyr Lys Ser
 260 265 270

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

Ala Val Asn Gln Asp Tyr Asp Ala Val Ser Phe Ser Arg Arg Leu Gly
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Lys Lys Ser Gly Lys Phe Ser Met Lys Ile Asp Lys Lys Glu Leu Glu
 305 310 315 320

Gly Leu Asn Asn Asn Glu Phe Arg Ile Ser Leu Met Phe Ile Leu Ala
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Asn Gly Leu His Met Gln Lys His Phe Thr Phe His Trp Asp Ala Leu
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Gln Asp Tyr Arg Asp Gly Ser Lys Ser
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 <211> 371
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<220>
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Lys Thr Ala Arg Gln Leu Asn Ile Val Tyr Phe Leu Gly Ser Asp Thr
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Glu Pro Val Pro Asp Tyr Glu Arg Arg Leu Ser Glu Leu Leu Leu Tyr
35 40 45

Leu Gln Gln Phe Tyr Gly Lys Glu Met Gln Arg His Gly Tyr Gly Ala
50 55 60

Arg Ser Phe Gly Leu Asp Ile Lys Ser Pro Gly Arg Val Asn Ile Ile
65 70 75 80

Glu Tyr Lys Ala Lys Asn Pro Ala Ala His Tyr Pro Tyr Glu Asn Gly
85 90 95

Gly Gly Trp Lys Ala Ala Gln Glu Leu Asp Glu Phe Phe Lys Ala His
100 105 110

Pro Asp Arg Lys Lys Ser Gln His Thr Leu Ile Ile Met Pro Thr Trp
115 120 125

Asn Asp Glu Lys Asn Gly Pro Asp Asn Pro Gly Gly Val Pro Phe Tyr
130 135 140

Gly Met Gly Arg Asn Cys Phe Ala Leu Asp Tyr Pro Ala Phe Asp Ile
145 150 155 160

Lys His Leu Gly Gln Lys Thr Arg Glu Gly Arg Leu Leu Thr Lys Trp
165 170 175

Tyr Gly Gly Met Ala His Glu Leu Gly His Gly Leu Asn Leu Pro His
180 185 190

Asn His Gln Thr Ala Ser Asp Gly Lys Lys Tyr Gly Thr Ala Leu Met
195 200 205

Gly Ser Gly Asn Tyr Thr Phe Gly Thr Ser Pro Thr Phe Leu Thr Pro
210 215 220

Ala Ser Cys Ala Leu Leu Asp Ala Cys Glu Val Phe Ser Val Thr Pro
225 230 235 240

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

Ala Ile Ser Phe Lys Gly Asp Gln Ile Leu Val Ser Gly Asn Tyr Lys
260 265 270

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

Tyr Ala Val Asn Gln Asp Tyr Asp Ala Val Ser Phe Ser Arg Arg Leu
290 295 300

Gly Lys Lys Ser Gly Lys Phe Ser Met Lys Ile Asp Lys Lys Glu Leu
305 310 315 320

Glu Gly Leu Asn Asn Asn Glu Phe Arg Ile Ser Leu Met Phe Ile Leu
325 330 335

Ala Asn Gly Leu His Met Gln Lys His Phe Thr Phe His Trp Asp Ala
340 345 350

Leu Gln Asp Tyr Arg Asp Gly Ser Lys Ser Gly Ser Gly His His His
355 360 365

His His His
370

<210> 13
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<220>
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