

SEQUENCE LISTING

<110> The Board of Trustees of the Leland Stanford Junior
University and University of Washington

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<120> BIOLOGICALLY RELEVANT ORTHOGONAL CYTOKINE/RECEPTOR PAIRS

<130> STAN-1246CIP

"<150> 62/217,364"

<151> 2015-09-11

"<150> 62/375,089"

<151> 2016-08-15

<150> PCT/US16/050511

<151> 2016-09-07

<160> 26

<170> PatentIn version 3.5

<210> 1

<211> 525

<212> PRT

<213> Homo sapiens

<400> 1

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Cys	Gln	Val	His	Ala	Trp	Pro	Asp	Arg	Arg	Arg	Trp	Asn	Gln	Thr	Cys
		35					40					45			

Glu	Leu	Leu	Pro	Val	Ser	Gln	Ala	Ser	Trp	Ala	Cys	Asn	Leu	Ile	Leu
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Gly Ala Pro Asp Ser Gln Lys Leu Thr Thr Val Asp Ile Val Thr Leu
65 70 75 80

Arg Val Leu Cys Arg Glu Gly Val Arg Trp Arg Val Met Ala Ile Gln
85 90 95

Asp Phe Lys Pro Phe Glu Asn Leu Arg Leu Met Ala Pro Ile Ser Leu
100 105 110

Gln Val Val His Val Glu Thr His Arg Cys Asn Ile Ser Trp Glu Ile
115 120 125

Ser Gln Ala Ser His Tyr Phe Glu Arg His Leu Glu Phe Glu Ala Arg
130 135 140

Thr Leu Ser Pro Gly His Thr Trp Glu Glu Ala Pro Leu Leu Thr Leu
145 150 155 160

Lys Gln Lys Gln Glu Trp Ile Cys Leu Glu Thr Leu Thr Pro Asp Thr
165 170 175

Gln Tyr Glu Phe Gln Val Arg Val Lys Pro Leu Gln Gly Glu Phe Thr
180 185 190

Thr Trp Ser Pro Trp Ser Gln Pro Leu Ala Phe Arg Thr Lys Pro Ala
195 200 205

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

Leu Ser Gly Ala Phe Gly Phe Ile Ile Leu Val Tyr Leu Leu Ile Asn
225 230 235 240

Cys Arg Asn Thr Gly Pro Trp Leu Lys Lys Val Leu Lys Cys Asn Thr
245 250 255

Pro Asp Pro Ser Lys Phe Phe Ser Gln Leu Ser Ser Glu His Gly Gly

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

Glu Gly Val Ser Phe Pro Trp Ser Arg Pro Pro Gly Gln Gly Glu Phe
 485 490 495

Arg Ala Leu Asn Ala Arg Leu Pro Leu Asn Thr Asp Ala Tyr Leu Ser
 500 505 510

Leu Gln Glu Leu Gln Gly Gln Asp Pro Thr His Leu Val
 515 520 525

<210> 2
 <211> 513
 <212> PRT
 <213> Mus musculus

<400> 2

Ala Val Lys Asn Cys Ser His Leu Glu Cys Phe Tyr Asn Ser Arg Ala
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Asn Val Ser Cys Met Trp Ser His Glu Glu Ala Leu Asn Val Thr Thr
 20 25 30

Cys His Val His Ala Lys Ser Asn Leu Arg His Trp Asn Lys Thr Cys
 35 40 45

Glu Leu Thr Leu Val Arg Gln Ala Ser Trp Ala Cys Asn Leu Ile Leu
 50 55 60

Gly Ser Phe Pro Glu Ser Gln Ser Leu Thr Ser Val Asp Leu Leu Asp
 65 70 75 80

Ile Asn Val Val Cys Trp Glu Glu Lys Gly Trp Arg Arg Val Lys Thr
 85 90 95

Cys Asp Phe His Pro Phe Asp Asn Leu Arg Leu Val Ala Pro His Ser
100 105 110

Leu Gln Val Leu His Ile Asp Thr Gln Arg Cys Asn Ile Ser Trp Lys
115 120 125

Val Ser Gln Val Ser His Tyr Ile Glu Pro Tyr Leu Glu Phe Glu Ala
130 135 140

Arg Arg Arg Leu Leu Gly His Ser Trp Glu Asp Ala Ser Val Leu Ser
145 150 155 160

Leu Lys Gln Arg Gln Gln Trp Leu Phe Leu Glu Met Leu Ile Pro Ser
165 170 175

Thr Ser Tyr Glu Val Gln Val Arg Val Lys Ala Gln Arg Asn Asn Thr
180 185 190

Gly Thr Trp Ser Pro Trp Ser Gln Pro Leu Thr Phe Arg Thr Arg Pro
195 200 205

Ala Asp Pro Met Lys Glu Ile Leu Pro Met Ser Trp Leu Arg Tyr Leu
210 215 220

Leu Leu Val Leu Gly Cys Phe Ser Gly Phe Phe Ser Cys Val Tyr Ile
225 230 235 240

Leu Val Lys Cys Arg Tyr Leu Gly Pro Trp Leu Lys Thr Val Leu Lys
245 250 255

Cys His Ile Pro Asp Pro Ser Glu Phe Phe Ser Gln Leu Ser Ser Gln
260 265 270

His Gly Gly Asp Leu Gln Lys Trp Leu Ser Ser Pro Val Pro Leu Ser
275 280 285

Phe Phe Ser Pro Ser Gly Pro Ala Pro Glu Ile Ser Pro Leu Glu Val

290

295

300

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

Ser Ala Pro Leu Pro Ser Pro Ser Gly His Ser Gln Ala Ser Cys Phe
 325 330 335

Thr Asn Gln Gly Tyr Phe Phe Phe His Leu Pro Asn Ala Leu Glu Ile
 340 345 350

Glu Ser Cys Gln Val Tyr Phe Thr Tyr Asp Pro Cys Val Glu Glu Glu
 355 360 365

Val Glu Glu Asp Gly Ser Arg Leu Pro Glu Gly Ser Pro His Pro Pro
 370 375 380

Leu Leu Pro Leu Ala Gly Glu Gln Asp Asp Tyr Cys Ala Phe Pro Pro
 385 390 395 400

Arg Asp Asp Leu Leu Leu Phe Ser Pro Ser Leu Ser Thr Pro Asn Thr
 405 410 415

Ala Tyr Gly Gly Ser Arg Ala Pro Glu Glu Arg Ser Pro Leu Ser Leu
 420 425 430

His Glu Gly Leu Pro Ser Leu Ala Ser Arg Asp Leu Met Gly Leu Gln
 435 440 445

Arg Pro Leu Glu Arg Met Pro Glu Gly Asp Gly Glu Gly Leu Ser Ala
 450 455 460

Asn Ser Ser Gly Glu Gln Ala Ser Val Pro Glu Gly Asn Leu His Gly
 465 470 475 480

Gln Asp Gln Asp Arg Gly Gln Gly Pro Ile Leu Thr Leu Asn Thr Asp
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Ile

<210> 3
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<212> PRT
<213> Mus musculus

<400> 3

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Gln Gln Gln Gln Gln Gln Gln Gln Gln Gln His Leu Glu Gln Leu Leu
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Met Asp Leu Gln Glu Leu Leu Ser Arg Met Glu Asn Tyr Arg Asn Leu
35 40 45

Lys Leu Pro Arg Met Leu Thr Phe Lys Phe Tyr Leu Pro Lys Gln Ala
50 55 60

Thr Glu Leu Lys Asp Leu Gln Cys Leu Glu Asp Glu Leu Gly Pro Leu
65 70 75 80

Arg His Val Leu Asp Leu Thr Gln Ser Lys Ser Phe Gln Leu Glu Asp
85 90 95

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

Gly Ser Asp Asn Thr Phe Glu Cys Gln Phe Asp Asp Glu Ser Ala Thr
115 120 125

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Ser Thr Ser Pro Gln
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<210> 4
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 <212> PRT
 <213> Homo sapiens

<400> 4

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Asn Pro Lys Leu Thr Arg Met Leu Thr Phe Lys Phe Tyr Met Pro Lys
 35 40 45

Lys Ala Thr Glu Leu Lys His Leu Gln Cys Leu Glu Glu Glu Leu Lys
 50 55 60

Pro Leu Glu Glu Val Leu Asn Leu Ala Gln Ser Lys Asn Phe His Leu
 65 70 75 80

Arg Pro Arg Asp Leu Ile Ser Asn Ile Asn Val Ile Val Leu Glu Leu
 85 90 95

Lys Gly Ser Glu Thr Thr Phe Met Cys Glu Tyr Ala Asp Glu Thr Ala
 100 105 110

Thr Ile Val Glu Phe Leu Asn Arg Trp Ile Thr Phe Cys Gln Ser Ile
 115 120 125

Ile Ser Thr Leu Thr
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<210> 5
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<213> Artificial sequence

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

Asn Pro Lys Leu Thr Arg Met Leu Thr Phe Lys Phe Tyr Met Pro Lys
35 40 45

Lys Ala Ile Glu Leu Lys His Leu Gln Cys Leu Glu Glu Glu Leu Lys
50 55 60

Pro Leu Glu Glu Val Leu Asn Leu Ala Gln Ser Lys Asn Phe His Leu
65 70 75 80

Asp Pro Arg Asp Leu Ile Ser Asn Ile Asn Val Ile Val Leu Glu Leu
85 90 95

Lys Gly Ser Glu Thr Thr Phe Met Cys Glu Tyr Ala Asp Glu Thr Ala
100 105 110

Thr Ile Val Glu Phe Leu Asn Arg Trp Ile Thr Phe Cys Gln Ser Ile
115 120 125

Ile Ser Thr Leu Thr
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Leu Leu Val Leu Leu Gln Gln Ile Leu Asn Gly Ile Asn Asn Tyr Lys
 20 25 30

Asn Pro Lys Leu Thr Arg Met Leu Thr Phe Lys Phe Tyr Met Pro Lys
 35 40 45

Lys Ala Thr Glu Leu Lys His Leu Gln Cys Leu Glu Glu Glu Leu Lys
 50 55 60

Pro Leu Glu Glu Val Leu Asn Leu Ala Gln Ser Lys Asn Phe His Leu
 65 70 75 80

Tyr Pro Arg Asp Leu Ile Ser Asn Ile Asn Val Ile Val Leu Glu Leu
 85 90 95

Lys Gly Ser Glu Thr Thr Phe Met Cys Glu Tyr Ala Asp Glu Thr Ala
 100 105 110

Thr Ile Val Glu Phe Leu Asn Arg Trp Ile Thr Phe Cys Gln Ser Ile
 115 120 125

Ile Ser Thr Leu Thr
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<210> 7
 <211> 133
 <212> PRT
 <213> Artificial sequence

<220>

<223> synthetic polypeptide

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

Asn Pro Lys Leu Thr Arg Met Leu Thr Phe Lys Phe Tyr Met Pro Lys
35 40 45

Lys Ala Thr Glu Leu Lys His Leu Gln Cys Leu Glu Glu Glu Leu Lys
50 55 60

Pro Leu Glu Glu Val Leu Asn Leu Ala Gln Ser Lys Asn Phe His Leu
65 70 75 80

Arg Pro Arg Asp Leu Ile Ser Asn Ile Asn Val Ile Val Leu Glu Leu
85 90 95

Lys Gly Ser Glu Thr Thr Phe Met Cys Glu Tyr Ala Asp Glu Thr Ala
100 105 110

Thr Ile Val Glu Phe Leu Asn Arg Trp Ile Thr Phe Cys Gln Ser Ile
115 120 125

Ile Ser Thr Leu Thr
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<210> 8

<211> 133

<212> PRT

<213> Artificial sequence

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<400> 8

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20 25 30

Asn Pro Lys Leu Thr Arg Met Leu Thr Phe Lys Phe Tyr Met Pro Lys
35 40 45

Lys Ala Thr Glu Leu Lys His Leu Gln Cys Leu Glu Glu Glu Leu Lys
50 55 60

Pro Leu Glu Glu Val Leu Asn Leu Ala Gln Ser Lys Asn Phe His Leu
65 70 75 80

Arg Pro Arg Asp Leu Ile Ser Asn Ile Asn Val Ile Val Leu Glu Leu
85 90 95

Lys Gly Ser Glu Thr Thr Phe Met Cys Glu Tyr Ala Asp Glu Thr Ala
100 105 110

Thr Ile Val Glu Phe Leu Asn Arg Trp Ile Thr Phe Cys Gln Ser Ile
115 120 125

Ile Ser Thr Leu Thr
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<210> 9

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<212> PRT

<213> Homo sapiens

<400> 9

Ala Val Asn Gly Thr Ser Gln Phe Thr Cys Phe Tyr Asn Ser Arg Ala
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20 25 30

Cys Gln Val His Ala Trp Pro Asp Arg Arg Arg Trp Asn Gln Thr Cys
35 40 45

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

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

Arg Val Leu Cys Arg Glu Gly Val Arg Trp Arg Val Met Ala Ile Gln
85 90 95

Asp Phe Lys Pro Phe Glu Asn Leu Arg Leu Met Ala Pro Ile Ser Leu
100 105 110

Gln Val Val His Val Glu Thr His Arg Cys Asn Ile Ser Trp Glu Ile
115 120 125

Ser Gln Ala Ser Asp Phe Phe Glu Arg His Leu Glu Phe Glu Ala Arg
130 135 140

Thr Leu Ser Pro Gly His Thr Trp Glu Glu Ala Pro Leu Leu Thr Leu
145 150 155 160

Lys Gln Lys Gln Glu Trp Ile Cys Leu Glu Thr Leu Thr Pro Asp Thr
165 170 175

Gln Tyr Glu Phe Gln Val Arg Val Lys Pro Leu Gln Gly Glu Phe Thr
180 185 190

Thr Trp Ser Pro Trp Ser Gln Pro Leu Ala Phe Arg Thr Lys Pro Ala
195 200 205

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

Leu Ser Gly Ala Phe Gly Phe Ile Ile Leu Val Tyr Leu Leu Ile Asn
 225 230 235 240

Cys Arg Asn Thr Gly Pro Trp Leu Lys Lys Val Leu Lys Cys Asn Thr
 245 250 255

Pro Asp Pro Ser Lys Phe Phe Ser Gln Leu Ser Ser Glu His Gly Gly
 260 265 270

Asp Val Gln Lys Trp Leu Ser Ser Pro Phe Pro Ser Ser Ser Phe Ser
 275 280 285

Pro Gly Gly Leu Ala Pro Glu Ile Ser Pro Leu Glu Val Leu Glu Arg
 290 295 300

Asp Lys Val Thr Gln Leu Leu Leu Gln Gln Asp Lys Val Pro Glu Pro
 305 310 315 320

Ala Ser Leu Ser Ser Asn His Ser Leu Thr Ser Cys Phe Thr Asn Gln
 325 330 335

Gly Tyr Phe Phe Phe His Leu Pro Asp Ala Leu Glu Ile Glu Ala Cys
 340 345 350

Gln Val Tyr Phe Thr Tyr Asp Pro Tyr Ser Glu Glu Asp Pro Asp Glu
 355 360 365

Gly Val Ala Gly Ala Pro Thr Gly Ser Ser Pro Gln Pro Leu Gln Pro
 370 375 380

Leu Ser Gly Glu Asp Asp Ala Tyr Cys Thr Phe Pro Ser Arg Asp Asp
 385 390 395 400

Leu Leu Leu Phe Ser Pro Ser Leu Leu Gly Gly Pro Ser Pro Pro Ser

405

410

415

Thr Ala Pro Gly Gly Ser Gly Ala Gly Glu Glu Arg Met Pro Pro Ser
 420 425 430

Leu Gln Glu Arg Val Pro Arg Asp Trp Asp Pro Gln Pro Leu Gly Pro
 435 440 445

Pro Thr Pro Gly Val Pro Asp Leu Val Asp Phe Gln Pro Pro Pro Glu
 450 455 460

Leu Val Leu Arg Glu Ala Gly Glu Glu Val Pro Asp Ala Gly Pro Arg
 465 470 475 480

Glu Gly Val Ser Phe Pro Trp Ser Arg Pro Pro Gly Gln Gly Glu Phe
 485 490 495

Arg Ala Leu Asn Ala Arg Leu Pro Leu Asn Thr Asp Ala Tyr Leu Ser
 500 505 510

Leu Gln Glu Leu Gln Gly Gln Asp Pro Thr His Leu Val
 515 520 525

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 "<223> N at position 33 may be a, c, g, or t"

<220>
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 <222> (34)..(34)
 "<223> N at position 34 may be a, c, or t"

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<220>
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<222> (35)..(35)
<223> N at position 35 may be g or t

<220>
<221> misc_feature
<222> (36)..(36)
"<223> N at position 36 may be a, c, g, or t"

<220>
<221> misc_feature
<222> (37)..(37)
"<223> N at position 37 may be a, c, or t"

<220>
<221> misc_feature
<222> (38)..(38)
<223> N at position 38 may be g or t

<220>
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<222> (45)..(45)
"<223> N at position 45 may be a, c, g, or t"

<220>
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<222> (46)..(46)
"<223> N at position 46 may be a, c, or t"

<220>
<221> misc_feature
<222> (47)..(47)
<223> N at position 47 may be g or t

<220>
<221> misc_feature
<222> (48)..(48)
"<223> N at position 48 may be a, c, or t"

<220>
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"<223> N at position 49 may be a, c, or t"

<220>
<221> misc_feature
<222> (50)..(50)

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<223> N at position 50 may be g or t

<220>

<221> misc_feature

<222> (54)..(54)

"<223> N at position 54 may be a, c, g, or t"

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<221> misc_feature

<222> (55)..(55)

"<223> N at position 55 may be a, c, or t"

<220>

<221> misc_feature

<222> (56)..(56)

<223> N at position 56 may be g or t

<220>

<221> misc_feature

<222> (57)..(59)

"<223> n is a, c, g, or t"

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ttttgaatgg aattaataat tacaagaatc ccaaactc 98

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<222> (31)..(31)

"<223> N at position 31 is a, c, or t"

<220>

<221> misc_feature

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<222> (32)..(32)
<223> N at position 32 is g or t

<220>
<221> misc_feature
<222> (33)..(33)
"<223> N at position 33 is a, c, g, or t"

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<221> misc_feature
<222> (34)..(34)
"<223> N at position 34 is a, c, or t"

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<222> (35)..(35)
<223> N at position 35 is g or t

<220>
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<222> (42)..(42)
"<223> N at position 42 is a, c, g, or t"

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<222> (43)..(43)
"<223> N at position 43 is a, c, or t"

<220>
<221> misc_feature
<222> (44)..(44)
<223> N at position 44 g or t

<220>
<221> misc_feature
<222> (45)..(45)
"<223> N at position 45 is a, c, g, or t"

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<221> misc_feature
<222> (46)..(46)
"<223> N at position 46 is a, c, or t"

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<221> misc_feature
<222> (47)..(47)
<223> N at position 47 is g or t

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 <222> (54)..(54)
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<220>
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 <222> (55)..(55)
 "<223> N at position 55 a, c, or t"

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 <222> (56)..(56)
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 "<223> N at position 20 is a, c, or t"

<220>
 <221> misc_feature
 <222> (21)..(21)
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 <213> Artificial sequence

 <220>
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 <210> 14
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 <220>
 <223> synthetic polynucleotide

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 <210> 15
 <211> 60
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> synthetic polynucleotide

 <400> 15
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 <210> 16
 <211> 45
 <212> DNA
 <213> Artificial sequence

 <220>
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 <400> 16
 ccaggatgct cacatttaag ttttacatgc ccaagaaggc cacag 45

 <210> 17
 <211> 59

<212> DNA
 <213> Artificial sequence

 <220>
 <223> synthetic polynucleotide

 <400> 17
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 <210> 18
 <211> 57
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> synthetic polynucleotide

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 <210> 19
 <211> 60
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> synthetic polynucleotide

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 <210> 20
 <211> 59
 <212> DNA
 <213> Artificial sequence

 <220>
 <223> synthetic polynucleotide

 <400> 20
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 <210> 21
 <211> 60
 <212> DNA

<213> Artificial sequence

<220>

<223> synthetic polynucleotide

<400> 21

gaaacaacat tcatgtgtga atatgctgat gagacagcaa ccattgtaga atttctgaac 60

<210> 22

<211> 58

<212> DNA

<213> Artificial sequence

<220>

<223> synthetic polynucleotide

<400> 22

gagatgatgc ttgacaaaa ggtaatccat ctgttcagaa attctacaat ggttgctg 58

<210> 23

<211> 59

<212> DNA

<213> Artificial sequence

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<400> 23

gattacccttt tgtcaaagca tcatctcaac actaactgcg gccgcttctg gtggcgaac 59

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<211> 53

<212> DNA

<213> Artificial sequence

<220>

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<400> 24

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<211> 21

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