SEQUENCE LISTING

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<120> PROCESS FOR PRODUCING MOLECULES CONTAINING SPECIALIZED GLYCAN STRUCTURES

<130> 513-17 PCT

<150> US 61/244,624
<151> 2009-09-22

<160> 7

<170> PatentIn version 3.5

<210> 1
<211> 304
<212> PRT
<213> Pseudomonas aeruginosa

<220>
<221> PEPTIDE
<222> (1)..(304)
<223> GDP-6-deoxy-D-lyxo-4-hexulose reductase (RMD)

<400> 1

Met Thr Gln Arg Leu Phe Val Thr Gly Leu Ser Gly Phe Val Gly Lys
1 5 10 15

His Leu Gln Ala Tyr Leu Ala Ala Ala His Thr Pro Trp Ala Leu Leu
20 25 30

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

Leu Trp Pro Glu Leu Pro Asp Ala Val Ile His Leu Ala Gly Gln Thr
50 55 60

Tyr Val Pro Glu Ala Phe Arg Asp Pro Ala Arg Thr Leu Gln Ile Asn
65 70 75 80

Leu Leu Gly Thr Leu Asn Leu Leu Gln Ala Leu Lys Ala Arg Gly Phe
85 90 95

Ser Gly Thr Phe Leu Tyr Ile Ser Ser Gly Asp Val Tyr Gly Gln Val
100 105 110

Ala Glu Ala Ala Leu Pro Ile His Glu Glu Leu Ile Pro His Pro Arg
115 120 125

Asn Pro Tyr Ala Val Ser Lys Leu Ala Ala Glu Ser Leu Cys Leu Gln
130 135 140

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

His Ile Gly Pro Gly Gln Lys Asp Ser Phe Val Ile Ala Ser Ala Ala
165 170 175

Arg Gln Ile Ala Arg Met Lys Gln Gly Leu Gln Ala Asn Arg Leu Glu
180 185 190

Val Gly Asp Ile Asp Val Ser Arg Asp Phe Leu Asp Val Gln Asp Val
195 200 205

Leu Ser Ala Tyr Leu Arg Leu Leu Ser His Gly Glu Ala Gly Ala Val
210 215 220

Tyr Asn Val Cys Ser Gly Gln Glu Gln Lys Ile Arg Glu Leu Ile Glu
225 230 235 240

Leu Leu Ala Asp Ile Ala Gln Val Glu Leu Glu Ile Val Gln Asp Pro
245 250 255

Ala Arg Met Arg Arg Ala Glu Gln Arg Arg Val Arg Gly Ser His Ala
260 265 270

Arg Leu His Asp Thr Thr Gly Trp Lys Pro Glu Ile Thr Ile Lys Gln
275 280 285

Ser Leu Arg Ala Ile Leu Ser Asp Trp Glu Ser Arg Val Arg Glu Glu
290 295 300

<210> 2
<211> 294
<212> PRT
<213> Actinobacillus actinomycetemcomitans

<220>
<221> PEPTIDE
<222> (1)..(294)
<223> GDP-6-deoxy-D-talose synthetase (GTS)

<400> 2

Met Lys Ile Leu Val Thr Gly Gly Ser Gly Phe Ile Gly Lys Asn Leu
1 5 10 15

Ile Tyr Leu Leu Arg Glu Lys Arg Glu Phe Glu Val Phe Gly Ala Thr
20 25 30

Val Glu Glu Thr Met Asp Leu Thr Asn Pro Cys Ser Val Gln Ser Val
35 40 45

Leu Glu Lys Thr Lys Pro Asp Phe Ile Val His Leu Ala Ala Leu Thr
50 55 60

Phe Val Pro Asn Asn Asn Pro Ile Thr Phe Tyr Leu Val Asn Thr Ile
65 70 75 80

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

Leu Gly Val Leu Cys Phe Ser Thr Ala Gly Ile Tyr Gly Ile Gln Glu
            100                 105                 110

Thr Lys Leu Leu Ser Glu Ser Leu Thr Pro Lys Pro Val Asn His Tyr
        115                 120                 125

Ser Met Ser Lys His Cys Met Glu His Ile Val Asn Lys Tyr Arg Cys
    130                 135                 140

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

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

Lys Asp Lys Thr Ile Glu Leu Gly Asn Leu Asp Ser Val Arg Asp Phe
            180                 185                 190

Ile Ser Val Asn Asp Cys Cys Asp Ile Ile Tyr Arg Leu Ile Ser Lys
        195                 200                 205

Leu Ile Glu Asn Glu Thr Ile Asn Ile Cys Thr Gly Ile Gly Tyr Ser
    210                 215                 220

Val Tyr Gln Ile Phe Gln Leu Leu Cys Glu Ile Ser Met His Gln Met
225                 230                 235                 240

Glu Ile Lys Gln Asn Glu Leu Phe Val Arg His Asp Asp Ile Pro Gln
                245                 250                 255

Met Ile Gly Asp Pro Ser Lys Leu Leu Asn Val Leu Gly Asn Asp Tyr
            260                 265                 270

Arg Phe Thr Ser Val Arg Ala Ile Leu Glu Glu Met Tyr Lys Asn Arg
        275                 280                 285

Leu Leu Glu Leu Ser Ile
    290
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<210> 3
<211> 367
<212> PRT
<213> Vibrio cholerae

<220>
<221> PEPTIDE
<222> (1)..(367)
<223> GDP-perosamine synthetase (Per)

<400> 3

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

Leu Asn Asp Cys Ile Asp Ser Gly Trp Val Ser Ser Arg Gly Lys Tyr
20 25 30

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

Ala Thr Thr Val Ser Asn Gly Thr Val Ala Leu His Leu Ala Met Ser
50 55 60

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

Tyr Val Ala Ser Val Asn Thr Ile Val Gln Cys Gly Ala Leu Pro Val
85 90 95

Phe Ala Glu Ile Glu Gly Glu Ser Leu Gln Val Ser Val Glu Asp Val
100 105 110

Lys Arg Lys Ile Asn Lys Lys Thr Lys Ala Val Met Ala Val His Ile
115 120 125

Tyr Gly Gln Ala Cys Asp Ile Gln Ser Leu Arg Asp Leu Cys Asp Glu
130 135 140

His Gly Leu Tyr Leu Ile Glu Asp Cys Ala Glu Ala Ile Gly Thr Ala
145 150 155 160

Val Asn Gly Lys Lys Val Gly Thr Phe Gly Asp Val Ser Thr Phe Ser
165 170 175

Phe Phe Gly Asn Lys Thr Ile Thr Ser Gly Glu Gly Gly Met Val Val
180 185 190

Ser Asn Ser Asp Ile Ile Ile Asp Lys Cys Leu Arg Leu Lys Asn Gln
195 200 205

Gly Val Val Ala Gly Lys Arg Tyr Trp His Asp Leu Val Ala Tyr Asn
210 215 220

Tyr Arg Met Thr Asn Leu Cys Ala Ala Ile Gly Val Ala Gln Leu Glu
225 230 235 240

Arg Val Asp Lys Ile Ile Lys Arg Lys Arg Asp Ile Ala Glu Ile Tyr
245 250 255

Arg Ser Glu Leu Ala Gly Leu Pro Met Gln Val His Lys Glu Ser Asn

260 265 270

Gly Thr Phe His Ser Tyr Trp Leu Thr Ser Ile Ile Leu Asp Gln Glu
275 280 285

Phe Glu Val His Arg Asp Gly Leu Met Thr Phe Leu Glu Asn Asn Asp
290 295 300

Ile Glu Ser Arg Pro Phe Phe Tyr Pro Ala His Thr Leu Pro Met Tyr
305 310 315 320

Glu His Leu Ala Glu Lys Thr Ala Phe Pro Leu Ser Asn Ser Tyr Ser
325 330 335

His Arg Gly Ile Asn Leu Pro Ser Trp Pro Gly Leu Cys Asp Asp Gln
340 345 350

Val Lys Glu Ile Cys Asn Cys Ile Lys Asn Tyr Phe Asn Cys Ile
355 360 365

<210> 4
<211> 388
<212> PRT
<213> Escherichia coli

<220>
<221> PEPTIDE
<222> (1)..(388)
<223> GDP-4-keto-6-deoxymannose-3-dehydratase (ColD)

<400> 4

Met Ile Asn Tyr Pro Leu Ala Ser Ser Thr Trp Asp Asp Leu Glu Tyr
1 5 10 15

Lys Ala Ile Gln Ser Val Leu Asp Ser Lys Met Phe Thr Met Gly Glu
20 25 30

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

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

Ala Ala Leu Phe Phe Thr Lys Lys Pro Arg Leu Lys Lys Gly Asp Glu
65 70 75 80

Ile Ile Val Pro Ala Val Ser Trp Ser Thr Thr Tyr Tyr Pro Leu Gln
85 90 95

Gln Tyr Gly Leu Arg Val Lys Phe Val Asp Ile Asp Ile Asn Thr Leu
100 105 110

Asn Ile Asp Ile Glu Ser Leu Lys Glu Ala Val Thr Asp Ser Thr Lys
115 120 125

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

Ile Asn Lys Ile Ile Gly Gly Arg Asp Ile Ile Leu Leu Glu Asp Asn
145 150 155 160

Cys Glu Ser Met Gly Ala Thr Phe Asn Asn Lys Cys Ala Gly Thr Phe
165 170 175

Gly Leu Met Gly Thr Phe Ser Ser Phe Tyr Ser His His Ile Ala Thr
180 185 190

Met Glu Gly Gly Cys Ile Val Thr Asp Asp Glu Glu Ile Tyr His Ile
195 200 205

Leu Leu Cys Ile Arg Ala His Gly Trp Thr Arg Asn Leu Pro Lys Lys
210 215 220

Asn Lys Val Thr Gly Val Lys Ser Asp Asp Gln Phe Glu Glu Ser Phe
225 230 235 240

Lys Phe Val Leu Pro Gly Tyr Asn Val Arg Pro Leu Glu Met Ser Gly
245 250 255

Ala Ile Gly Ile Glu Gln Leu Lys Lys Leu Pro Arg Phe Ile Ser Val
260 265 270

Arg Arg Lys Asn Ala Glu Tyr Phe Leu Asp Lys Phe Lys Asp His Pro
275 280 285

Tyr Leu Asp Val Gln Gln Glu Thr Gly Glu Ser Ser Trp Phe Gly Phe
290 295 300

Ser Phe Ile Ile Lys Lys Asp Ser Gly Val Ile Arg Lys Gln Leu Val
305 310 315 320

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

Asn Phe Leu Lys Asn Thr Asp Val Leu Lys Tyr Phe Asp Tyr Thr Val
340 345 350

His Asn Asn Val Asp Asn Ala Glu Tyr Leu Asp Lys Asn Gly Leu Phe
355 360 365

Val Gly Asn His Gln Ile Glu Leu Phe Asp Glu Ile Asp Tyr Leu Arg
370 375 380

Glu Val Leu Lys
385

<210> 5
<211> 321
<212> PRT
<213> Cricetulus griseus

<220>
<221> PEPTIDE
<222> (1)..(321)
<223> GDP-Fucose synthetase (GST) (Fx protein)

<400> 5

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

Gly Leu Val Gly Arg Ala Ile Gln Lys Val Val Ala Asp Gly Ala Gly
20 25 30

Leu Pro Gly Glu Glu Trp Val Phe Val Ser Ser Lys Asp Ala Asp Leu
35 40 45

Thr Asp Ala Ala Gln Thr Gln Ala Leu Phe Gln Lys Val Gln Pro Thr
50 55 60

His Val Ile His Leu Ala Ala Met Val Gly Gly Leu Phe Arg Asn Ile
65 70 75 80

Lys Tyr Asn Leu Asp Phe Trp Arg Lys Asn Val His Ile Asn Asp Asn
85 90 95

Val Leu His Ser Ala Phe Glu Val Gly Thr Arg Lys Val Val Ser Cys
100 105 110

Leu Ser Thr Cys Ile Phe Pro Asp Lys Thr Thr Tyr Pro Ile Asp Glu
115 120 125

Thr Met Ile His Asn Gly Pro Pro His Ser Ser Asn Phe Gly Tyr Ser
130 135 140

Tyr Ala Lys Arg Met Ile Asp Val Gln Asn Arg Ala Tyr Phe Gln Gln
145 150 155 160

His Gly Cys Thr Phe Thr Ala Val Ile Pro Thr Asn Val Phe Gly Pro
165 170 175

His Asp Asn Phe Asn Ile Glu Asp Gly His Val Leu Pro Gly Leu Ile
180 185 190

His Lys Val His Leu Ala Lys Ser Asn Gly Ser Ala Leu Thr Val Trp
195 200 205

Gly Thr Gly Lys Pro Arg Arg Gln Phe Ile Tyr Ser Leu Asp Leu Ala
210 215 220

Arg Leu Phe Ile Trp Val Leu Arg Glu Tyr Asn Glu Val Glu Pro Ile
225 230 235 240

Ile Leu Ser Val Gly Glu Glu Asp Glu Val Ser Ile Lys Glu Ala Ala
245 250 255

Glu Ala Val Val Glu Ala Met Asp Phe Cys Gly Glu Val Thr Phe Asp
260 265 270

Ser Thr Lys Ser Asp Gly Gln Tyr Lys Lys Thr Ala Ser Asn Gly Lys
275 280 285

Leu Arg Ala Tyr Leu Pro Asp Phe Arg Phe Thr Pro Phe Lys Gln Ala
290 295 300

Val Lys Glu Thr Cys Ala Trp Phe Thr Asp Asn Tyr Glu Gln Ala Arg
305 310 315 320

Lys

<210> 6
<211> 314
<212> PRT
<213> Cricetulus griseus

<220>
<221> PEPTIDE
<222> (1)..(314)
<223> GDP-Fucose synthetase Cys109Ser- (GFS-Cys109Ser) mutant

<400> 6

Met Arg Ile Leu Val Thr Gly Gly Ser Gly Leu Val Gly Arg Ala Ile
1 5 10 15

Gln Lys Val Val Ala Asp Gly Ala Gly Leu Pro Gly Glu Glu Trp Val
20 25 30

Phe Val Ser Ser Lys Asp Ala Asp Leu Thr Asp Ala Ala Gln Thr Gln
35 40 45

Ala Leu Phe Gln Lys Val Gln Pro Thr His Val Ile His Leu Ala Ala
50 55 60

Met Val Gly Gly Leu Phe Arg Asn Ile Lys Tyr Asn Leu Asp Phe Trp
65 70 75 80

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

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Val Gly Thr Arg Lys Val Val Ser Cys Leu Ser Thr Ser Ile Phe Pro
            100                 105                 110

Asp Lys Thr Thr Tyr Pro Ile Asp Glu Thr Met Ile His Asn Gly Pro
        115                 120                 125

Pro His Ser Ser Asn Phe Gly Tyr Ser Tyr Ala Lys Arg Met Ile Asp
    130                 135                 140

Val Gln Asn Arg Ala Tyr Phe Gln Gln His Gly Cys Thr Phe Thr Ala
145                 150                 155                 160

Val Ile Pro Thr Asn Val Phe Gly Pro His Asp Asn Phe Asn Ile Glu
                165                 170                 175

Asp Gly His Val Leu Pro Gly Leu Ile His Lys Val His Leu Ala Lys
            180                 185                 190

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

Gln Phe Ile Tyr Ser Leu Asp Leu Ala Arg Leu Phe Ile Trp Val Leu
    210                 215                 220

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

Asp Glu Val Ser Ile Lys Glu Ala Ala Glu Ala Val Val Glu Ala Met
                245                 250                 255

Asp Phe Cys Gly Glu Val Thr Phe Asp Ser Thr Lys Ser Asp Gly Gln
            260                 265                 270

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

Phe Arg Phe Thr Pro Phe Lys Gln Ala Val Lys Glu Thr Cys Ala Trp
    290                 295                 300

Phe Thr Asp Asn Tyr Glu Gln Ala Arg Lys
305                 310
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<210> 7
<211> 307
<212> PRT
<213> Escherichia coli

<220>
<221> PEPTIDE
<222> (1)..(307)
<223> GDP-L-colitose synthase (ColC)

<400> 7

Met Lys Ile Leu Leu Thr Gly Ser Thr Gly Met Val Gly Arg Asn Ile
1 5 10 15

Val Asp Asn Asn Asn Ser Asn Lys Tyr Glu Leu Leu Cys Pro Thr Ser
20 25 30

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

Cys His Ser Pro Asp Leu Ile Ile His Ala Ala Gly Leu Val Gly Gly
50 55 60

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

Lys Met Gly Val Asn Ile Val Asn Glu Ala Lys Asn Cys Gly Val Lys
85 90 95

Asn Phe Ile Asn Leu Gly Ser Ser Cys Met Tyr Pro Lys Gly Ile Asp
100 105 110

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

Asn Glu Gly Tyr Ala Leu Ala Lys Ile Thr Val Ala Lys Leu Cys Glu
130 135 140

Tyr Ile Thr Lys Glu Ser Glu Gly Tyr His Tyr Lys Thr Ile Ile Pro
145 150 155 160

Cys Asn Leu Tyr Gly Lys Tyr Asp Lys Phe Asp Glu His Ser Ser His
165 170 175

Met Ile Pro Ala Val Ile Asn Arg Ile His Asn Ala Lys Val Asn Asn
180 185 190

Ile Lys Leu Ile Glu Ile Trp Gly Asp Gly Glu Ser Arg Arg Glu Phe
195 200 205

Met Tyr Ala Glu Asp Phe Ala Asn Phe Ile Tyr Gln Ala Ile Pro Asn
210 215 220

Ile Gln Arg Leu Pro Cys Met Leu Asn Val Gly Leu Gly His Asp Phe
225 230 235 240

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

Gly Ser Phe Thr His Asp Leu Thr Lys Pro Val Gly Met Arg Arg Lys

260 265 270

Leu Val Asp Ile Thr Leu Leu Ser Glu Phe Gly Trp Lys Tyr Gln Phe
275 280 285

Glu Leu Arg Asp Gly Ile Lys Glu Thr Tyr Lys Tyr Tyr Leu Glu Asn
290 295 300

Val Tyr Lys
305