

1
SEQUENCE LISTING

<110> NATIONAL UNIVERSITY CORPORATION CHIBA UNIVERSITY

<120> NOVEL ANTI-SUGAR CHAIN ANTIBODIES AND THEIR USES

<130> C0951MP003

<150> JP2020-169966

<151> 2020-10-07

<160> 29

<170> PatentIn version 3.5

<210> 1

<211> 8

<212> PRT

<213> Mus musculus

<400> 1

Gly Phe Ser Leu Thr Ser Tyr Ala
1 5

<210> 2

<211> 7

<212> PRT

<213> Mus musculus

<400> 2

Ile Trp Gly Gly Gly Ser Thr
1 5

<210> 3

<211> 11

<212> PRT

<213> Mus musculus

<400> 3

Ala Lys His Glu Lys Leu Gly Arg Phe Pro Tyr
1 5 10

<210> 4

<211> 5

<212> PRT

<213> Mus musculus

<400> 4

Ser Ser Val Ser Tyr
1 5

<210> 5
 <211> 3
 <212> PRT
 <213> Mus musculus

<400> 5

Glu Ile Ser
 1

<210> 6
 <211> 9
 <212> PRT
 <213> Mus musculus

<400> 6

Gln Gln Trp Asn Tyr Pro Leu Ala Thr
 1 5

<210> 7
 <211> 24
 <212> DNA
 <213> Mus musculus

<400> 7
 gggttttcat taaccagcta tgct

24

<210> 8
 <211> 21
 <212> DNA
 <213> Mus musculus

<400> 8
 atatgggggtg gtggaagcac a

21

<210> 9
 <211> 33
 <212> DNA
 <213> Mus musculus

<400> 9
 gccaaacatg aaaaactggg acgttttcct tac

33

<210> 10
 <211> 15
 <212> DNA
 <213> Mus musculus

<400> 10
 tcgagtgtaa gttac

15

<210> 11

<211> 9
 <212> DNA
 <213> Mus musculus

<400> 11
 gaaatatcc

9

<210> 12
 <211> 27
 <212> DNA
 <213> Mus musculus

<400> 12
 cagcagtgga attatcctct ggccacg

27

<210> 13
 <211> 117
 <212> PRT
 <213> Mus musculus

<400> 13

Gln Val Gln Leu Lys Glu Ser Gly Pro Gly Leu Val Ala Pro Ser Gln
 1 5 10 15

Ser Leu Ser Ile Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
 20 25 30

Ala Val His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
 35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Met
 50 55 60

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

Lys Met Asn Ser Leu Gln Thr Asp Asp Thr Ala Met Tyr Tyr Cys Ala
 85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
 100 105 110

Val Thr Val Ser Ala
 115

<210> 14
 <211> 106
 <212> PRT

<213> Mus musculus

<400> 14

Glu Ile Val Leu Thr Gln Ser Pro Ala Ile Thr Ala Ala Ser Leu Gly
1 5 10 15

Gln Lys Val Thr Ile Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Pro Trp Ile Tyr
35 40 45

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

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu Ala Glu
65 70 75 80

Asp Ala Ala Ile Tyr Tyr Cys Gln Gln Trp Asn Tyr Pro Leu Ala Thr
85 90 95

Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
100 105

<210> 15

<211> 117

<212> PRT

<213> Artificial Sequence

<220>

<223> Humanized SF1 Heavy Chain Variable Region H1

<400> 15

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
20 25 30

Ala Val His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Lys
50 55 60

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

Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
100 105 110

Val Thr Val Ser Ser
115

<210> 16
<211> 117
<212> PRT
<213> Artificial Sequence

<220>
<223> Humanized SF1 Heavy Chain Variable Region H2

<400> 16

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
20 25 30

Ala Val His Trp Ile Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Ile
35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Lys
50 55 60

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

Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
100 105 110

Val Thr Val Ser Ser
115

<210> 17

<211> 117
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Humanized SF1 Heavy Chain Variable Region H3

<400> 17

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Gly
 1 5 10 15

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

Ala Val His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Leu
 35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Val Lys
 50 55 60

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

Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Leu Tyr Tyr Cys Ala
 85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
 100 105 110

Val Thr Val Ser Ser
 115

<210> 18
 <211> 106
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Humanized SF1 Heavy Chain Variable Region L1

<400> 18

Glu Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
 1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Pro Leu Ile Tyr
 35 40 45

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

Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu
 65 70 75 80

Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr Pro Leu Ala Thr
 85 90 95

Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
 100 105

<210> 19
 <211> 106
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Humanized SF1 Heavy Chain Variable Region L2

<400> 19

Asp Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
 1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Pro Leu Ile Tyr
 35 40 45

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

Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu
 65 70 75 80

Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr Pro Leu Ala Thr
 85 90 95

Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
 100 105

<210> 20
 <211> 106
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Humanized SF1 Heavy Chain Variable Region L3

<400> 20

Glu Ile Val Leu Thr Gln Ser Pro Asp Phe Gln Ser Val Thr Pro Lys
 1 5 10 15

Glu Lys Val Thr Ile Thr Cys Arg Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30

His Trp Tyr Gln Gln Lys Pro Asp Gln Ser Pro Lys Pro Leu Ile Tyr
 35 40 45

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

Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Asn Ser Leu Glu Ala Glu
 65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr Pro Leu Ala Thr
 85 90 95

Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys
 100 105

<210> 21
 <211> 251
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Humanized SF1-scFv-H1L1

<400> 21

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
 1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
 20 25 30

Ala Val His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
 35 40 45

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

<210> 22
 <211> 251
 <212> PRT
 <213> Artificial Sequence

<220>

<223> Humanized SF1-scFv-H1L2

<400> 22

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
20 25 30

Ala Val His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Lys
50 55 60

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

Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys Ala
85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
100 105 110

Val Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly
115 120 125

Gly Gly Gly Ser Asp Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser
130 135 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Ser
145 150 155 160

Val Ser Tyr Met His Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys
165 170 175

Pro Leu Ile Tyr Glu Ile Ser Lys Leu Ala Ser Gly Val Pro Ser Arg
180 185 190

Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser
195 200 205

Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr
210 215 220

Pro Leu Ala Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Gly Leu
 225 230 235 240

Gln Gln Gly Gly Thr His His His His His His
 245 250

<210> 23
 <211> 251
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Humanized SF1-scFv-H2L1

<400> 23

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
 1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
 20 25 30

Ala Val His Trp Ile Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Ile
 35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Lys
 50 55 60

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

Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys Ala
 85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
 100 105 110

Val Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly
 115 120 125

Gly Gly Gly Ser Glu Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser
 130 135 140

Ala Ser Val Gly Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Ser
 145 150 155 160

Val Ser Tyr Met His Trp Tyr Gln Gln Lys¹² Pro Gly Lys Ala Pro Lys
165 170 175

Pro Leu Ile Tyr Glu Ile Ser Lys Leu Ala Ser Gly Val Pro Ser Arg
180 185 190

Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser
195 200 205

Leu Gln Pro Glu Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr
210 215 220

Pro Leu Ala Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Gly Leu
225 230 235 240

Gln Gln Gly Gly Thr His His His His His His
245 250

<210> 24
<211> 251
<212> PRT
<213> Artificial Sequence

<220>
<223> Humanized SF1-scFv-H3L3

<400> 24

Gln Val Gln Leu Val Glu Ser Gly Gly Gly Val Val Gln Pro Gly Gly
1 5 10 15

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

Ala Val His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Leu
35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Val Lys
50 55 60

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

Gln Met Asn Ser Leu Arg Thr Glu Asp Thr Ala Leu Tyr Tyr Cys Ala
85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu

100

105

13

110

Val Thr Val Ser Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly
 115 120 125

Gly Gly Gly Ser Glu Ile Val Leu Thr Gln Ser Pro Asp Phe Gln Ser
 130 135 140

Val Thr Pro Lys Glu Lys Val Thr Ile Thr Cys Arg Ala Ser Ser Ser
 145 150 155 160

Val Ser Tyr Met His Trp Tyr Gln Gln Lys Pro Asp Gln Ser Pro Lys
 165 170 175

Pro Leu Ile Tyr Glu Ile Ser Lys Leu Ala Ser Gly Val Pro Ser Arg
 180 185 190

Phe Ser Gly Ser Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Asn Ser
 195 200 205

Leu Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr
 210 215 220

Pro Leu Ala Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Gly Leu
 225 230 235 240

Gln Gln Gly Gly Thr His His His His His His
 245 250

<210> 25

<211> 447

<212> PRT

<213> Artificial Sequence

<220>

<223> Full Length Humanized SF1 Heavy Chain

<400> 25

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
 1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
 20 25 30

Ala Val His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
 35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Lys
 50 55 60

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

Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys Ala
 85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
 100 105 110

Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu
 115 120 125

Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala Ala Leu Gly Cys
 130 135 140

Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser
 145 150 155 160

Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser
 165 170 175

Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser
 180 185 190

Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His Lys Pro Ser Asn
 195 200 205

Thr Lys Val Asp Lys Lys Val Glu Pro Lys Ser Cys Asp Lys Thr His
 210 215 220

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

Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr
 245 250 255

Pro Glu Val Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro Glu
 260 265 270

Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys

275

280

15

285

Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser
 290 295 300

Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys
 305 310 315 320

Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile
 325 330 335

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

Pro Ser Arg Asp Glu Leu Thr Lys Asn Gln Val Ser Leu Thr Cys Leu
 355 360 365

Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn
 370 375 380

Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser
 385 390 395 400

Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg
 405 410 415

Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu
 420 425 430

His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
 435 440 445

<210> 26

<211> 213

<212> PRT

<213> Artificial Sequence

<220>

<223> Full Length Humanized SF1 Light Chain

<400> 26

Glu Ile Gln Leu Thr Gln Ser Pro Ser Ser Leu Ser Ala Ser Val Gly
 1 5 10 15

Asp Arg Val Thr Ile Thr Cys Arg Ala Ser Ser Ser Val Ser Tyr Met
 20 25 30

His Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Pro Leu Ile Tyr
 35 40 45
 Glu Ile Ser Lys Leu Ala Ser Gly Val Pro Ser Arg Phe Ser Gly Ser
 50 55 60
 Gly Ser Gly Thr Asp Tyr Thr Leu Thr Ile Ser Ser Leu Gln Pro Glu
 65 70 75 80
 Asp Phe Ala Thr Tyr Tyr Cys Gln Gln Trp Asn Tyr Pro Leu Ala Thr
 85 90 95
 Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg Thr Val Ala Ala Pro
 100 105 110
 Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly Thr
 115 120 125
 Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala Lys
 130 135 140
 Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln Glu
 145 150 155 160
 Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser Ser
 165 170 175
 Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr Ala
 180 185 190
 Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser Phe
 195 200 205
 Asn Arg Gly Glu Cys
 210

<210> 27
 <211> 447
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Full Length Humanized SF1 Heavy Chain IgG1-LALA
 <400> 27

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

Phe Leu Phe Pro Pro Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr
245 250 255

Pro Glu Val Thr Cys Val Val Val Asp Val Ser His Glu Asp Pro Glu
260 265 270

Val Lys Phe Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys
275 280 285

Thr Lys Pro Arg Glu Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser
290 295 300

Val Leu Thr Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys
305 310 315 320

Cys Lys Val Ser Asn Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile
325 330 335

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

Pro Ser Arg Asp Glu Leu Thr Lys Asn Gln Val Ser Leu Thr Cys Leu
355 360 365

Val Lys Gly Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn
370 375 380

Gly Gln Pro Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser
385 390 395 400

Asp Gly Ser Phe Phe Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg
405 410 415

Trp Gln Gln Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu
420 425 430

His Asn His Tyr Thr Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
435 440 445

$\langle 210 \rangle$	28
$\langle 211 \rangle$	444
$\langle 212 \rangle$	PRT
$\langle 213 \rangle$	Artificial Sequence

<220>

<223> Full Length Humanized SF1 Heavy Chain IgG4-SPLE

<400> 28

Gln Val Gln Leu Gln Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Glu
 1 5 10 15

Thr Leu Ser Leu Thr Cys Thr Val Ser Gly Phe Ser Leu Thr Ser Tyr
 20 25 30

Ala Val His Trp Val Arg Gln Pro Pro Gly Lys Gly Leu Glu Trp Leu
 35 40 45

Gly Ile Ile Trp Gly Gly Gly Ser Thr Asn Tyr Asn Ser Ala Leu Lys
 50 55 60

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

Lys Leu Ser Ser Val Thr Ala Ala Asp Thr Ala Val Tyr Tyr Cys Ala
 85 90 95

Lys His Glu Lys Leu Gly Arg Phe Pro Tyr Trp Gly Gln Gly Thr Leu
 100 105 110

Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser Val Phe Pro Leu
 115 120 125

Ala Pro Cys Ser Arg Ser Thr Ser Glu Ser Thr Ala Ala Leu Gly Cys
 130 135 140

Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val Ser Trp Asn Ser
 145 150 155 160

Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala Val Leu Gln Ser
 165 170 175

Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val Pro Ser Ser Ser
 180 185 190

Leu Gly Thr Lys Thr Tyr Thr Cys Asn Val Asp His Lys Pro Ser Asn
 195 200 205

Thr Lys Val Asp Lys Arg Val Glu Ser Lys Tyr Gly Pro Pro Cys Pro
 210 215 220

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

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

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

Asn Trp Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro
 275 280 285

Arg Glu Glu Gln Phe Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr
 290 295 300

Val Leu His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val
 305 310 315 320

Ser Asn Lys Gly Leu Pro Ser Ser Ile Glu Lys Thr Ile Ser Lys Ala
 325 330 335

Lys Gly Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Gln
 340 345 350

Glu Glu Met Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly
 355 360 365

Phe Tyr Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro
 370 375 380

Glu Asn Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser
 385 390 395 400

Phe Phe Leu Tyr Ser Arg Leu Thr Val Asp Lys Ser Arg Trp Gln Glu
 405 410 415

Gly Asn Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His
 420 425 430

Tyr Thr Gln Lys Ser Leu Ser Leu Ser Leu Gly Lys
 435 440

<211> 15
<212> PRT
<213> Artificial Sequence

<220>
<223> G4S Linker

<400> 29

Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10 15