

Sequence_Listing
SEQUENCE LISTING

<110> UNIVERSITY OF PITTSBURGH - OF THE COMMONWEALTH SYSTEM OF
HIGHER EDUCATION

<120> COMPUTATIONALLY OPTIMIZED BROADLY REACTIVE ANTIGENS FOR H1N1
INFLUENZA

<130> 8123-90161-03

<150> US 61/730,186

<151> 2012-11-27

<160> 8

<170> PatentIn version 3.5

<210> 1

<211> 566

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic polypeptide

<400> 1

Met Glu Ala Arg Leu Leu Val Leu Leu Cys Ala Phe Ala Ala Thr Asn
1 5 10 15

Ala Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr
20 25 30

Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
35 40 45

Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Lys Leu Lys Gly Ile
50 55 60

Ala Pro Leu Gln Leu Gly Lys Cys Asn Ile Ala Gly Trp Ile Leu Gly
65 70 75 80

Asn Pro Glu Cys Glu Ser Leu Leu Ser Lys Arg Ser Trp Ser Tyr Ile
85 90 95

Val Glu Thr Pro Asn Ser Glu Asn Gly Thr Cys Tyr Pro Gly Asp Phe
100 105 110

Ile Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
115 120 125

Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Asn His Asn
130 135 140

Thr Thr Lys Gly Val Thr Ala Ala Cys Ser His Ala Gly Lys Ser Ser
145 150 155 160

Phe Tyr Arg Asn Leu Leu Trp Leu Thr Lys Lys Asn Gly Ser Tyr Pro
Page 1

Sequence_Listing

165

170

175

Asn Leu Ser Lys Ser Tyr Val Asn Asn Lys Gly Lys Glu Val Leu Val
 180 185 190
 Leu Trp Gly Val His His Pro Ser Asn Ile Glu Asp Gln Gln Ser Leu
 195 200 205
 Tyr Gln Asn Glu Asn Ala Tyr Val Ser Val Val Ser Ser Asn Tyr Asn
 210 215 220
 Arg Arg Phe Thr Pro Glu Ile Ala Lys Arg Pro Lys Val Arg Asp Gln
 225 230 235 240
 Glu Gly Arg Met Asn Tyr Tyr Trp Thr Leu Leu Glu Pro Gly Asp Thr
 245 250 255
 Ile Ile Phe Glu Ala Asn Gly Asn Leu Ile Ala Pro Trp Tyr Ala Phe
 260 265 270
 Ala Leu Ser Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Ser
 275 280 285
 Met His Glu Cys Asp Thr Lys Cys Gln Thr Pro Gln Gly Ala Ile Asn
 290 295 300
 Ser Ser Leu Pro Phe Gln Asn Ile His Pro Val Thr Ile Gly Glu Cys
 305 310 315 320
 Pro Lys Tyr Val Arg Ser Thr Lys Leu Arg Met Val Thr Gly Leu Arg
 325 330 335
 Asn Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly
 340 345 350
 Phe Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr
 355 360 365
 His His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser
 370 375 380
 Thr Gln Asn Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Ser Val Ile
 385 390 395 400
 Glu Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Asn
 405 410 415
 Leu Glu Lys Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe
 420 425 430
 Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn

Sequence_Listing

435 440 445
 Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
 450 455 460
 Lys Val Lys Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly
 465 470 475 480
 Cys Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val
 485 490 495
 Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu
 500 505 510
 Asn Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr
 515 520 525
 Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
 530 535 540
 Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu
 545 550 555 560
 Gln Cys Arg Ile Cys Ile
 565

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 <212> PRT
 <213> Artificial Sequence
 <220>
 <223> Synthetic polypeptide
 <400> 2

Met Glu Ala Arg Leu Leu Val Leu Leu Cys Ala Phe Ala Ala Thr Asn
 1 5 10 15
 Ala Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr
 20 25 30
 Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
 35 40 45
 Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Arg Leu Lys Gly Ile
 50 55 60
 Ala Pro Leu Gln Leu Gly Lys Cys Asn Ile Ala Gly Trp Ile Leu Gly
 65 70 75 80
 Asn Pro Glu Cys Glu Ser Leu Leu Ser Lys Arg Ser Trp Ser Tyr Ile
 85 90 95

Sequence_Listing

Val Glu Thr Pro Asn Ser Glu Asn Gly Thr Cys Tyr Pro Gly Asp Phe
 100 105 110
 Ile Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
 115 120 125
 Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Lys His Asn
 130 135 140
 Thr Thr Arg Gly Val Thr Ala Ala Cys Ser His Ala Gly Lys Ser Ser
 145 150 155 160
 Phe Tyr Arg Asn Leu Leu Trp Leu Thr Glu Lys Asp Gly Ser Tyr Pro
 165 170 175
 Lys Leu Ser Asn Ser Tyr Val Asn Lys Lys Gly Lys Glu Val Leu Val
 180 185 190
 Leu Trp Gly Val His His Pro Ser Asn Ile Lys Asp Gln Gln Thr Leu
 195 200 205
 Tyr Gln Lys Glu Asn Ala Tyr Val Ser Val Val Ser Ser Asn Tyr Asn
 210 215 220
 Arg Arg Phe Thr Pro Glu Ile Ala Glu Arg Pro Lys Val Arg Gly Gln
 225 230 235 240
 Ala Gly Arg Met Asn Tyr Tyr Trp Thr Leu Leu Glu Pro Gly Asp Thr
 245 250 255
 Ile Ile Phe Glu Ala Asn Gly Asn Leu Ile Ala Pro Trp Tyr Ala Phe
 260 265 270
 Ala Leu Ser Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Ser
 275 280 285
 Met His Glu Cys Asp Thr Lys Cys Gln Thr Pro Gln Gly Ala Ile Asn
 290 295 300
 Ser Ser Leu Pro Phe Gln Asn Ile His Pro Val Thr Ile Gly Glu Cys
 305 310 315 320
 Pro Lys Tyr Val Arg Ser Thr Lys Leu Arg Met Val Thr Gly Leu Arg
 325 330 335
 Asn Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly
 340 345 350
 Phe Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr
 355 360 365

Sequence_Listing

His His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser
370 375 380

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

Glu Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Asn
405 410 415

Leu Glu Lys Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe
420 425 430

Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
435 440 445

Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
450 455 460

Lys Val Lys Asn Gln Leu Arg Asn Asn Ala Lys Glu Ile Gly Asn Gly
465 470 475 480

Cys Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val
485 490 495

Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu
500 505 510

Asn Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr
515 520 525

Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
530 535 540

Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu
545 550 555 560

Gln Cys Arg Ile Cys Ile
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<210> 3

<211> 566

<212> PRT

<213> Artificial Sequence

<220>

<223> Synthetic polypeptide

<400> 3

Met Glu Ala Arg Leu Leu Val Leu Leu Cys Ala Phe Ala Ala Thr Asn
1 5 10 15

Ala Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr

Sequence_Listing

20 25 30

Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
 35 40 45

Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Arg Leu Lys Gly Ile
 50 55 60

Ala Pro Leu Gln Leu Gly Asn Cys Ser Val Ala Gly Trp Ile Leu Gly
 65 70 75 80

Asn Pro Glu Cys Glu Ser Leu Phe Ser Lys Glu Ser Trp Ser Tyr Ile
 85 90 95

Ala Glu Thr Pro Asn Pro Glu Asn Gly Thr Cys Tyr Pro Gly Tyr Phe
 100 105 110

Ala Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
 115 120 125

Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Asn His Thr
 130 135 140

Val Thr Lys Gly Val Thr Ala Ser Cys Ser His Asn Gly Lys Ser Ser
 145 150 155 160

Phe Tyr Arg Asn Leu Leu Trp Leu Thr Glu Lys Asn Gly Leu Tyr Pro
 165 170 175

Asn Leu Ser Lys Ser Tyr Val Asn Asn Lys Glu Lys Glu Val Leu Val
 180 185 190

Leu Trp Gly Val His His Pro Ser Asn Ile Gly Asp Gln Arg Ala Ile
 195 200 205

Tyr His Thr Glu Asn Ala Tyr Val Ser Val Val Ser Ser His Tyr Ser
 210 215 220

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

Glu Gly Arg Ile Asn Tyr Tyr Trp Thr Leu Leu Glu Pro Gly Asp Thr
 245 250 255

Ile Ile Phe Glu Ala Asn Gly Asn Leu Ile Ala Pro Trp Tyr Ala Phe
 260 265 270

Ala Leu Ser Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Ser
 275 280 285

Met Asp Glu Cys Asp Ala Lys Cys Gln Thr Pro Gln Gly Ala Ile Asn

Sequence_Listing

290

295

300

Ser Ser Leu Pro Phe Gln Asn Val His Pro Val Thr Ile Gly Glu Cys
305 310 315 320

Pro Lys Tyr Val Arg Ser Thr Lys Leu Arg Met Val Thr Gly Leu Arg
325 330 335

Asn Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly
340 345 350

Phe Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr
355 360 365

His His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser
370 375 380

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

Glu Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Lys
405 410 415

Leu Glu Arg Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe
420 425 430

Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
435 440 445

Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
450 455 460

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

Cys Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val
485 490 495

Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu
500 505 510

Asn Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr
515 520 525

Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
530 535 540

Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu
545 550 555 560

Gln Cys Arg Ile Cys Ile

Sequence_Listing

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<210> 4
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 <213> Artificial Sequence

<220>
 <223> Synthetic polypeptide

<400> 4

Met Lys Ala Lys Leu Leu Val Leu Leu Cys Ala Phe Thr Ala Thr Tyr
 1 5 10 15

Ala Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr
 20 25 30

Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
 35 40 45

Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Arg Leu Lys Gly Ile
 50 55 60

Ala Pro Leu Gln Leu Gly Asn Cys Ser Ile Ala Gly Trp Ile Leu Gly
 65 70 75 80

Asn Pro Glu Cys Glu Ser Leu Phe Ser Lys Glu Ser Trp Ser Tyr Ile
 85 90 95

Val Glu Thr Pro Asn Ser Glu Asn Gly Thr Cys Tyr Pro Gly Tyr Phe
 100 105 110

Ala Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
 115 120 125

Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Ala His Thr
 130 135 140

Val Thr Lys Gly Val Thr Ala Ser Cys Ser His Asn Gly Lys Ser Ser
 145 150 155 160

Phe Tyr Arg Asn Leu Leu Trp Leu Thr Glu Lys Asn Gly Ser Tyr Pro
 165 170 175

Ala Leu Ser Lys Ser Tyr Val Asn Asn Lys Glu Lys Glu Val Leu Val
 180 185 190

Leu Trp Gly Val His His Pro Ser Asn Ile Gly Asp Gln Arg Ala Ile
 195 200 205

Tyr His Thr Glu Asn Ala Tyr Val Ser Val Val Ser Ser His Tyr Ser
 210 215 220

Sequence_Listing

Arg Arg Phe Thr Pro Glu Ile Ala Lys Arg Pro Lys Val Arg Asp Gln
 225 230 235 240
 Glu Gly Arg Ile Asn Tyr Tyr Trp Thr Leu Leu Glu Pro Gly Asp Thr
 245 250 255
 Ile Ile Phe Glu Ala Asn Gly Asn Leu Ile Ala Pro Trp Tyr Ala Phe
 260 265 270
 Ala Leu Ser Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Ser
 275 280 285
 Met Asp Glu Cys Asp Ala Lys Cys Gln Thr Pro Gln Gly Ala Ile Asn
 290 295 300
 Ser Ser Leu Pro Phe Gln Asn Val His Pro Val Thr Ile Gly Glu Cys
 305 310 315 320
 Pro Lys Tyr Val Arg Ser Thr Lys Leu Arg Met Val Thr Gly Leu Arg
 325 330 335
 Asn Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly
 340 345 350
 Phe Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr
 355 360 365
 His His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser
 370 375 380
 Thr Gln Asn Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Ser Val Ile
 385 390 395 400
 Glu Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Lys
 405 410 415
 Leu Glu Arg Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe
 420 425 430
 Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
 435 440 445
 Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
 450 455 460
 Lys Val Lys Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly
 465 470 475 480
 Cys Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val
 485 490 495

Sequence_Listing

Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu
500 505 510

Asn Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr
515 520 525

Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
530 535 540

Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu
545 550 555 560

Gln Cys Arg Ile Cys Ile
565

<210> 5

<211> 566

<212> PRT

<213> Artificial Sequence

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<223> Synthetic polypeptide

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Met Glu Ala Arg Leu Leu Val Leu Leu Cys Ala Phe Ala Ala Thr Asn
1 5 10 15

Ala Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr
20 25 30

Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
35 40 45

Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Lys Leu Lys Gly Ile
50 55 60

Ala Pro Leu Gln Leu Gly Asn Cys Ser Ile Ala Gly Trp Ile Leu Gly
65 70 75 80

Asn Pro Glu Cys Glu Ser Leu Phe Ser Lys Glu Ser Trp Ser Tyr Ile
85 90 95

Val Glu Thr Pro Asn Ser Glu Asn Gly Thr Cys Tyr Pro Gly Tyr Phe
100 105 110

Ala Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
115 120 125

Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Asn His Thr
130 135 140

Val Thr Lys Gly Val Thr Ala Ser Cys Ser His Asn Gly Lys Ser Ser

Sequence_Listing

145		150		155		160
Phe	Tyr	Arg	Asn	Leu	Leu	Trp
			165			
				Leu	Thr	Glu
						170
				Lys	Asn	Gly
						Ser
						Tyr
						175
Asn	Leu	Ser	Lys	Ser	Tyr	Val
			180			
				Asn	Asn	Lys
						185
				Glu	Lys	Glu
						190
				Val	Leu	Val
Leu	Trp	Gly	Val	His	His	Pro
		195				
				Ser	Asn	Ile
						200
				Gly	Asp	Gln
						205
				Arg	Ala	Ile
Tyr	His	Thr	Glu	Asn	Ala	Tyr
	210					215
				Val	Ser	Val
						220
				Val	Ser	Ser
						His
						Tyr
						Ser
Arg	Arg	Phe	Thr	Pro	Glu	Ile
225					230	
				Ala	Lys	Arg
						235
				Pro	Lys	Val
						Arg
						Asp
						Gln
						240
Glu	Gly	Arg	Ile	Asn	Tyr	Tyr
				245		
				Trp	Thr	Leu
						250
						Leu
						Glu
						Pro
						Gly
						Asp
						255
						Thr
Ile	Ile	Phe	Glu	Ala	Asn	Gly
			260			
				Asn	Gly	Asn
						265
				Leu	Ile	Ala
						Pro
						Trp
						Tyr
						270
						Ala
						Phe
Ala	Leu	Ser	Arg	Gly	Phe	Gly
		275				
				Ser	Gly	Ile
						280
				Ile	Ile	Thr
						285
				Asn	Ala	Ser
Met	Asp	Glu	Cys	Asp	Ala	Lys
	290					295
				Cys	Gln	Thr
						Pro
						Gln
						300
				Gly	Ala	Ile
						Asn
Ser	Ser	Leu	Pro	Phe	Gln	Asn
305					310	
				Val	His	Pro
						315
				Val	Thr	Ile
						Gly
						Glu
						Cys
						320
Pro	Lys	Tyr	Val	Arg	Ser	Thr
				325		
				Lys	Leu	Arg
						330
				Met	Val	Thr
						Gly
						Leu
						335
Asn	Ile	Pro	Ser	Ile	Gln	Ser
			340			
				Arg	Gly	Leu
						345
				Phe	Gly	Ala
						350
				Ile	Ala	Gly
Phe	Ile	Glu	Gly	Gly	Trp	Thr
		355				
				Gly	Met	Ile
						360
				Asp	Gly	Trp
						365
				Tyr	Gly	Tyr
						Gly
						Tyr
His	His	Gln	Asn	Glu	Gln	Gly
	370					375
				Ser	Gly	Tyr
						Ala
						380
				Ala	Asp	Gln
						Lys
						Ser
Thr	Gln	Asn	Ala	Ile	Asn	Gly
385						390
				Ile	Thr	Asn
						395
				Val	Asn	Ser
						Val
						Ile
						400
Glu	Lys	Met	Asn	Thr	Gln	Phe
				405		
				Ala	Val	Gly
						410
				Lys	Glu	Phe
						415
				Asn	Lys	
Leu	Glu	Arg	Arg	Met	Glu	Asn
						Leu
						Asn
						Lys
						Lys
						Val
						Asp
						Asp
						Gly
						Phe

Sequence_Listing

420

425

430

Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
435 440 445

Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
450 455 460

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

Cys Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val
485 490 495

Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu
500 505 510

Asn Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr
515 520 525

Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
530 535 540

Val Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu
545 550 555 560

Gln Cys Arg Ile Cys Ile
565

<210> 6
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<213> Artificial Sequence

<220>
<223> Synthetic polypeptide

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

Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
35 40 45

Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Leu Leu Lys Gly Ile
50 55 60

Ala Pro Leu Gln Leu Gly Asn Cys Ser Val Ala Gly Trp Ile Leu Gly
65 70 75 80

Sequence_Listing

Asn Pro Glu Cys Glu₈₅ Leu Leu Ile Ser Lys₉₀ Glu Ser Trp Ser Tyr₉₅ Ile
 Val Glu Thr Pro₁₀₀ Asn Pro Glu Asn Gly₁₀₅ Thr Cys Tyr Pro Gly₁₁₀ Tyr Phe
 Ala Asp Tyr₁₁₅ Glu Glu Leu Arg Glu₁₂₀ Gln Leu Ser Ser Val₁₂₅ Ser Ser Phe
 Glu Arg₁₃₀ Phe Glu Ile Phe Pro₁₃₅ Lys Glu Ser Ser Trp₁₄₀ Pro Asn His Thr
 Val₁₄₅ Thr Gly Val Ser Ala₁₅₀ Ser Cys Ser His Asn₁₅₅ Gly Lys Ser Ser Phe₁₆₀
 Tyr Arg Asn Leu₁₆₅ Leu Trp Leu Thr Gly Lys₁₇₀ Asn Gly Leu Tyr Pro₁₇₅ Asn
 Leu Ser Lys Ser₁₈₀ Tyr Ala Asn Asn Lys₁₈₅ Glu Lys Glu Val₁₉₀ Leu Val Leu
 Trp Gly Val₁₉₅ His His Pro Pro Asn₂₀₀ Ile Gly Asp Gln₂₀₅ Arg Ala Leu Tyr
 His Thr₂₁₀ Glu Asn Ala Tyr Val₂₁₅ Ser Val Val Ser Ser₂₂₀ His Tyr Ser Arg
 Lys₂₂₅ Phe Thr Pro Glu Ile₂₃₀ Ala Lys Arg Pro Lys₂₃₅ Val Arg Asp Gln Glu₂₄₀
 Gly Arg Ile Asn₂₄₅ Tyr Tyr Trp Thr Leu Leu₂₅₀ Glu Pro Gly Asp Thr₂₅₅ Ile
 Ile Phe Glu Ala₂₆₀ Asn Gly Asn Leu Ile₂₆₅ Ala Pro Arg Tyr Ala₂₇₀ Phe Ala
 Leu Ser Arg₂₇₅ Gly Phe Gly Ser Gly₂₈₀ Ile Ile Thr Ser Asn₂₈₅ Ala Pro Met
 Asp Glu₂₉₀ Cys Asp Ala Lys Cys₂₉₅ Gln Thr Pro Gln Gly₃₀₀ Ala Ile Asn Ser
 Ser₃₀₅ Leu Pro Phe Gln Asn₃₁₀ Val His Pro Val Thr₃₁₅ Ile Gly Glu Cys Pro₃₂₀
 Lys Tyr Val Arg Ser₃₂₅ Ala Lys Leu Arg Met₃₃₀ Val Thr Gly Leu Arg₃₃₅ Asn
 Ile Pro Ser Ile₃₄₀ Gln Ser Arg Gly Leu₃₄₅ Phe Gly Ala Ile Ala₃₅₀ Gly Phe

Sequence_Listing

Ile Glu Gly Gly Trp Thr Gly Met Val Asp Gly Trp Tyr Gly Tyr His
355 360 365

His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser Thr
370 375 380

Gln Asn Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Ser Val Ile Glu
385 390 395 400

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

Glu Arg Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe Leu
420 425 430

Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu
435 440 445

Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys
450 455 460

Val Lys Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys
465 470 475 480

Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val Lys
485 490 495

Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu Asn
500 505 510

Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr Gln
515 520 525

Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu Val
530 535 540

Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln
545 550 555 560

Cys Arg Ile Cys Ile
565

<210> 7
<211> 566
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic polypeptide

<400> 7

Met Glu Ala Arg Leu Leu Val Leu Leu Cys Ala Phe Ala Ala Thr Asn
Page 14

Sequence_Listing

1	5	10	15
Ala Asp Thr	Ile Cys Ile Gly Tyr	His Ala Asn Asn Ser	Thr Asp Thr
	20	25	30
Val Asp Thr	Val Leu Glu Lys	Asn Val Thr Val Thr	His Ser Val Asn
	35	40	45
Leu Leu Glu	Asp Ser His	Asn Gly Lys Leu Cys	Arg Leu Lys Gly Ile
	50	55	60
Ala Pro Leu	Gln Leu Gly Asn Cys Ser	Ile Ala Gly Trp Ile Leu Gly	
65	70	75	80
Asn Pro Glu	Cys Glu Ser Leu Leu Ser	Lys Lys Ser Trp Ser Tyr Ile	
	85	90	95
Val Glu Thr	Pro Asn Ser Glu Asn	Gly Thr Cys Tyr Pro Gly Asp Phe	
	100	105	110
Ile Asp Tyr	Glu Glu Leu Arg Glu Gln Leu Ser Ser	Val Ser Ser Phe	
	115	120	125
Glu Arg Phe	Glu Ile Phe Pro Lys Glu Ser Ser	Trp Pro Asn His Thr	
	130	135	140
Val Thr Lys	Gly Val Thr Ala Ala Cys Ser	His Ala Gly Lys Ser Ser	
145	150	155	160
Phe Tyr Arg	Asn Leu Leu Trp Leu Thr	Glu Lys Asn Gly Ser Tyr Pro	
	165	170	175
Asn Leu Ser	Lys Ser Tyr Val Asn Asn Lys Gly Lys Glu	Val Leu Val	
	180	185	190
Leu Trp Gly	Val His His Pro Ser Asn Ile Gly Asp	Gln Gln Ala Leu	
	195	200	205
Tyr Gln Thr	Glu Asn Ala Tyr Val Ser Val Val	Ser Ser His Tyr Asn	
	210	215	220
Arg Lys Phe	Thr Pro Glu Ile Ala Lys Arg	Pro Lys Val Arg Asp Gln	
225	230	235	240
Glu Gly Arg	Ile Asn Tyr Tyr Trp Thr	Leu Leu Glu Pro Gly Asp Thr	
	245	250	255
Ile Ile Phe	Glu Ala Asn Gly Asn Leu Ile Ala Pro Trp	Tyr Ala Phe	
	260	265	270
Ala Leu Ser	Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Ser		

Sequence_Listing

275 280 285
 Met His Glu Cys Asp Thr Lys Cys Gln Thr Pro Gln Gly Ala Ile Asn
 290 295 300
 Ser Ser Leu Pro Phe Gln Asn Ile His Pro Val Thr Ile Gly Glu Cys
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 Pro Lys Tyr Val Arg Ser Thr Lys Leu Arg Met Val Thr Gly Leu Arg
 325 330 335
 Asn Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly
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 Phe Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr
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 His His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser
 370 375 380
 Thr Gln Asn Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Ser Val Ile
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 Glu Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Lys
 405 410 415
 Leu Glu Lys Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe
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 Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
 435 440 445
 Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
 450 455 460
 Lys Val Lys Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly
 465 470 475 480
 Cys Phe Glu Phe Tyr His Lys Cys Asn Asn Glu Cys Met Glu Ser Val
 485 490 495
 Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu
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 Asn Arg Glu Lys Ile Asp Gly Val Lys Leu Glu Ser Met Gly Val Tyr
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 Gln Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu
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Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
35 40 45

Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Xaa Leu Lys Gly Ile
50 55 60

Ala Pro Leu Gln Leu Gly Xaa Cys Xaa Xaa Ala Gly Trp Ile Leu Gly
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Asn Pro Glu Cys Glu Xaa Leu Xaa Ser Lys Xaa Ser Trp Ser Tyr Ile
85 90 95

Xaa Glu Thr Pro Asn Xaa Glu Asn Gly Thr Cys Tyr Pro Gly Xaa Phe
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Xaa Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
115 120 125

Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Xaa His Xaa
130 135 140

Xaa Thr Xaa Gly Val Xaa Ala Xaa Cys Ser His Xaa Gly Lys Ser Ser
145 150 155 160

Phe Tyr Arg Asn Leu Leu Trp Leu Thr Xaa Lys Xaa Gly Xaa Tyr Pro
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Xaa Leu Ser Xaa Ser Tyr Xaa Asn Xaa Lys Xaa Lys Glu Val Leu Val
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Sequence_Listing

Leu Trp Gly Val His His Pro Xaa Asn Ile Xaa Asp Gln Xaa Xaa Xaa
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 Tyr Xaa Xaa Glu Asn Ala Tyr Val Ser Val Val Ser Ser Xaa Tyr Xaa
 210 215 220
 Arg Xaa Phe Thr Pro Glu Ile Ala Xaa Arg Pro Lys Val Arg Xaa Gln
 225 230 235 240
 Xaa Gly Arg Xaa Asn Tyr Tyr Trp Thr Leu Leu Glu Pro Gly Asp Thr
 245 250 255
 Ile Ile Phe Glu Ala Asn Gly Asn Leu Ile Ala Pro Xaa Tyr Ala Phe
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 Ala Leu Ser Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Xaa
 275 280 285
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 Pro Lys Tyr Val Arg Ser Xaa Lys Leu Arg Met Val Thr Gly Leu Arg
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 Phe Ile Glu Gly Gly Trp Thr Gly Met Xaa Asp Gly Trp Tyr Gly Tyr
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 Thr Gln Asn Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Ser Val Ile
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 Leu Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
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 Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu
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Sequence_Listing

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