SEQUENCE LISTING

<110> Commonwealth Scientific and Industrial Research Organisation
Nourish Ingredients Pty Ltd

<120> PRODUCTION OF PHOSPHOLIPIDS IN MICROBES AND USES THEREOF

<130> 533510pct

<150> AU2021900593
<151> 2021-03-03

<150> AU2021903366
<151> 2021-10-20

<150> AU2021903367
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<150> AU2021904195
<151> 2021-12-22

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<170> PatentIn version 3.5

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Met Ser Ala Val Thr Val Thr Gly Ser Asp Pro Lys Asn Arg Gly Ser
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Ser Ser Asn Thr Glu Gln Glu Val Pro Lys Val Ala Ile Asp Thr Asn
20 25 30

Gly Asn Val Phe Ser Val Pro Asp Phe Thr Ile Lys Asp Ile Leu Gly
35 40 45

Ala Ile Pro His Glu Cys Tyr Glu Arg Arg Leu Ala Thr Ser Leu Tyr
50 55 60

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Tyr Val Phe Arg Asp Ile Phe Cys Met Leu Thr Thr Gly Tyr Leu Thr
65                  70                  75                  80

His Lys Ile Leu Tyr Pro Leu Leu Ile Ser Tyr Thr Ser Asn Ser Ile
                85                  90                  95

Ile Lys Phe Thr Phe Trp Ala Leu Tyr Thr Tyr Val Gln Gly Leu Phe
            100                 105                 110

Gly Thr Gly Ile Trp Val Leu Ala His Glu Cys Gly His Gln Ala Phe
        115                 120                 125

Ser Asp Tyr Gly Ile Val Asn Asp Phe Val Gly Trp Thr Leu His Ser
    130                 135                 140

Tyr Leu Met Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Gly Lys His
145                 150                 155                 160

His Lys Ala Thr Gly His Met Thr Arg Asp Met Val Phe Val Pro Ala
                165                 170                 175

Thr Lys Glu Glu Phe Lys Lys Ser Arg Asn Phe Phe Gly Asn Leu Ala
            180                 185                 190

Glu Tyr Ser Glu Asp Ser Pro Leu Arg Thr Leu Tyr Glu Leu Leu Val
        195                 200                 205

Gln Gln Leu Gly Gly Trp Ile Ala Tyr Leu Phe Val Asn Val Thr Gly
    210                 215                 220

Gln Pro Tyr Pro Asp Val Pro Ser Trp Lys Trp Asn His Phe Trp Leu
225                 230                 235                 240

Thr Ser Pro Leu Phe Glu Gln Arg Asp Ala Leu Tyr Ile Phe Leu Ser
                245                 250                 255
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Asp Leu Gly Ile Leu Thr Gln Gly Ile Val Leu Thr Leu Trp Tyr Lys
            260                 265                 270

Lys Phe Gly Gly Trp Ser Leu Phe Ile Asn Trp Phe Val Pro Tyr Ile
        275                 280                 285

Trp Val Asn His Trp Leu Val Phe Ile Thr Phe Leu Gln His Thr Asp
    290                 295                 300

Pro Thr Met Pro His Tyr Asn Ala Glu Glu Trp Thr Phe Ala Lys Gly
305                 310                 315                 320

Ala Ala Ala Thr Ile Asp Arg Lys Phe Gly Phe Ile Gly Pro His Ile
                325                 330                 335

Phe His Asp Ile Ile Glu Thr His Val Leu His His Tyr Cys Ser Arg
            340                 345                 350

Ile Pro Phe Tyr Asn Ala Arg Pro Ala Ser Glu Ala Ile Lys Lys Val
        355                 360                 365

Met Gly Lys His Tyr Arg Ser Ser Asp Glu Asn Met Trp Lys Ser Leu
    370                 375                 380

Trp Lys Ser Phe Arg Ser Cys Gln Tyr Val Asp Gly Asp Asn Gly Val
385                 390                 395                 400

Leu Met Phe Arg Asn Ile Asn Asn Cys Gly Val Gly Ala Ala Glu Lys
                405                 410                 415
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<210> 2
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<213> Yarrowia lipolytica

<400> 2

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Met Asp Ser Thr Thr Gln Thr Asn Thr Gly Thr Gly Lys Val Ala Val
1               5                   10                  15
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Gln Pro Pro Thr Ala Phe Ile Lys Pro Ile Glu Lys Val Ser Glu Pro
            20                  25                  30

Val Tyr Asp Thr Phe Gly Asn Glu Phe Thr Pro Pro Asp Tyr Ser Ile
        35                  40                  45

Lys Asp Ile Leu Asp Ala Ile Pro Gln Glu Cys Tyr Lys Arg Ser Tyr
    50                  55                  60

Val Lys Ser Tyr Ser Tyr Val Ala Arg Asp Cys Phe Phe Ile Ala Val
65                  70                  75                  80

Phe Ala Tyr Met Ala Tyr Ala Tyr Leu Pro Leu Ile Pro Ser Ala Ser
                85                  90                  95

Gly Arg Ala Val Ala Trp Ala Met Tyr Ser Ile Val Gln Gly Leu Phe
            100                 105                 110

Gly Thr Gly Leu Trp Val Leu Ala His Glu Cys Gly His Ser Ala Phe
        115                 120                 125

Ser Asp Ser Asn Thr Val Asn Asn Val Thr Gly Trp Val Leu His Ser
    130                 135                 140

Ser Met Leu Val Pro Tyr Tyr Ala Trp Lys Leu Thr His Ser Met His
145                 150                 155                 160

His Lys Ser Thr Gly His Leu Thr Arg Asp Met Val Phe Val Pro Lys
                165                 170                 175

Asp Arg Lys Glu Phe Met Glu Asn Arg Gly Ala His Asp Trp Ser Glu
            180                 185                 190

Leu Ala Glu Asp Ala Pro Leu Met Thr Leu Tyr Gly Leu Ile Thr Gln
        195                 200                 205

Gln Val Phe Gly Trp Pro Leu Tyr Leu Leu Ser Asn Val Thr Gly Gln
```

210 215 220

Lys Tyr Pro Lys Leu Asn Lys Trp Ala Val Asn His Phe Asn Pro Asn
225 230 235 240

Ala Pro Leu Phe Glu Lys Lys Asp Trp Phe Asn Ile Trp Ile Ser Asn
245 250 255

Val Gly Ile Gly Ile Thr Met Ser Val Ile Ala Tyr Ser Ile Asn Arg
260 265 270

Trp Gly Leu Ala Ser Val Thr Leu Tyr Tyr Leu Ile Pro Tyr Leu Trp
275 280 285

Val Asn His Trp Leu Val Ala Ile Thr Tyr Leu Gln His Thr Asp Pro
290 295 300

Thr Leu Pro His Tyr His Ala Asp Gln Trp Asn Phe Thr Arg Gly Ala
305 310 315 320

Ala Ala Thr Ile Asp Arg Glu Phe Gly Phe Ile Gly Ser Phe Cys Phe
325 330 335

His Asp Ile Ile Glu Thr His Val Leu His His Tyr Val Ser Arg Ile
340 345 350

Pro Phe Tyr Asn Ala Arg Ile Ala Thr Glu Lys Ile Lys Lys Val Met
355 360 365

Gly Lys His Tyr Arg His Asp Asp Thr Asn Phe Ile Lys Ser Leu Tyr
370 375 380

Thr Val Ala Arg Thr Cys Gln Phe Val Glu Gly Lys Glu Gly Ile Gln
385 390 395 400

Met Phe Arg Asn Val Asn Gly Val Gly Val Ala Pro Asp Gly Leu Pro
405 410 415

Ser Lys Lys

<210> 3
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<213> Acheta domesticus

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Met Asp Leu Asn Glu Glu Ser Ala Pro Ser Gly Val Leu Phe Glu Glu
1 5 10 15

Asp Val Ala Glu Gln Glu Ala Lys Met Ala Asn Gly Gly Pro Lys Lys
20 25 30

Gly Lys Lys Leu Glu Glu Pro Tyr Arg Leu Glu Ile Val Trp Phe Asn
35 40 45

Val Leu Trp Phe Val Leu Leu His Ala Gly Ala Leu Tyr Gly Val Tyr
50 55 60

Leu Ile Phe Ala Ser Ala Lys Ile Tyr Thr Thr Leu Tyr Gly Phe Leu
65 70 75 80

Leu Cys Glu Leu Ser Leu Leu Ser Ile Thr Ala Gly Val His Arg Leu
85 90 95

Trp Ala His Arg Ala Tyr Lys Ala Lys Trp Pro Leu Arg Leu Thr Leu
100 105 110

Met Val Leu Asn Leu Leu Ala Tyr Gln Asn Ser Ile Tyr Glu Trp Ala
115 120 125

Arg Asp His Arg Val His His Lys Phe Ser Glu Thr Asn Ala Asp Pro
130 135 140

Val Asn Ala Lys Arg Gly Phe Phe Phe Ser His Val Gly Trp Leu Leu
145 150 155 160

```
Cys Arg Lys His Pro Glu Val Arg Ala Lys Gly Gly Arg Ile Asp Leu
                165                 170                 175

Ser Asp Leu Glu Arg Asp Pro Ile Val Met Phe Gln Lys Arg His Tyr
            180                 185                 190

Tyr Lys Leu Val Pro Phe Val Ser Phe Val Ile Pro Thr Leu Ile Pro
        195                 200                 205

Met Tyr Phe Trp Gly Glu Thr Leu Ser Asn Ser Trp Tyr Val Ser Thr
    210                 215                 220

Met Phe Arg Tyr Cys Leu Ser Leu Asn Leu Thr Trp Leu Val Asn Ser
225                 230                 235                 240

Ala Ala His Met Trp Gly Asn Lys Pro Tyr Asp Lys Asn Ile Asn Pro
                245                 250                 255

Val Glu Asn Leu Ala Val Ala Ile Gly Ser Leu Gly Glu Gly Trp His
            260                 265                 270

Asn Phe His His Val Phe Pro Trp Asp Tyr Lys Thr Ser Glu Leu Gly
        275                 280                 285

Asn Tyr Ser Leu Asn Phe Thr Asn Ala Phe Ile Asp Leu Ala Val Leu
    290                 295                 300

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

Thr Arg Val Gly Arg Thr Gly Asp Gly Ser His Asp Val Trp Gly Trp
                325                 330                 335

Gly Asp Lys Asp Leu Pro Lys Glu Leu Ala Asp Gln Thr Met Ile Glu
            340                 345                 350
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Asn Arg Lys Thr Glu
355

<210> 4
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<212> PRT
<213> Fusarium moniliforme

<400> 4

Met Ala Ser Thr Ser Ala Leu Pro Lys Gln Asn Pro Ala Leu Arg Arg
1 5 10 15

Thr Val Thr Ser Thr Thr Val Thr Asp Ser Glu Ser Ala Ala Val Ser
20 25 30

Pro Ser Asp Ser Pro Arg His Ser Ala Ser Ser Thr Ser Leu Ser Ser
35 40 45

Met Ser Glu Val Asp Ile Ala Lys Pro Lys Ser Glu Tyr Gly Val Met
50 55 60

Leu Asp Thr Tyr Gly Asn Gln Phe Glu Val Pro Asp Phe Thr Ile Lys
65 70 75 80

Asp Ile Tyr Asn Ala Ile Pro Lys His Cys Phe Lys Arg Ser Ala Leu
85 90 95

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

Phe Ser Ile Trp Tyr Asn Phe Val Thr Pro Glu Tyr Ile Pro Ser Thr
115 120 125

Pro Ala Arg Ala Gly Leu Trp Ala Val Tyr Thr Val Leu Gln Gly Leu
130 135 140

Phe Gly Thr Gly Leu Trp Val Ile Ala His Glu Cys Gly His Gly Ala
145 150 155 160

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

Ser Ser Leu Leu Val Pro Tyr Phe Ser Trp Gln Ile Ser His Arg Lys
            180                 185                 190

His His Lys Ala Thr Gly Asn Met Glu Arg Asp Met Val Phe Val Pro
        195                 200                 205

Arg Thr Arg Glu Gln Gln Ala Thr Arg Leu Gly Lys Met Thr His Glu
    210                 215                 220

Leu Ala His Leu Thr Glu Glu Thr Pro Ala Phe Thr Leu Leu Met Leu
225                 230                 235                 240

Val Leu Gln Gln Leu Val Gly Trp Pro Asn Tyr Leu Ile Thr Asn Val
                245                 250                 255

Thr Gly His Asn Tyr His Glu Arg Gln Arg Glu Gly Arg Gly Lys Gly
            260                 265                 270

Lys His Asn Gly Leu Gly Gly Gly Val Asn His Phe Asp Pro Arg Ser
        275                 280                 285

Pro Leu Tyr Glu Asn Ser Asp Ala Lys Leu Ile Val Leu Ser Asp Ile
    290                 295                 300

Gly Ile Gly Leu Met Ala Thr Ala Leu Tyr Phe Leu Val Gln Lys Phe
305                 310                 315                 320

Gly Phe Tyr Asn Met Ala Ile Trp Tyr Phe Val Pro Tyr Leu Trp Val
                325                 330                 335

Asn His Trp Leu Val Ala Ile Thr Phe Leu Gln His Thr Asp Pro Thr
            340                 345                 350

Leu Pro His Tyr Thr Asn Asp Glu Trp Asn Phe Val Arg Gly Ala Ala
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355 360 365

Ala Thr Ile Asp Arg Glu Met Gly Phe Ile Gly Arg His Leu Leu His
370 375 380

Gly Ile Ile Glu Thr His Val Leu His His Tyr Val Ser Ser Ile Pro
385 390 395 400

Phe Tyr Asn Ala Asp Glu Ala Thr Glu Ala Ile Lys Pro Ile Met Gly
405 410 415

Lys His Tyr Arg Ala Asp Val Gln Asp Gly Pro Arg Gly Phe Ile Arg
420 425 430

Ala Met Tyr Arg Ser Ala Arg Met Cys Gln Trp Val Glu Pro Ser Ala
435 440 445

Gly Ala Glu Gly Ala Gly Lys Gly Val Leu Phe Phe Arg Asn Arg Asn
450 455 460

Asn Val Gly Thr Pro Pro Ala Val Ile Lys Pro Val Ala
465 470 475

<210> 5
<211> 456
<212> PRT
<213> Ostreococcus tauri

<400> 5

Met Cys Val Glu Thr Glu Asn Asn Asp Gly Ile Pro Thr Val Glu Ile
1 5 10 15

Ala Phe Asp Gly Glu Arg Glu Arg Ala Glu Ala Asn Val Lys Leu Ser
20 25 30

Ala Glu Lys Met Glu Pro Ala Ala Leu Ala Lys Thr Phe Ala Arg Arg
35 40 45

```
Tyr Val Val Ile Glu Gly Val Glu Tyr Asp Val Thr Asp Phe Lys His
    50                  55                  60

Pro Gly Gly Thr Val Ile Phe Tyr Ala Leu Ser Asn Thr Gly Ala Asp
65                  70                  75                  80

Ala Thr Glu Ala Phe Lys Glu Phe His His Arg Ser Arg Lys Ala Arg
                85                  90                  95

Lys Ala Leu Ala Ala Leu Pro Ser Arg Pro Ala Lys Thr Ala Lys Val
            100                 105                 110

Asp Asp Ala Glu Met Leu Gln Asp Phe Ala Lys Trp Arg Lys Glu Leu
        115                 120                 125

Glu Arg Asp Gly Phe Phe Lys Pro Ser Pro Ala His Val Ala Tyr Arg
    130                 135                 140

Phe Ala Glu Leu Ala Ala Met Tyr Ala Leu Gly Thr Tyr Leu Met Tyr
145                 150                 155                 160

Ala Arg Tyr Val Val Ser Ser Val Leu Val Tyr Ala Cys Phe Phe Gly
                165                 170                 175

Ala Arg Cys Gly Trp Val Gln His Glu Gly Gly His Ser Ser Leu Thr
            180                 185                 190

Gly Asn Ile Trp Trp Asp Lys Arg Ile Gln Ala Phe Thr Ala Gly Phe
        195                 200                 205

Gly Leu Ala Gly Ser Gly Asp Met Trp Asn Ser Met His Asn Lys His
    210                 215                 220

His Ala Thr Pro Gln Lys Val Arg His Asp Met Asp Leu Asp Thr Thr
225                 230                 235                 240

Pro Ala Val Ala Phe Phe Asn Thr Ala Val Glu Asp Asn Arg Pro Arg
                245                 250                 255
```

```
Gly Phe Ser Lys Tyr Trp Leu Arg Leu Gln Ala Trp Thr Phe Ile Pro
            260                 265                 270

Val Thr Ser Gly Leu Val Leu Leu Phe Trp Met Phe Phe Leu His Pro
        275                 280                 285

Ser Lys Ala Leu Lys Gly Gly Lys Tyr Glu Glu Leu Val Trp Met Leu
    290                 295                 300

Ala Ala His Val Ile Arg Thr Trp Thr Ile Lys Ala Val Thr Gly Phe
305                 310                 315                 320

Thr Ala Met Gln Ser Tyr Gly Leu Phe Leu Ala Thr Ser Trp Val Ser
                325                 330                 335

Gly Cys Tyr Leu Phe Ala His Phe Ser Thr Ser His Thr His Leu Asp
            340                 345                 350

Val Val Pro Ala Asp Glu His Leu Ser Trp Val Arg Tyr Ala Val Asp
        355                 360                 365

His Thr Ile Asp Ile Asp Pro Ser Gln Gly Trp Val Asn Trp Leu Met
    370                 375                 380

Gly Tyr Leu Asn Cys Gln Val Ile His His Leu Phe Pro Ser Met Pro
385                 390                 395                 400

Gln Phe Arg Gln Pro Glu Val Ser Arg Arg Phe Val Ala Phe Ala Lys
                405                 410                 415

Lys Trp Asn Leu Asn Tyr Lys Val Met Thr Tyr Ala Gly Ala Trp Lys
            420                 425                 430

Ala Thr Leu Gly Asn Leu Asp Asn Val Gly Lys His Tyr Tyr Val His
        435                 440                 445
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Gly Gln His Ser Gly Lys Thr Ala
450 455

<210> 6
<211> 457
<212> PRT
<213> Mortierella alpina

<400> 6

Met Ala Ala Ala Pro Ser Val Arg Thr Phe Thr Arg Ala Glu Ile Leu
1 5 10 15

Asn Ala Glu Ala Leu Asn Glu Gly Lys Lys Asp Ala Glu Ala Pro Phe
20 25 30

Leu Met Ile Ile Asp Asn Lys Val Tyr Asp Val Arg Glu Phe Val Pro
35 40 45

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

Thr Asp Val Phe Asp Thr Phe His Pro Glu Ala Ala Trp Glu Thr Leu
65 70 75 80

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

Asn Asp Asp Phe Ala Ala Glu Val Arg Lys Leu Arg Thr Leu Phe Gln
100 105 110

Ser Leu Gly Tyr Tyr Asp Ser Ser Lys Ala Tyr Tyr Ala Phe Lys Val
115 120 125

Ser Phe Asn Leu Cys Ile Trp Gly Leu Ser Thr Phe Ile Val Ala Lys
130 135 140

Arg Gly Gln Thr Ser Thr Leu Ala Asn Glu Leu Ser Ala Ala Leu Leu
145 150 155 160

```
Gly Leu Phe Trp Gln Gln Arg Gly Trp Leu Ala His Asp Phe Leu His
                165                 170                 175

His Gln Val Phe Gln Asp Arg Phe Trp Gly Asp Leu Phe Gly Ala Phe
            180                 185                 190

Leu Gly Gly Asp Cys Gln Gly Phe Ser Ser Ser Trp Trp Lys Asp Lys
        195                 200                 205

His Asn Thr His His Ala Ala Pro Asn Val His Gly Glu Asp Pro Asp
    210                 215                 220

Ile Asp Thr His Pro Leu Leu Thr Trp Ser Glu His Ala Leu Glu Met
225                 230                 235                 240

Phe Ser Asp Val Pro Asp Glu Glu Leu Thr Arg Met Trp Ser Arg Phe
                245                 250                 255

Met Val Leu Asn Gln Thr Trp Phe Tyr Phe Pro Ile Leu Ser Phe Ala
            260                 265                 270

Arg Leu Ser Trp Cys Leu Gln Ser Ile Leu Phe Val Leu Pro Asn Gly
        275                 280                 285

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

Gln Leu Ser Leu Ala Met His Trp Thr Trp Tyr Leu Ala Thr Met Phe
305                 310                 315                 320

Leu Phe Ile Lys Asp Pro Val Asn Met Met Val Tyr Phe Leu Val Ser
                325                 330                 335

Gln Ala Val Cys Gly Asn Leu Leu Ala Ile Val Phe Ser Leu Asn His
            340                 345                 350

Asn Gly Met Pro Val Ile Ser Lys Glu Glu Ala Val Asp Met Asp Phe
```

355 360 365

Phe Thr Lys Gln Ile Ile Thr Gly Arg Asp Val His Pro Gly Leu Phe
370 375 380

Ala Asn Trp Phe Thr Gly Gly Leu Asn Tyr Gln Ile Glu His His Leu
385 390 395 400

Phe Pro Ser Met Pro Arg His Asn Phe Ser Lys Ile Gln Pro Ala Val
405 410 415

Glu Thr Leu Cys Lys Lys Tyr Gly Val Arg Tyr His Thr Thr Gly Met
420 425 430

Ile Glu Gly Thr Ala Glu Val Phe Ser Arg Leu Asn Glu Val Ser Lys
435 440 445

Ala Ala Ser Lys Met Gly Lys Ala Gln
450 455

<210> 7
<211> 272
<212> PRT
<213> Pavlova pinguis

<400> 7

Met Val Ala Pro Pro Ile Thr Leu Glu Trp Leu Leu Ser Pro Lys Leu
1 5 10 15

Lys Asp Ala Val Phe Gly Gly Glu Val Leu Tyr Phe Ser Ile Ala Tyr
20 25 30

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

Lys Gly Ala Tyr Lys Ser Gly Met Ile Ala Tyr Asn Val Ile Met Cys
50 55 60

```
Val Phe Ser Leu Val Cys Phe Ile Cys Gln Leu Ala Ala Leu Gly Tyr
65                  70                  75                  80

Asp Met Gly Tyr Leu Gln Trp Val Arg Asp Leu Thr Gly Asp Glu Ile
                85                  90                  95

Val Pro Leu Tyr Gln Asp Val Ser Pro Ser Pro Ala Phe Ser Asn Lys
            100                 105                 110

Leu Phe Lys Tyr Ser Ser Ile Ala Phe His Tyr Ser Lys Tyr Val Glu
        115                 120                 125

Tyr Met Asp Thr Ala Trp Leu Val Met Lys Gly Lys Pro Val Ser Leu
    130                 135                 140

Leu Gln Gly Phe His His Phe Gly Ala Ala Trp Asp Thr Tyr Phe Gly
145                 150                 155                 160

Ile Thr Phe Gln Asn Glu Gly Ile Tyr Val Phe Val Val Leu Asn Ala
                165                 170                 175

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

Leu Lys Phe Ser Leu Lys Phe Val Ile Thr Leu Met Gln Ile Thr Gln
        195                 200                 205

Phe Asn Val Gly Phe Val Met Val Tyr His Tyr Ile Thr Leu Glu Tyr
    210                 215                 220

Phe Arg Asn Ser Pro Glu Leu Val Phe Ser Tyr Leu Phe Asn Tyr Ala
225                 230                 235                 240

Tyr Val Cys Thr Val Leu Leu Leu Phe Met Gln Phe Phe Tyr Met Asp
                245                 250                 255

Asn Phe Gly Lys Lys Lys Ala Ala Ala Ala Ala Gly Lys Lys Lys Lys
            260                 265                 270
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<210> 8
<211> 279
<212> PRT
<213> Pavlova salina

<400> 8

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


Pro Gly Leu Lys Asp Ala Val Ile Gly Gly Glu Val Leu Tyr Phe Ser
            20                  25                  30


Leu Gly Tyr Leu Leu Leu Glu Pro Ile Leu Lys Arg Ser Pro Phe Val
        35                  40                  45


Asp Lys Arg Lys Gly Ala Tyr Arg Asn Gly Met Ile Ala Tyr Asn Ile
    50                  55                  60


Leu Met Cys Gly Phe Ser Leu Val Cys Phe Val Cys Gln Met Ala Ala
65                  70                  75                  80


Leu Gly Leu Asp Arg Gly His Leu Gln Phe Val Arg Asp Leu Thr Gly
                85                  90                  95


Asp Ser Val Val Gln Leu Tyr Gln Asp Val Ser Pro Ser Pro Ala Phe
            100                 105                 110


Ala Asn Lys Leu Phe Arg Tyr Ser Ala Val Ala Phe His Tyr Ser Lys
        115                 120                 125


Tyr Val Glu Tyr Met Asp Thr Ala Trp Leu Val Leu Lys Gly Lys Pro
    130                 135                 140


Val Ser Phe Leu Gln Gly Phe His His Phe Gly Ala Ala Trp Asp Thr
145                 150                 155                 160


Tyr Phe Gly Ile Thr Phe Gln Asn Glu Gly Thr Tyr Val Phe Val Leu
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165 170 175

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

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

Ile Thr Gln Phe Leu Leu Gly Phe Ala Leu Val Tyr Pro Tyr Ile Asp
210 215 220

Leu Gly Tyr Phe Arg Ala Ser Pro Glu Leu Val Trp Ser Tyr Leu Phe
225 230 235 240

Asn Tyr Ala Tyr Val Leu Met Val Leu Phe Leu Phe Met Arg Phe Phe
245 250 255

Tyr His Asp Asn Phe Ser Lys His Lys Pro Ile Ser Arg Ile Asp Ser
260 265 270

Ser Asn Arg Met Lys Thr Glu
275

<210> 9
<211> 258
<212> PRT
<213> Isochrysis galbana

<400> 9

Met Ala Leu Ala Asn Asp Ala Gly Glu Arg Ile Trp Ala Ala Val Thr
1 5 10 15

Asp Pro Glu Ile Leu Ile Gly Thr Phe Ser Tyr Leu Leu Leu Lys Pro
20 25 30

Leu Leu Arg Asn Ser Gly Leu Val Asp Glu Lys Lys Gly Ala Tyr Arg
35 40 45

```
Thr Ser Met Ile Trp Tyr Asn Val Leu Leu Ala Leu Phe Ser Ala Leu
    50                  55                  60

Ser Phe Tyr Val Thr Ala Thr Ala Leu Gly Trp Asp Tyr Gly Thr Gly
65                  70                  75                  80

Ala Trp Leu Arg Arg Gln Thr Gly Asp Thr Pro Gln Pro Leu Phe Gln
                85                  90                  95

Cys Pro Ser Pro Val Trp Asp Ser Lys Leu Phe Thr Trp Thr Ala Lys
            100                 105                 110

Ala Phe Tyr Tyr Ser Lys Tyr Val Glu Tyr Leu Asp Thr Ala Trp Leu
        115                 120                 125

Arg Val Ser Phe Leu Gln Ala Phe His His Phe Gly Ala Pro Trp Asp
    130                 135                 140

Val Tyr Leu Gly Ile Arg Leu His Asn Glu Gly Val Trp Ile Phe Met
145                 150                 155                 160

Phe Phe Asn Ser Phe Ile His Thr Ile Met Tyr Thr Tyr Tyr Gly Leu
                165                 170                 175

Thr Ala Ala Gly Tyr Lys Phe Lys Ala Lys Pro Leu Ile Thr Ala Met
            180                 185                 190

Gln Ile Cys Gln Phe Val Gly Gly Phe Leu Leu Val Trp Asp Tyr Ile
        195                 200                 205

Asn Val Pro Cys Phe Asn Ser Asp Lys Gly Lys Leu Phe Ser Trp Ala
    210                 215                 220

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

Phe Tyr Gln Asp Asn Leu Ala Thr Lys Lys Ser Ala Lys Ala Gly Lys
                245                 250                 255
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Gln Leu

<210> 10
<211> 263
<212> PRT
<213> Isochrysis galbana

<400> 10

Met Ala Leu Ala Asn Asp Ala Gly Glu Arg Ile Trp Ala Ala Val Thr
1 5 10 15

Asp Pro Glu Ile Leu Ile Gly Thr Phe Ser Tyr Leu Leu Leu Lys Pro
20 25 30

Leu Leu Arg Asn Ser Gly Leu Val Asp Glu Lys Lys Gly Ala Tyr Arg
35 40 45

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

Ser Phe Tyr Val Thr Ala Thr Ala Leu Gly Trp Asp Tyr Gly Thr Gly
65 70 75 80

Ala Trp Leu Arg Arg Gln Thr Gly Asp Thr Pro Gln Pro Leu Phe Gln
85 90 95

Cys Pro Ser Pro Val Trp Asp Ser Lys Leu Phe Thr Trp Thr Ala Lys
100 105 110

Ala Phe Tyr Tyr Ser Lys Tyr Val Glu Tyr Leu Asp Thr Ala Trp Leu
115 120 125

Val Leu Lys Gly Lys Arg Val Ser Phe Leu Gln Ala Phe His His Phe
130 135 140

Gly Ala Pro Trp Asp Val Tyr Leu Gly Ile Arg Leu His Asn Glu Gly

145 150 155 160

Val Trp Ile Phe Met Phe Phe Asn Ser Phe Ile His Thr Ile Met Tyr
165 170 175

Thr Tyr Tyr Gly Leu Thr Ala Ala Gly Tyr Lys Phe Lys Ala Lys Pro
180 185 190

Leu Ile Thr Ala Met Gln Ile Cys Gln Phe Val Gly Gly Phe Leu Leu
195 200 205

Val Trp Asp Tyr Ile Asn Val Pro Cys Phe Asn Ser Asp Lys Gly Lys
210 215 220

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

Leu Phe Cys His Phe Phe Tyr Gln Asp Asn Leu Ala Thr Lys Lys Ser
245 250 255

Ala Lys Ala Gly Lys Gln Leu
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<210> 11
<211> 261
<212> PRT
<213> Isochrysis galbana

<400> 11

Met Ala Thr Glu Ala Thr Ala Ser Ile Trp Ala Ala Val Ser Asp Pro
1 5 10 15

Glu Ile Leu Ile Gly Thr Phe Ser Tyr Leu Leu Leu Lys Pro Ile Leu
20 25 30

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

```
Met Ile Trp Tyr Asn Val Ile Leu Ala Leu Phe Ser Ala Thr Ser Phe
    50                  55                  60

Tyr Val Thr Ala Thr Ala Leu Gly Trp Asp Tyr Gly Ser Gly Glu Trp
65                  70                  75                  80

Leu Arg Arg Leu Thr Gly Asp Thr Pro Gln Pro Leu Phe Gln Cys Pro
                85                  90                  95

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

Tyr Tyr Ser Lys Tyr Val Glu Tyr Leu Asp Thr Ala Trp Leu Val Leu
        115                 120                 125

Lys Gly Lys Asn Val Ser Phe Leu Gln Ala Phe His His Phe Gly Ala
    130                 135                 140

Pro Trp Asp Val Tyr Leu Gly Ile Arg Leu Gln Asn Glu Gly Val Trp
145                 150                 155                 160

Ile Phe Met Phe Phe Asn Ser Phe Ile His Thr Ile Met Tyr Thr Tyr
                165                 170                 175

Tyr Gly Leu Thr Ala Ala Gly Tyr Lys Ile Lys Ala Lys Pro Leu Ile
            180                 185                 190

Thr Ala Met Gln Ile Ser Gln Phe Met Gly Gly Phe Ile Leu Val Trp
        195                 200                 205

Asp Tyr Ile Asn Ile Pro Cys Phe Arg Ser Asp Asn Gly Lys Val Phe
    210                 215                 220

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

Cys His Phe Phe Tyr Lys Asp Asn Leu Ala Ser Lys Lys Pro Ala Lys
                245                 250                 255
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Gly Gly Lys Ala Leu
260

<210> 12
<211> 266
<212> PRT
<213> Emiliania huxleyi

<400> 12

Met Leu Asp Arg Ala Ser Ser Asp Ala Ala Ile Trp Ser Ala Val Ser
1 5 10 15

Asp Pro Glu Ile Leu Ile Gly Thr Phe Ser Tyr Leu Leu Leu Lys Pro
20 25 30

Leu Leu Arg Asn Ser Gly Leu Val Asp Glu Arg Lys Gly Ala Tyr Arg
35 40 45

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

Ser Phe Tyr Val Thr Ala Thr Ala Leu Gly Trp Asp Lys Gly Thr Gly
65 70 75 80

Glu Trp Leu Arg Ser Leu Thr Gly Asp Ser Pro Gln Gln Leu Trp Gln
85 90 95

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

Ala Phe Tyr Tyr Ser Lys Tyr Val Glu Tyr Leu Asp Thr Ala Trp Leu
115 120 125

Val Leu Lys Gly Lys Lys Val Ser Phe Leu Gln Gly Phe His His Phe
130 135 140

Gly Ala Pro Trp Asp Val Tyr Leu Gly Ile Arg Leu Lys Asn Glu Gly

145 150 155 160

Val Trp Ile Phe Met Phe Phe Asn Ser Phe Ile His Thr Val Met Tyr
165 170 175

Thr Tyr Tyr Gly Leu Thr Ala Ala Gly Tyr Lys Ile Arg Gly Lys Pro
180 185 190

Ile Ile Thr Ala Met Gln Ile Ser Gln Phe Val Gly Gly Phe Val Leu
195 200 205

Val Trp Asp Tyr Ile Asn Val Pro Cys Phe His Ala Asp Ala Gly Gln
210 215 220

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

Leu Phe Cys His Phe Phe Tyr Met Asp Asn Ile Ala Lys Ala Lys Ala
245 250 255

Lys Lys Ala Val Ala Thr Arg Lys Ala Leu
260 265

<210> 13
<211> 297
<212> PRT
<213> Pyramimonas cordata

<400> 13

Met Glu Phe Ala Gln Pro Leu Val Ala Met Ala Gln Glu Gln Tyr Ala
1 5 10 15

Ala Ile Asp Ala Val Val Ala Pro Ala Ile Phe Ser Ala Thr Asp Ser
20 25 30

Ile Gly Trp Gly Leu Lys Pro Ile Ser Ser Ala Thr Lys Asp Leu Pro
35 40 45

```
Leu Val Glu Ser Pro Thr Pro Leu Ile Leu Ser Leu Leu Ala Tyr Phe
    50                  55                  60

Ala Ile Val Gly Ser Gly Leu Val Tyr Arg Lys Val Phe Pro Arg Thr
65                  70                  75                  80

Val Lys Gly Gln Asp Pro Phe Leu Leu Lys Ala Leu Met Leu Ala His
                85                  90                  95

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

Tyr Glu Ala Tyr Val Asn Lys Tyr Ser Phe Trp Gly Asn Ala Tyr Asn
        115                 120                 125

Pro Ala Gln Thr Glu Met Ala Lys Val Ile Trp Ile Phe Tyr Val Ser
    130                 135                 140

Lys Ile Tyr Glu Phe Met Asp Thr Phe Ile Met Leu Leu Lys Gly Asn
145                 150                 155                 160

Val Asn Gln Val Ser Phe Leu His Val Tyr His His Gly Ser Ile Ser
                165                 170                 175

Gly Ile Trp Trp Met Ile Thr Tyr Ala Ala Pro Gly Gly Asp Ala Tyr
            180                 185                 190

Phe Ser Ala Ala Leu Asn Ser Trp Val His Val Cys Met Tyr Thr Tyr
        195                 200                 205

Tyr Phe Met Ala Ala Val Leu Pro Lys Asp Glu Lys Thr Lys Arg Lys
    210                 215                 220

Tyr Leu Trp Trp Gly Arg Tyr Leu Thr Gln Met Gln Met Phe Gln Phe
225                 230                 235                 240

Phe Met Asn Leu Leu Gln Ala Val Tyr Leu Leu Tyr Ser Ser Ser Pro
                245                 250                 255
```

```
Tyr Pro Lys Phe Ile Ala Gln Leu Leu Val Val Tyr Met Val Thr Leu
            260                 265                 270


Leu Met Leu Phe Gly Asn Phe Tyr Tyr Met Lys His His Ala Ser Lys
        275                 280                 285


Lys Gln Lys Leu Ala Ser Lys Lys Gln
    290                 295
```

<210> 14
<211> 427
<212> PRT
<213> Pavlova salina

<400> 14

```
Met Gly Arg Gly Gly Asp Ser Ser Gly Gln Ala His Pro Ala Ala Glu
1               5                   10                  15


Leu Ala Val Pro Ser Asp Arg Ala Glu Val Ser Asn Ala Asp Ser Lys
            20                  25                  30


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


Gln Arg Thr His Pro Gly Gly Ser Lys Val Phe Arg Ile Phe Gln Asp
    50                  55                  60


Arg Asp Ala Thr Glu Gln Phe Glu Ser Tyr His Ser Lys Arg Ala Ile
65                  70                  75                  80


Lys Met Met Glu Gly Met Leu Lys Lys Ser Glu Asp Ala Pro Ala Asp
                85                  90                  95


Thr Pro Leu Pro Ser Gln Ser Pro Met Gly Lys Asp Phe Lys Ala Met
            100                 105                 110


Ile Glu Arg His Val Ala Ala Gly Tyr Tyr Asp Pro Cys Pro Leu Asp
```

```
        115                 120                 125

Glu Leu Phe Lys Leu Ser Leu Val Leu Leu Pro Thr Phe Ala Gly Met
    130                 135                 140

Tyr Met Leu Lys Ala Gly Val Gly Ser Pro Leu Cys Gly Ala Leu Met
145                 150                 155                 160

Val Ser Phe Gly Trp Tyr Leu Asp Gly Trp Leu Ala His Asp Tyr Leu
                165                 170                 175

His His Ser Val Phe Lys Gly Ser Val Ala Arg Thr Val Gly Trp Asn
            180                 185                 190

Asn Ala Ala Gly Tyr Phe Leu Gly Phe Val Gln Gly Tyr Ala Val Glu
        195                 200                 205

Trp Trp Arg Ala Arg His Asn Thr His His Val Cys Thr Asn Glu Asp
    210                 215                 220

Gly Ser Asp Pro Asp Ile Lys Thr Ala Pro Leu Leu Ile Tyr Val Arg
225                 230                 235                 240

Asn Lys Pro Ser Ile Ala Lys Arg Leu Asn Ala Phe Gln Arg Tyr Gln
                245                 250                 255

Gln Tyr Tyr Tyr Val Pro Val Met Ala Ile Leu Asp Leu Tyr Trp Arg
            260                 265                 270

Leu Glu Ser Ile Ala Tyr Val Ala Met Arg Leu Pro Lys Met Leu Pro
        275                 280                 285

Gln Ala Leu Ala Leu Val Ala His Tyr Ala Ile Val Ala Trp Val Phe
    290                 295                 300

Ala Gly Asn Tyr His Leu Leu Pro Leu Val Thr Val Leu Arg Gly Phe
305                 310                 315                 320
```

```
Gly Thr Gly Ile Thr Val Phe Ala Thr His Tyr Gly Glu Asp Ile Leu
                325                 330                 335

Asp Ala Asp Gln Val Arg His Met Thr Leu Val Glu Gln Thr Ala Leu
            340                 345                 350

Thr Ser Arg Asn Ile Ser Gly Gly Trp Leu Val Asn Val Leu Thr Gly
        355                 360                 365

Phe Ile Ser Leu Gln Thr Glu His His Leu Phe Pro Met Met Pro Thr
    370                 375                 380

Gly Asn Leu Met Thr Ile Gln Pro Glu Val Arg Ala Phe Phe Lys Lys
385                 390                 395                 400

His Gly Leu Glu Tyr Arg Glu Gly Asn Leu Ile Glu Cys Val Arg Gln
                405                 410                 415

Asn Ile Arg Ala Leu Ala Phe Glu His Leu Leu
            420                 425
```

<210> 15
<211> 425
<212> PRT
<213> Pavlova salina

<400> 15

```
Met Pro Pro Arg Asp Ser Tyr Ser Tyr Ala Ala Pro Pro Ser Ala Gln
1               5                   10                  15

Leu His Glu Val Asp Thr Pro Gln Glu His Asp Lys Lys Glu Leu Val
            20                  25                  30

Ile Gly Asp Arg Ala Tyr Asp Val Thr Asn Phe Val Lys Arg His Pro
        35                  40                  45

Gly Gly Lys Ile Ile Ala Tyr Gln Val Gly Thr Asp Ala Thr Asp Ala
    50                  55                  60
```

```
Tyr Lys Gln Phe His Val Arg Ser Ala Lys Ala Asp Lys Met Leu Lys
65                  70                  75                  80

Ser Leu Pro Ser Arg Pro Val His Lys Gly Tyr Ser Pro Arg Arg Ala
                85                  90                  95

Asp Leu Ile Ala Asp Phe Gln Glu Phe Thr Lys Gln Leu Glu Ala Glu
            100                 105                 110

Gly Met Phe Glu Pro Ser Leu Pro His Val Ala Tyr Arg Leu Ala Glu
        115                 120                 125

Val Ile Ala Met His Val Ala Gly Ala Ala Leu Ile Trp His Gly Tyr
    130                 135                 140

Thr Phe Ala Gly Ile Ala Met Leu Gly Val Val Gln Gly Arg Cys Gly
145                 150                 155                 160

Trp Leu Met His Glu Gly Gly His Tyr Ser Leu Thr Gly Asn Ile Ala
                165                 170                 175

Phe Asp Arg Ala Ile Gln Val Ala Cys Tyr Gly Leu Gly Cys Gly Met
            180                 185                 190

Ser Gly Ala Trp Trp Arg Asn Gln His Asn Lys His His Ala Thr Pro
        195                 200                 205

Gln Lys Leu Gln His Asp Val Asp Leu Asp Thr Leu Pro Leu Val Ala
    210                 215                 220

Phe His Glu Arg Ile Ala Ala Lys Val Lys Ser Pro Ala Met Lys Ala
225                 230                 235                 240

Trp Leu Ser Met Gln Ala Lys Leu Phe Ala Pro Val Thr Thr Leu Leu
                245                 250                 255
```

```
Val Ala Leu Gly Trp Gln Leu Tyr Leu His Pro Arg His Met Leu Arg
            260                 265                 270

Thr Lys His Tyr Asp Glu Leu Ala Met Leu Gly Ile Arg Tyr Gly Leu
        275                 280                 285

Val Gly Tyr Leu Ala Ala Asn Tyr Gly Ala Gly Tyr Val Leu Ala Cys
    290                 295                 300

Tyr Leu Leu Tyr Val Gln Leu Gly Ala Met Tyr Ile Phe Cys Asn Phe
305                 310                 315                 320

Ala Val Ser His Thr His Leu Pro Val Val Glu Pro Asn Glu His Ala
                325                 330                 335

Thr Trp Val Glu Tyr Ala Ala Asn His Thr Thr Asn Cys Ser Pro Ser
            340                 345                 350

Trp Trp Cys Asp Trp Trp Met Ser Tyr Leu Asn Tyr Gln Ile Glu His
        355                 360                 365

His Leu Tyr Pro Ser Met Pro Gln Phe Arg His Pro Lys Ile Ala Pro
    370                 375                 380

Arg Val Lys Gln Leu Phe Glu Lys His Gly Leu His Tyr Asp Val Arg
385                 390                 395                 400

Gly Tyr Phe Glu Ala Met Ala Asp Thr Phe Ala Asn Leu Asp Asn Val
                405                 410                 415

Ala His Ala Pro Glu Lys Lys Met Gln
            420                 425
```

<210> 16
<211> 446
<212> PRT
<213> Mortierella alpina

<400> 16

```
Met Gly Thr Asp Gln Gly Lys Thr Phe Thr Trp Glu Glu Leu Ala Ala
1               5                  10                  15

His Asn Thr Lys Asp Asp Leu Leu Leu Ala Ile Arg Gly Arg Val Tyr
            20                  25                  30

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

Leu Leu Gly Ala Gly Arg Asp Val Thr Pro Val Phe Glu Met Tyr His
    50                  55                  60

Ala Phe Gly Ala Ala Asp Ala Ile Met Lys Lys Tyr Tyr Val Gly Thr
65                  70                  75                  80

Leu Val Ser Asn Glu Leu Pro Ile Phe Pro Glu Pro Thr Val Phe His
                85                  90                  95

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

Asp Pro Lys Asn Arg Pro Glu Ile Trp Gly Arg Tyr Ala Leu Ile Phe
        115                 120                 125

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

Val Glu Arg Thr Trp Leu Gln Val Val Phe Ala Ile Ile Met Gly Phe
145                 150                 155                 160

Ala Cys Ala Gln Val Gly Leu Asn Pro Leu His Asp Ala Ser His Phe
                165                 170                 175

Ser Val Thr His Asn Pro Thr Val Trp Lys Ile Leu Gly Ala Thr His
            180                 185                 190

Asp Phe Phe Asn Gly Ala Ser Tyr Leu Val Trp Met Tyr Gln His Met
```

195 200 205

Leu Gly His His Pro Tyr Thr Asn Ile Ala Gly Ala Asp Pro Asp Val
210 215 220

Ser Thr Ser Glu Pro Asp Val Arg Arg Ile Lys Pro Asn Gln Lys Trp
225 230 235 240

Phe Val Asn His Ile Asn Gln His Met Phe Val Pro Phe Leu Tyr Gly
245 250 255

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

Val Lys Thr Asn Asp Ala Ile Arg Val Asn Pro Ile Ser Thr Trp His
275 280 285

Thr Val Met Phe Trp Gly Gly Lys Ala Phe Phe Val Trp Tyr Arg Leu
290 295 300

Ile Val Pro Leu Gln Tyr Leu Pro Leu Gly Lys Val Leu Leu Leu Phe
305 310 315 320

Thr Val Ala Asp Met Val Ser Ser Tyr Trp Leu Ala Leu Thr Phe Gln
325 330 335

Ala Asn His Val Val Glu Glu Val Gln Trp Pro Leu Pro Asp Glu Asn
340 345 350

Gly Ile Ile Gln Lys Asp Trp Ala Ala Met Gln Val Glu Thr Thr Gln
355 360 365

Asp Tyr Ala His Asp Ser His Leu Trp Thr Ser Ile Thr Gly Ser Leu
370 375 380

Asn Tyr Gln Ala Val His His Leu Phe Pro Asn Val Ser Gln His His
385 390 395 400

```
Tyr Pro Asp Ile Leu Ala Ile Ile Lys Asn Thr Cys Ser Glu Tyr Lys
                405                 410                 415


Val Pro Tyr Leu Val Lys Asp Thr Phe Trp Gln Ala Phe Ala Ser His
            420                 425                 430


Leu Glu His Leu Arg Val Leu Gly Leu Arg Pro Lys Glu Glu
        435                 440                 445
```

<210> 17
<211> 267
<212> PRT
<213> Pyramimonas cordata

<400> 17

```
Met Ala Ser Ile Ala Ile Pro Ala Ala Leu Ala Gly Thr Leu Gly Tyr
1               5                   10                  15


Val Thr Tyr Asn Val Ala Asn Pro Asp Ile Pro Ala Ser Glu Lys Val
            20                  25                  30


Pro Ala Tyr Phe Met Gln Val Glu Tyr Trp Gly Pro Thr Ile Gly Thr
        35                  40                  45


Ile Gly Tyr Leu Leu Phe Ile Tyr Phe Gly Lys Arg Ile Met Gln Asn
    50                  55                  60


Arg Ser Gln Pro Phe Gly Leu Lys Asn Ala Met Leu Val Tyr Asn Phe
65                  70                  75                  80


Tyr Gln Thr Phe Phe Asn Ser Tyr Cys Ile Tyr Leu Phe Val Thr Ser
                85                  90                  95


His Arg Ala Gln Gly Leu Lys Val Trp Gly Asn Ile Pro Asp Met Thr
            100                 105                 110


Ala Asn Ser Trp Gly Ile Ser Gln Val Ile Trp Leu His Tyr Asn Asn
        115                 120                 125
```

```
Lys Tyr Val Glu Leu Leu Asp Thr Phe Phe Met Val Met Arg Lys Lys
    130                 135                 140

Phe Asp Gln Leu Ser Phe Leu His Ile Tyr His His Thr Leu Leu Ile
145                 150                 155                 160

Trp Ser Trp Phe Val Val Met Lys Leu Glu Pro Val Gly Asp Cys Tyr
                165                 170                 175

Phe Gly Ser Ser Val Asn Thr Phe Val His Val Ile Met Tyr Ser Tyr
            180                 185                 190

Tyr Gly Leu Ala Ala Leu Gly Val Asn Cys Phe Trp Lys Lys Tyr Ile
        195                 200                 205

Thr Gln Ile Gln Met Leu Gln Phe Cys Ile Cys Ala Ser His Ser Ile
    210                 215                 220

Tyr Thr Ala Tyr Val Gln Asn Thr Ala Phe Trp Leu Pro Tyr Leu Gln
225                 230                 235                 240

Leu Trp Val Met Val Asn Met Phe Val Leu Phe Ala Asn Phe Tyr Arg
                245                 250                 255

Lys Arg Tyr Lys Ser Lys Gly Ala Lys Lys Gln
            260                 265
```

<210> 18
<211> 447
<212> PRT
<213> Pavlova salina

<400> 18

```
Met Pro Pro Ser Ala Ala Lys Gln Met Gly Ala Ser Thr Gly Val His
1               5                   10                  15

Ala Gly Val Thr Asp Ser Ser Ala Phe Thr Arg Lys Asp Val Ala Asp
```

```
                                                35
            20                  25                  30

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

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

Gly Arg Asp Ala Thr Glu Ala Phe Met Glu Tyr His Arg Arg Ala Trp
65                  70                  75                  80

Pro Lys Ser Arg Met Ser Arg Phe His Val Gly Ser Leu Ala Ser Thr
                85                  90                  95

Glu Glu Pro Val Ala Ala Asp Glu Gly Tyr Leu Gln Leu Cys Ala Arg
            100                 105                 110

Ile Ala Lys Met Val Pro Ser Val Ser Ser Gly Phe Ala Pro Ala Ser
        115                 120                 125

Tyr Trp Val Lys Ala Gly Leu Ile Leu Gly Ser Ala Ile Ala Leu Glu
    130                 135                 140

Ala Tyr Met Leu Tyr Ala Gly Lys Arg Leu Leu Pro Ser Ile Val Leu
145                 150                 155                 160

Gly Trp Leu Phe Ala Leu Ile Gly Leu Asn Ile Gln His Asp Ala Asn
                165                 170                 175

His Gly Ala Leu Ser Lys Ser Ala Ser Val Asn Leu Ala Leu Gly Leu
            180                 185                 190

Cys Gln Asp Trp Ile Gly Gly Ser Met Ile Leu Trp Leu Gln Glu His
        195                 200                 205

Val Val Met His His Leu His Thr Asn Asp Val Asp Lys Asp Pro Asp
    210                 215                 220
```

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

Pro Met His Trp Leu Gln His Leu Tyr Leu Leu Pro Gly Glu Thr Met
                245                 250                 255

Tyr Ala Phe Lys Leu Leu Phe Leu Asp Ile Ser Glu Leu Val Met Trp
            260                 265                 270

Arg Trp Glu Gly Glu Pro Ile Ser Lys Leu Ala Gly Tyr Leu Phe Met
        275                 280                 285

Pro Ser Leu Leu Leu Lys Leu Thr Phe Trp Ala Arg Phe Val Ala Leu
    290                 295                 300

Pro Leu Tyr Leu Ala Pro Ser Val His Thr Ala Val Cys Ile Ala Ala
305                 310                 315                 320

Thr Val Met Thr Gly Ser Phe Tyr Leu Ala Phe Phe Phe Phe Ile Ser
                325                 330                 335

His Asn Phe Glu Gly Val Ala Ser Val Gly Pro Asp Gly Ser Ile Thr
            340                 345                 350

Ser Met Thr Arg Gly Ala Ser Phe Leu Lys Arg Gln Ala Glu Thr Ser
        355                 360                 365

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

Tyr Gln Ile Glu His His Leu Phe Pro Arg Val His His Gly Phe Tyr
385                 390                 395                 400

Pro Arg Leu Ala Pro Leu Val Lys Ala Glu Leu Glu Ala Arg Gly Ile
                405                 410                 415

Glu Tyr Lys His Tyr Pro Thr Ile Trp Ser Asn Leu Ala Ser Thr Leu
```

420 425 430

Arg His Met Tyr Ala Leu Gly Arg Arg Pro Arg Ser Lys Ala Glu
435 440 445

<210> 19
<211> 519
<212> PRT
<213> Thraustochytrium

<400> 19

Met Thr Val Gly Tyr Asp Glu Glu Ile Pro Phe Glu Gln Val Arg Ala
1 5 10 15

His Asn Lys Pro Asp Asp Ala Trp Cys Ala Ile His Gly His Val Tyr
20 25 30

Asp Val Thr Lys Phe Ala Ser Val His Pro Gly Gly Asp Ile Ile Leu
35 40 45

Leu Ala Ala Gly Lys Glu Ala Thr Val Leu Tyr Glu Thr Tyr His Val
50 55 60

Arg Gly Val Ser Asp Ala Val Leu Arg Lys Tyr Arg Ile Gly Lys Leu
65 70 75 80

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

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

Val Met Arg Glu Arg Val Val Ala Arg Leu Lys Glu Arg Gly Lys Ala
115 120 125

Arg Arg Gly Gly Tyr Glu Leu Trp Ile Lys Ala Phe Leu Leu Leu Val
130 135 140

```
Gly Phe Trp Ser Ser Leu Tyr Trp Met Cys Thr Leu Asp Pro Ser Phe
145                 150                 155                 160


Gly Ala Ile Leu Ala Ala Met Ser Leu Gly Val Phe Ala Ala Phe Val
                165                 170                 175


Gly Thr Cys Ile Gln His Asp Gly Asn His Gly Ala Phe Ala Gln Ser
            180                 185                 190


Arg Trp Val Asn Lys Val Ala Gly Trp Thr Leu Asp Met Ile Gly Ala
        195                 200                 205


Ser Gly Met Thr Trp Glu Phe Gln His Val Leu Gly His His Pro Tyr
    210                 215                 220


Thr Asn Leu Ile Glu Glu Glu Asn Gly Leu Gln Lys Val Ser Gly Lys
225                 230                 235                 240


Lys Met Asp Thr Lys Leu Ala Asp Gln Glu Ser Asp Pro Asp Val Phe
                245                 250                 255


Ser Thr Tyr Pro Met Met Arg Leu His Pro Trp His Gln Lys Arg Trp
            260                 265                 270


Tyr His Arg Phe Gln His Ile Tyr Gly Pro Phe Ile Phe Gly Phe Met
        275                 280                 285


Thr Ile Asn Lys Val Val Thr Gln Asp Val Gly Val Val Leu Arg Lys
    290                 295                 300


Arg Leu Phe Gln Ile Asp Ala Glu Cys Arg Tyr Ala Ser Pro Met Tyr
305                 310                 315                 320


Val Ala Arg Phe Trp Ile Met Lys Ala Leu Thr Val Leu Tyr Met Val
                325                 330                 335


Ala Leu Pro Cys Tyr Met Gln Gly Pro Trp His Gly Leu Lys Leu Phe
            340                 345                 350
```

```
Ala Ile Ala His Phe Thr Cys Gly Glu Val Leu Ala Thr Met Phe Ile
        355                 360                 365

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

Lys Gly Thr Met Ala Pro Pro Lys Thr Met His Gly Val Thr Pro Met
385                 390                 395                 400

Asn Asn Thr Arg Lys Glu Val Glu Ala Glu Ala Ser Lys Ser Gly Ala
                405                 410                 415

Val Val Lys Ser Val Pro Leu Asp Asp Trp Ala Ala Val Gln Cys Gln
            420                 425                 430

Thr Ser Val Asn Trp Ser Val Gly Ser Trp Phe Trp Asn His Phe Ser
        435                 440                 445

Gly Gly Leu Asn His Gln Ile Glu His His Leu Phe Pro Gly Leu Ser
    450                 455                 460

His Glu Thr Tyr Tyr His Ile Gln Asp Val Val Gln Ser Thr Cys Ala
465                 470                 475                 480

Glu Tyr Gly Val Pro Tyr Gln His Glu Pro Ser Leu Trp Thr Ala Tyr
                485                 490                 495

Trp Lys Met Leu Glu His Leu Arg Gln Leu Gly Asn Glu Glu Thr His
            500                 505                 510

Glu Ser Trp Gln Arg Ala Ala
        515
```

<210> 20
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 20
gggggcgcct agggataaca gggtaatgat aac 33

<210> 21
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 21
cccggcgcca ttaccctgtt atccctactc gc 32

<210> 22
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 22
gggggcgcgc cgagtcgact ttccgataca gaag 34

<210> 23
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 23
cccgcgatcg ctgatggttg tgatcaaccg gaaa 34

<210> 24
<211> 36
<212> DNA
<213> Artificial Sequence

<220>

<223> Synthetic primer

<400> 24
ggggcgatcg cagagtccgt tttgtagagt aatatg 36

<210> 25
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 25
cccgcggccg cacggacctc gcaagttgca aaaag 35

<210> 26
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 26
gggggcgcgc catgctgcgg gcggatcctg g 31

<210> 27
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 27
cccgcgatcg cagcttttgt tttgtgtgac ttgtc 35

<210> 28
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 28
ggggcgatcg cggaaaactg cctgggttag gc 32

<210> 29
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 29
cccgcggccg ctctgatggc ctggagcgag tt 32

<210> 30
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 30
gggggcgcgc ctgggagtgt atttggaaaa tgact 35

<210> 31
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 31
cccgcgatcg ctttgcgggc ggtacgggta c 31

<210> 32
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 32
ggggcgatcg ccataacact catcagtagc ctttac 36

<210> 33
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 33
cccgcggccg ctcttgtaat tccatagata atatatacg 39

<210> 34
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 34
gggggcgcgc cgccgacaat ctctcttcct catt 34

<210> 35
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 35
cccgcgatcg ctgtgtgtgc ggagagtgtc ttg 33

<210> 36
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 36
ggggcgatcg cgcacagtcg cttcaccact tg 32

<210> 37
<211> 37
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 37
cccgcggccg ctaaaacaat gacaaataca actctag 37

<210> 38
<211> 35
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 38
ggggcgatcg ctagggataa cagggtaatg ataac 35

<210> 39
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 39
cccgcgatcg cattaccctg ttatccctac tcgc 34

<210> 40
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 40
gtgtccgagc ccgtctacg 19

<210> 41
<211> 22

<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 41
acatggtgat accaataccg ac 22

<210> 42
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 42
gatgcaaatg acgcacggcc 20

<210> 43
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 43
ccaaacgaca ctcgatagtg 20

<210> 44
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 44
tgctttgcgt gggagagctc 20

<210> 45
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 45
cagtggttga cattctatag gcac 24

<210> 46
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 46
caggcaacag acaagtcaca c 21

<210> 47
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 47
catctggctc caacggccac 20

<210> 48
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 48
cagctgtggg tcgttttcgc 20

<210> 49
<211> 20
<212> DNA
<213> Artificial Sequence

<220>

<223> Synthetic primer

<400> 49
gctatttgcc taacccaggc 20

<210> 50
<211> 21
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 50
catagctaca cccaaagtcg c 21

<210> 51
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 51
cgctcagcgg actgaccatg 20

<210> 52
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 52
tcttggggta cacgggctgg 20

<210> 53
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 53
ctgtaaaggc tactgatgag tg 22

<210> 54
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 54
catgactaat cattcacgcg ac 22

<210> 55
<211> 20
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<220>
<223> Synthetic primer

<400> 55
cgtggtcggt gtgatagccg 20

<210> 56
<211> 20
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<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 56
gttcgcagca gatcggctcg 20

<210> 57
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 57
cgaacgccct tctccatcag tg 22

<210> 58
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<220>
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<400> 58
cgttggaggc tgtgggtctg 20

<210> 59
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<220>
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<400> 59
agtgctcaag ctcgtggcag 20

<210> 60
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<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 60
gatctcggtt ctggccgtac 20

<210> 61
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic primer

<400> 61
gcctccagga agtccatggg 20

<210> 62
<211> 3260
<212> DNA
<213> Yarrowia lipolytica

<400> 62
aactatacaa gtatcaagtt gcccattgtg ttgtatgttc cagaaccatt gtacccgtac 60

aagtagttaa gcatagccct tgtgcaagag tgtgtacgat caatgtctca gatacggcgg 120

tgactgccgc ttctggcagt ctttcaacgc tgcgtttctt cgtcgatgga ccggaagagc 180

tctctttacg agccaaaggc tccaagagtt tggttgtctt gtactctcta tctttccaca 240

ccgccgccca caaggttcgg aacgacatct cccaactcta actttaagca tggcctgttg 300

agaagccatg ctattcatcg gacacctgtt caacgagtca acaagcggac atagtcgtca 360

agtagtggca gcacagagag agagtcgtgc caatgggggt catgtagtag cacatgacga 420

aataagagac gttggattca tgtagaaccg acgtagtcac gtgaacacgt ccaaggtctt 480

cccctcttca cgtgcacgtg taactggttc tttcactctc ccccccgcca taagtcgacc 540

catgtcacgg ttgagacgtg gtccctccac actatccacg ctgagagcag cagtataccc 600

cgggcggttc cgttcggagc tctcttggcc aatccgcaca tgcgcattat gcgtttttca 660

ggtggtaaca gacgaggagt acgagcgtgt taaagtggcg gttaggagag gcggggcccg 720

tagttatata caagaggtag atgcgtgctg gtgttagagg ggctctcagg attaggagga 780

aaatttgaca ttggccctca acatataacc tcgggtgtgc ctctgtttac cctcagcttt 840

tgcttgtccc caagtcagtc acgccaggcc aaaaaggttg gtggattgac agggagaaaa 900

aaaaaagcct agtgggttta aactcgaggt aagacattga aatatatacc ggtcggcatc 960

ctgagtccct ttctcgtatt ccaacagacc gaccatagaa atggattcga ccacgcagac 1020

caacaccggc accggcaagg tggccgtgca gccccccacg gccttcatta agcccattga 1080

gaaggtgtcc gagcccgtct acgacacctt tggcaacgag ttcactcctc cagactactc 1140

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ccagcaggtg tttggatggc ctctgtatct gctgtctaac gttaccggac agaagtaccc 1680

caagctcaac aaatgggctg tcaaccactt caaccccaac gccccgctgt ttgagaagaa 1740

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gtgggtcaac cactggctcg tggccatcac ctacctgcag cacaccgacc ccactctgcc 1920

ccactaccac gccgaccagt ggaacttcac ccgaggagcc gccgccacca tcgaccgaga 1980

gtttggcttc atcggctcct tctgcttcca tgacatcatc gagacccacg ttctgcacca 2040

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catgggcaag cactaccgac acgacgacac caacttcatc aagtctcttt acactgtcgc 2160

ccgaacctgc cagtttgttg aaggtaagga aggcattcag atgtttagaa acgtcaatgg 2220

agtcggagtt gctcctgacg gcctgccttc taaaaagtag agctagaaat gttatttgat 2280

tgtgttttaa ctgaacagca ccgagcccga ggctaagcca agcgaagccg aggggttgtg 2340

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attggcaatt caatcgacca taagcgtatc cggtaacggt gagacattga gacaccgatc 2880

gattagagag actactgtac gagcagtcta ctgtatatta gaaggaacaa taggtagtcc 2940

aactgagctt ttaactagtg ggtgtttttt gaacgtgttt ggagatctta ttaagcaaaa 3000

aaaaagctgt gttcacatta acaccaacaa accctgccgg tagttccttc aaaaacgcca 3060

catgcatcaa tcatcttcag ctttgccgat ctcctcctgc cgaggttaca accaactgga 3120

gccatcttta tcgtgccgta gagaagcgca gccagggaga gtttgagacc ggcaaaacga 3180

gggaatcggt agattctcag aaataatcca tatggagtca cgtgatcaga cttcccatgg 3240

acttttatat tgatatttgt 3260

<210> 63
<211> 1620
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic resistance marker cassette

<400> 63
tagggataac agggtaatga taacttcgta tagcatacat tatacgaagt tatgggttgg 60

cggcgcattt gtgtcccaaa aaacagcccc aattgcccca ttgacccca aattgaccca 120

gtagcggacc caaccccggc gagagccccc ttcaccccac atatcaaacc tcccccggtt 180

cccacacttg ccgttaaggg cgtagggtac tgcagtctgg aatctacgct tgttcagact 240

ttgtactagt ttctttgtct ggccatccgg gtaacccatg ccggacgcaa aatagactac 300

tgaaaatttt tttgctttgt ggttgggact ttagccaagg gtataaaaga ccaccgtccc 360

cgaattacct ttcctcttct tttctctctc tccttgtcaa ctcacacccg aagcacaatg 420

aagaagcccg agctgaccgc tacctctgtt gagaagttcc tgattgagaa gtttgattcc 480

gtttccgacc tgatgcagct gtccgagggc gaggagtctc gagccttctc ctttgacgtg 540

ggcggacgag gttacgttct gcgagtgaac tcgtgtgccg acggcttcta caaggatcga 600

tacgtctacc gacactttgc ttctgccgct ctgcccatcc ctgaggttct cgacattggc 660

gagttctctg agtccctcac ctactgcatc tctcgacgag ctcagggagt caccctgcag 720

gacctccctg agactgagct gcctgctgtc ctccagcctg ttgctgaggc catggacgct 780

atcgctgctg ctgatctgtc ccagacctcg ggtttcggcc cctttggacc tcagggaatt 840

ggacagtaca ccacttggcg agacttcatc tgtgctattg ccgatcctca cgtctaccat 900

tggcagaccg ttatggacga tactgtgtcg gcttctgtcg ctcaggctct ggacgagctg 960

atgctctggg ccgaggattg ccccgaggtt cgacacctgg tgcatgctga cttcggttcc 1020

aacaacgttc tcaccgacaa cggccgaatc actgccgtga ttgactggtc cgaggctatg 1080

tttggcgact cgcagtacga ggtggccaac atcttctttt ggcgaccctg gctggcttgt 1140

atggagcagc agacccgata cttcgagcga cgacatcctg agctcgctgg ctcccctcga 1200

ctgcgagctt acatgctccg aattggtctg gaccagctct accagtcgct ggtggatggc 1260

aactttgacg atgctgcctg ggctcaggga cgatgtgacg ccatcgtgcg atctggcgct 1320

ggaaccgtcg gacgaactca gattgcccga cgatccgctg ctgtctggac cgacggatgc 1380

gtggaggtcc tggctgattc gggtaaccga cgaccctcta ctcgacctcg agctaaggag 1440

taagtgtctg tggtatctaa gctatttatc actctttaca acttctacct caactatcta 1500

ctttaataaa tgaatatcgt ttattctcta tgattactgt atatgcgttc ctctaagaca 1560

aatcgaatat aacttcgtat agcaggagtt atccgaagcg agtagggata acagggtaat 1620

<210> 64
<211> 341
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic resistance marker

<400> 64

Met Lys Lys Pro Glu Leu Thr Ala Thr Ser Val Glu Lys Phe Leu Ile
1 5 10 15

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

Glu Ser Arg Ala Phe Ser Phe Asp Val Gly Gly Arg Gly Tyr Val Leu

```
        35                  40                  45

Arg Val Asn Ser Cys Ala Asp Gly Phe Tyr Lys Asp Arg Tyr Val Tyr
    50                  55                  60

Arg His Phe Ala Ser Ala Ala Leu Pro Ile Pro Glu Val Leu Asp Ile
65                  70                  75                  80

Gly Glu Phe Ser Glu Ser Leu Thr Tyr Cys Ile Ser Arg Arg Ala Gln
                85                  90                  95

Gly Val Thr Leu Gln Asp Leu Pro Glu Thr Glu Leu Pro Ala Val Leu
            100                 105                 110

Gln Pro Val Ala Glu Ala Met Asp Ala Ile Ala Ala Ala Asp Leu Ser
        115                 120                 125

Gln Thr Ser Gly Phe Gly Pro Phe Gly Pro Gln Gly Ile Gly Gln Tyr
    130                 135                 140

Thr Thr Trp Arg Asp Phe Ile Cys Ala Ile Ala Asp Pro His Val Tyr
145                 150                 155                 160

His Trp Gln Thr Val Met Asp Asp Thr Val Ser Ala Ser Val Ala Gln
                165                 170                 175

Ala Leu Asp Glu Leu Met Leu Trp Ala Glu Asp Cys Pro Glu Val Arg
            180                 185                 190

His Leu Val His Ala Asp Phe Gly Ser Asn Asn Val Leu Thr Asp Asn
        195                 200                 205

Gly Arg Ile Thr Ala Val Ile Asp Trp Ser Glu Ala Met Phe Gly Asp
    210                 215                 220

Ser Gln Tyr Glu Val Ala Asn Ile Phe Phe Trp Arg Pro Trp Leu Ala
225                 230                 235                 240
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Cys Met Glu Gln Gln Thr Arg Tyr Phe Glu Arg Arg His Pro Glu Leu
                245                 250                 255

Ala Gly Ser Pro Arg Leu Arg Ala Tyr Met Leu Arg Ile Gly Leu Asp
            260                 265                 270

Gln Leu Tyr Gln Ser Leu Val Asp Gly Asn Phe Asp Asp Ala Ala Trp
        275                 280                 285

Ala Gln Gly Arg Cys Asp Ala Ile Val Arg Ser Gly Ala Gly Thr Val
    290                 295                 300

Gly Arg Thr Gln Ile Ala Arg Arg Ser Ala Ala Val Trp Thr Asp Gly
305                 310                 315                 320

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

Pro Arg Ala Lys Glu
            340
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<210> 65
<211> 1165
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic resistance marker cassette

<400> 65

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tagggataac agggtaatga taacttcgta tagcatacat tatacgaagt tatggggttg       60

gcggcgcatt tgtgtcccaa aaaacagccc caattgcccc aattgacccc aaattgaccc      120

agtagcggac ccaaccccgg cgagagcccc cttcacccca catatcaaac ctcccccggt      180

tcccacactt gccgttaagg gcgtagggta ctgcagtctg gaatctacgc ttgttcagac      240

tttgtactag tttctttgtc tggccatccg ggtaacccat gccggacgca aaatagacta      300

ctgaaaattt ttttgctttg tggttgggac tttagccaag ggtataaaag accaccgtcc      360
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ccgaattacc tttcctcttc ttttctctct ctccttgtca actcacaccc gaagcacaat 420

gaccactctg gatgacaccg cttaccgata ccgaacttcc gttcctggcg atgccgaggc 480

tattgaggct ctggatggat ctttcaccac tgacaccgtt ttccgagtga ccgctactgg 540

cgacggcttc accctgcgag aggtgcctgt cgaccctcct ctcaccaagg ttttccctga 600

cgatgagtcg gacgatgagt ctgacgctgg agaggacggc gaccctgact ctcgaacttt 660

cgtggcttac ggcgacgatg gcgacctggc cggctttgtg gtcgtttctt actccggatg 720

gaaccgacga ctgaccgtgg aggacatcga ggtcgctcct gagcaccgag gtcatggtgt 780

cggacgagct ctgatgggtc tggctactga gttcgctcga gagcgaggtg ctggccacct 840

gtggctcgag gtcaccaacg ttaacgcccc tgctattcat gcctaccgac gaatgggttt 900

taccctgtgt ggcctcgata ctgccctgta cgacggaacc gcttccgatg gagagcaggc 960

cctctacatg tcgatgccct gcccttaagt gtctgtggta tctaagctat ttatcactct 1020

ttacaacttc tacctcaact atctacttta ataaatgaat atcgtttatt ctctatgatt 1080

actgtatatg cgttcctcta agacaaatcg aatataactt cgtatagcag gagttatccg 1140

aagcgagtag ggataacagg gtaat 1165

<210> 66
<211> 189
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic resistance marker

<400> 66

Met Thr Thr Leu Asp Asp Thr Ala Tyr Arg Tyr Arg Thr Ser Val Pro
1 5 10 15

Gly Asp Ala Glu Ala Ile Glu Ala Leu Asp Gly Ser Phe Thr Thr Asp
20 25 30

Thr Val Phe Arg Val Thr Ala Thr Gly Asp Gly Phe Thr Leu Arg Glu
35 40 45

Val Pro Val Asp Pro Pro Leu Thr Lys Val Phe Pro Asp Asp Glu Ser
50 55 60

Asp Asp Glu Ser Asp Ala Gly Glu Asp Gly Asp Pro Asp Ser Arg Thr
65 70 75 80

Phe Val Ala Tyr Gly Asp Asp Gly Asp Leu Ala Gly Phe Val Val Val
85 90 95

Ser Tyr Ser Gly Trp Asn Arg Arg Leu Thr Val Glu Asp Ile Glu Val
100 105 110

Ala Pro Glu His Arg Gly His Gly Val Gly Arg Ala Leu Met Gly Leu
115 120 125

Ala Thr Glu Phe Ala Arg Glu Arg Gly Ala Gly His Leu Trp Leu Glu
130 135 140

Val Thr Asn Val Asn Ala Pro Ala Ile His Ala Tyr Arg Arg Met Gly
145 150 155 160

Phe Thr Leu Cys Gly Leu Asp Thr Ala Leu Tyr Asp Gly Thr Ala Ser
165 170 175

Asp Gly Glu Gln Ala Leu Tyr Met Ser Met Pro Cys Pro
180 185

<210> 67
<211> 286
<212> PRT
<213> Yarrowia lipolytica

<400> 67

Met Pro Ser Tyr Glu Ala Arg Ala Asn Val His Lys Ser Ala Phe Ala
1 5 10 15

Ala Arg Val Leu Lys Leu Val Ala Ala Lys Lys Thr Asn Leu Cys Ala
20 25 30

```
Ser Leu Asp Val Thr Thr Thr Lys Glu Leu Ile Glu Leu Ala Asp Lys
        35                  40                  45

Val Gly Pro Tyr Val Cys Met Ile Lys Thr His Ile Asp Ile Ile Asp
    50                  55                  60

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

Lys His Gly Phe Phe Leu Phe Glu Asp Arg Lys Phe Ala Asp Ile Gly
                85                  90                  95

Asn Thr Val Lys His Gln Tyr Lys Asn Gly Val Tyr Arg Ile Ala Glu
            100                 105                 110

Trp Ser Asp Ile Thr Asn Ala His Gly Val Pro Gly Thr Gly Ile Ile
        115                 120                 125

Ala Gly Leu Arg Ala Gly Ala Glu Glu Thr Val Ser Glu Gln Lys Lys
    130                 135                 140

Glu Asp Val Ser Asp Tyr Glu Asn Ser Gln Tyr Lys Glu Phe Leu Val
145                 150                 155                 160

Pro Ser Pro Asn Glu Lys Leu Ala Arg Gly Leu Leu Met Leu Ala Glu
                165                 170                 175

Leu Ser Cys Lys Gly Ser Leu Ala Thr Gly Glu Tyr Ser Lys Gln Thr
            180                 185                 190

Ile Glu Leu Ala Arg Ser Asp Pro Glu Phe Val Val Gly Phe Ile Ala
        195                 200                 205

Gln Asn Arg Pro Lys Gly Asp Ser Glu Asp Trp Leu Ile Leu Thr Pro
    210                 215                 220
```

Gly Val Gly Leu Asp Asp Lys Gly Asp Ala Leu Gly Gln Gln Tyr Arg
225 230 235 240

Thr Val Glu Asp Val Met Ser Thr Gly Thr Asp Ile Ile Ile Val Gly
245 250 255

Arg Gly Leu Tyr Gly Gln Asn Arg Asp Pro Ile Glu Glu Ala Lys Arg
260 265 270

Tyr Gln Lys Ala Gly Trp Glu Ala Tyr Gln Lys Ile Asn Cys
275 280 285

<210> 68
<211> 2861
<212> DNA
<213> Yarrowia lipolytica

<400> 68
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aacttgcctg tggctcgact tacagccaaa tgttcgcggc aaaatttgaa tattttgcac 120

acttattgtc ccaaaaccaa ataatgccaa caaaatccga tatagtgtag gggctatcac 180

ataccctctc ataagaatac ttttaaccgt ggagacgggg ttcgattcgt atcggagtgt 240

ttatttttg ctcaaccata ccctggggtg tgttctgtgg agcattctca cttttggtaa 300

acgacattgc ttcaagtgca gcggaatcaa aaagtataaa gtgggcagcg agtatacctg 360

tacagactgt aggcgataac tcaatccaat taccccccac aacatgactg gccaaactga 420

tctcaagact ttattgaaat cagcaacacc gattctcaat gaaggcacat acttcttctg 480

caacattcac ttgacgccta aagttggtga gaaatggacc gacaagacat attctgctat 540

ccacggactg ttgcctgtgt cggtggctac aatacgtgag tcagaagggc tgacggtggt 600

ggttcccaag gaaaaggtcg acgagtatct gtctgactcg tcattgccgc ctttggagta 660

cgactccaac tatgagtgtg cttggatcac tttgacgata cattcttcgt tggaggctgt 720

gggtctgaca gctgcgtttt cggcgcggtt ggccgacaac aatatcagct gcaacgtcat 780

tgctggcttt catcatgatc acatttttgt cggcaaaggc gacgcccaga gagccattga 840

cgttctttct aatttggacc gatagccgta tagtccagtc tatctataag ttcaactaac 900

tcgtaactat taccataaca tatacttcac tgccccagat aaggttccga taaaaagttc 960

tgcagactaa atttatttca gtctcctctt caccaccaaa atgccctcct acgaagctcg 1020

agctaacgtc cacaagtccg cctttgccgc tcgagtgctc aagctcgtgg cagccaagaa 1080

aaccaacctg tgtgcttctc tggatgttac caccaccaag gagctcattg agcttgccga 1140

taaggtcgga ccttatgtgt gcatgatcaa gacccatatc gacatcattg acgacttcac 1200

ctacgccggc actgtgctcc ccctcaagga acttgctctt aagcacggtt tcttcctgtt 1260

cgaggacaga aagttcgcag atattggcaa cactgtcaag caccagtaca agaacggtgt 1320

ctaccgaatc gccgagtggt ccgatatcac caacgcccac ggtgtacccg gaaccggaat 1380

cattgctggc ctgcgagctg gtgccgagga aactgtctct gaacagaaga aggaggacgt 1440

ctctgactac gagaactccc agtacaagga gttcctggtc ccctctccca acgagaagct 1500

ggccagaggt ctgctcatgc tggccgagct gtcttgcaag ggctctctgg ccactggcga 1560

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tgcccagaac cgacctaagg gcgactctga ggactggctt attctgaccc ccggggtggg 1680

tcttgacgac aagggagacg ctctcggaca gcagtaccga actgttgagg atgtcatgtc 1740

taccggaacg gatatcataa ttgtcggccg aggtctgtac ggccagaacc gagatcctat 1800

tgaggaggcc aagcgatacc agaaggctgg ctgggaggct taccagaaga ttaactgtta 1860

gaggttagac tatggatatg taatttaact gtgtatatag agagcgtgca agtatggagc 1920

gcttgttcag cttgtatgat ggtcagacga cctgtctgat cgagtatgta tgatactgca 1980

caacctgtgt atccgcatga tctgtccaat ggggcatgtt gttgtgtttc tcgatacgga 2040

gatgctgggt acaagtagct aatacgattg aactacttat acttatatga ggcttgaaga 2100

aagctgactt gtgtatgact tattctcaac tacatcccca gtcacaatac caccactgca 2160

ctaccactac accaaaacca tgatcaaacc acccatggac ttcctggagg cagaagaact 2220

tgttatggaa aagctcaaga gagagaagcc aagatactat caagacatgt gtcgcaactt 2280

caaggaggac caagctctgt acaccgagaa acaggccttt gtcgacgaag ctctaaagct 2340

gaaacgggac atcgaaaagt tggagaagtc aatctggaaa ctacacgtag aaaacagaca 2400

ccatctccaa caagtacagg acttcaaatt tgcactgaag acattctgtg ggtggagcca 2460

taagtaacaa tcgcctgctc caggaactta aaaaagaggc attataggcc ccttcatctg 2520

aatattcttt gagtaccaac tgccgccaac tccccaatcg ttaattagtg ttatctattc 2580

tatctatgct attagcacat atttatcatg tgctgctgtt atgtacgggt tcaatataca 2640

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atgatttcaa acacgaacag accgatagac gtagacggaa gcgcactgag ggtcgtccag 2760

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gctgtatgca gagtctcaac gtaggctcgg tagtagagat g 2861

<210> 69
<211> 3545
<212> DNA
<213> Yarrowia lipolytica

<400> 69
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atattagccc gtaataaatg cccgtctcca tcttcatatg gccatcaccc cgcaaatagc 120

cggccaatca ggcgtatgtc acctgttgct cacacgcatg tcctcggacc gttgtattgt 180

gcaagtaggg gtacctcccc gatccatcct cgaccagtgg cacgctcaac cccatggttc 240

gcttttctct tttcgtctat cctgaactga gtttttttcc acgccaactg atatcccctt 300

acgttacccc ctcatcacct ggtgaggcga aactgtaagg tgaaagctaa aaatgacatc 360

tcagctgcac gaaggaccgg ggcttaaaag acgggctggt gcttgtgatt taaaactgga 420

caaatctcag cttgcttgaa attttggtct ccaactgttt ccgagcgaat cgcacacaaa 480

ccgggcttct ctctgcagac cacgcccccg aaactctttc tcccaccacc accaacactc 540

cctttccatt cccacaccgt tcctctctcg tgcgtcatcc ttgcgcaatc atcttcgtct 600

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cttaggaaca gcaacctgag ctacagaaat ctatctatag gcggataaaa aaacgcaccc 720

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<210> 70
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<212> PRT
<213> Yarrowia lipolytica

<400> 70

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Leu Asn Arg Cys Glu Thr Phe Ser Leu Val Trp His Ile Phe Ser Ile
        35                  40                  45

Pro Thr Phe Leu Thr Ile Phe Met Leu Cys Cys Ala Ile Pro Leu Leu
    50                  55                  60

Trp Pro Phe Val Ile Ala Tyr Val Val Tyr Ala Val Lys Asp Asp Ser
65                  70                  75                  80

Pro Ser Asn Gly Gly Val Val Lys Arg Tyr Ser Pro Ile Ser Arg Asn
                85                  90                  95

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

Lys Thr Val Asp Leu Glu Pro Thr His Thr Tyr Tyr Pro Leu Asp Val
        115                 120                 125

Gln Glu Tyr His Leu Ile Ala Glu Arg Tyr Trp Pro Gln Asn Lys Tyr
    130                 135                 140

Leu Arg Ala Ile Ile Ser Thr Ile Glu Tyr Phe Leu Pro Ala Phe Met
145                 150                 155                 160

Lys Arg Ser Leu Ser Ile Asn Glu Gln Glu Gln Pro Ala Glu Arg Asp
                165                 170                 175

Pro Leu Leu Ser Pro Val Ser Pro Ser Ser Pro Gly Ser Gln Pro Asp
            180                 185                 190
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Lys Trp Ile Asn His Asp Ser Arg Tyr Ser Arg Gly Glu Ser Ser Gly
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Ser Asn Gly His Ala Ser Gly Ser Glu Leu Asn Gly Asn Gly Asn Asn
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Gly Thr Thr Asn Arg Arg Pro Leu Ser Ser Ala Ser Ala Gly Ser Thr
225                 230                 235                 240

Ala Ser Asp Ser Thr Leu Leu Asn Gly Ser Leu Asn Ser Tyr Ala Asn
                245                 250                 255

Gln Ile Ile Gly Glu Asn Asp Pro Gln Leu Ser Pro Thr Lys Leu Lys
            260                 265                 270

Pro Thr Gly Arg Lys Tyr Ile Phe Gly Tyr His Pro His Gly Ile Ile
        275                 280                 285

Gly Met Gly Ala Phe Gly Gly Ile Ala Thr Glu Gly Ala Gly Trp Ser
    290                 295                 300

Lys Leu Phe Pro Gly Ile Pro Val Ser Leu Met Thr Leu Thr Asn Asn
305                 310                 315                 320

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

Ser Val Ser Lys Lys Ser Cys Lys Ala Leu Leu Lys Arg Asn Gln Ser
            340                 345                 350

Ile Cys Ile Val Val Gly Gly Ala Gln Glu Ser Leu Leu Ala Arg Pro
        355                 360                 365

Gly Val Met Asp Leu Val Leu Leu Lys Arg Lys Gly Phe Val Arg Leu
    370                 375                 380

Gly Met Glu Val Gly Asn Val Ala Leu Val Pro Ile Met Ala Phe Gly
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385 390 395 400

Glu Asn Asp Leu Tyr Asp Gln Val Ser Asn Asp Lys Ser Ser Lys Leu
405 410 415

Tyr Arg Phe Gln Gln Phe Val Lys Asn Phe Leu Gly Phe Thr Leu Pro
420 425 430

Leu Met His Ala Arg Gly Val Phe Asn Tyr Asp Val Gly Leu Val Pro
435 440 445

Tyr Arg Arg Pro Val Asn Ile Val Val Gly Ser Pro Ile Asp Leu Pro
450 455 460

Tyr Leu Pro His Pro Thr Asp Glu Glu Val Ser Glu Tyr His Asp Arg
465 470 475 480

Tyr Ile Ala Glu Leu Gln Arg Ile Tyr Asn Glu His Lys Asp Glu Tyr
485 490 495

Phe Ile Asp Trp Thr Glu Glu Gly Lys Gly Ala Pro Glu Phe Arg Met
500 505 510

Ile Glu

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<211> 3581
<212> DNA
<213> Yarrowia lipolytica

<400> 71
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<211> 526
<212> PRT
<213> Yarrowia lipolytica

<400> 72

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Gly Tyr Glu Ser Gly Pro Pro Ser Arg Gln Ser Ser Gln Pro Ser Ser
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Arg Ala Ser Ser Arg Thr Arg Asn Lys His Ser Ser Ser Thr Leu Ser
35 40 45

Leu Ser Gly Leu Thr Met Lys Val Gln Lys Lys Pro Ala Gly Pro Pro
50 55 60

Ala Asn Ser Lys Thr Pro Phe Leu His Ile Lys Pro Val His Thr Cys
65 70 75 80

Cys Ser Thr Ser Met Leu Ser Arg Asp Tyr Asp Gly Ser Asn Pro Ser
85 90 95

Phe Lys Gly Phe Lys Asn Ile Gly Met Ile Ile Leu Ile Val Gly Asn
100 105 110

Leu Arg Leu Ala Phe Glu Asn Tyr Leu Lys Tyr Gly Ile Ser Asn Pro
115 120 125

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

Leu Ile Val Val Ala Tyr Ala His Ile Leu Met Ala Tyr Ala Ile Glu
145                 150                 155                 160

Ser Ala Ala Lys Leu Leu Phe Leu Ser Ser Lys His His Tyr Met Ala
                165                 170                 175

Val Gly Leu Leu His Thr Met Asn Thr Leu Ser Ser Ile Ser Leu Leu
            180                 185                 190

Ser Tyr Val Val Tyr Tyr Tyr Leu Pro Asn Pro Val Ala Gly Thr Ile
        195                 200                 205

Val Glu Phe Val Ala Val Ile Leu Ser Leu Lys Leu Ala Ser Tyr Ala
    210                 215                 220

Leu Thr Asn Ser Asp Leu Arg Lys Ala Ala Ile His Ala Gln Lys Leu
225                 230                 235                 240

Asp Lys Thr Gln Asp Asp Asn Glu Lys Glu Ser Thr Ser Ser Ser Ser
                245                 250                 255

Ser Ser Asp Asp Ala Glu Thr Leu Ala Asp Ile Asp Val Ile Pro Ala
            260                 265                 270

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

Leu Tyr Phe Trp Phe Ala Pro Thr Leu Val Tyr Gln Pro Val Tyr Pro
    290                 295                 300

Lys Thr Glu Arg Ile Arg Pro Lys His Val Ile Arg Asn Leu Phe Glu
305                 310                 315                 320

Leu Val Ser Leu Cys Met Leu Ile Gln Phe Leu Ile Phe Gln Tyr Ala
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325 330 335

Tyr Pro Ile Met Gln Ser Cys Leu Ala Leu Phe Phe Gln Pro Lys Leu
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Asp Tyr Ala Asn Ile Ser Glu Arg Leu Met Lys Leu Ala Ser Val Ser
355 360 365

Met Met Val Trp Leu Ile Gly Phe Tyr Ala Phe Phe Gln Asn Gly Leu
370 375 380

Asn Leu Ile Ala Glu Leu Thr Cys Phe Gly Asn Arg Thr Phe Tyr Gln
385 390 395 400

Gln Trp Trp Asn Ser Arg Ser Ile Gly Gln Tyr Trp Thr Leu Trp Asn
405 410 415

Lys Pro Val Asn Gln Tyr Phe Arg His His Val Tyr Val Pro Leu Leu
420 425 430

Ala Arg Gly Met Ser Arg Phe Asn Ala Ser Val Val Val Phe Phe Phe
435 440 445

Ser Ala Val Ile His Glu Leu Leu Val Gly Ile Pro Thr His Asn Ile
450 455 460

Ile Gly Ala Ala Phe Phe Gly Met Met Ser Gln Val Pro Leu Ile Met
465 470 475 480

Ala Thr Glu Asn Leu Gln His Ile Asn Ser Ser Leu Gly Pro Phe Leu
485 490 495

Gly Asn Cys Ala Phe Trp Phe Thr Phe Phe Leu Gly Gln Pro Thr Cys
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Ala Phe Leu Tyr Tyr Leu Ala Tyr Asn Tyr Lys Gln Asn Gln
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<212> DNA
<213> Yarrowia lipolytica

<400> 73
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ttttgagacg ttgatgttgg gggctagtgg ggcgatttgg gggcaataaa cggggtaaat 3720

ctgtgctttt gaggctgtat ttttgattcc agccttttt aatttattgt tatctgcttt 3780

actacaaatt tctgccgtat ttttagcccc tcaatttcgt ctgtcacttc tcatgtcgca 3840

caaggctgtg ccatcttgca ttaggttatc caaccctact gtctcttctc tgtctgtctg 3900

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<210> 74
<211> 648
<212> PRT
<213> Yarrowia lipolytica

<400> 74

Met Thr Gln Pro Val Asn Arg Lys Ala Thr Val Glu Arg Val Glu Pro
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Ala Val Glu Val Ala Asp Ser Glu Ser Glu Ala Lys Thr Asp Val His
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Val His His His His His His His Lys Arg Lys Ser Val Lys Gly Lys
        35                  40                  45

Ile Leu Asn Phe Phe Thr Arg Ser Arg Arg Ile Thr Phe Val Leu Gly
    50                  55                  60

Ala Val Val Gly Val Ile Ala Ala Gly Tyr Tyr Ala Ala Pro Pro Glu
65                  70                  75                  80

Leu Ser Ile Asp Ile Asp Ala Leu Leu Gly Asp Leu Pro Ser Phe Asp
                85                  90                  95

Phe Asp Ala Leu Ser Leu Asp Asn Leu Ser Met Asp Ser Val Ser Asp
            100                 105                 110

Phe Val Gln Asp Met Lys Ser Arg Phe Pro Thr Lys Ile Leu Gln Glu
        115                 120                 125

Ala Ala Lys Ile Glu Lys His Gln Lys Ser Glu Gln Lys Ala Ala Pro
    130                 135                 140

Phe Ala Val Gly Lys Ala Met Lys Ser Glu Gly Leu Asn Ala Lys Tyr
145                 150                 155                 160

Pro Val Val Leu Val Pro Gly Val Ile Ser Thr Gly Leu Glu Ser Trp
                165                 170                 175

Ser Leu Glu Gly Thr Glu Glu Cys Pro Thr Glu Ser His Phe Arg Lys
            180                 185                 190

Arg Met Trp Gly Ser Trp Tyr Met Ile Arg Val Met Leu Leu Asp Lys
        195                 200                 205

Tyr Cys Trp Leu Gln Asn Leu Met Leu Asp Thr Glu Thr Gly Leu Asp
```

210 215 220

Pro Pro His Phe Lys Leu Arg Ala Ala Gln Gly Phe Ala Ser Ala Asp
225 230 235 240

Phe Phe Met Ala Gly Tyr Trp Leu Trp Asn Lys Leu Leu Glu Asn Leu
245 250 255

Ala Val Ile Gly Tyr Asp Thr Asp Thr Met Ser Ala Ala Ala Tyr Asp
260 265 270

Trp Arg Leu Ser Tyr Pro Asp Leu Glu His Arg Asp Gly Tyr Phe Ser
275 280 285

Lys Leu Lys Ala Ser Ile Glu Glu Thr Lys Arg Met Thr Gly Glu Lys
290 295 300

Thr Val Leu Thr Gly His Ser Met Gly Ser Gln Val Ile Phe Tyr Phe
305 310 315 320

Met Lys Trp Ala Glu Ala Glu Gly Tyr Gly Gly Gly Gly Pro Asn Trp
325 330 335

Val Asn Asp His Ile Glu Ser Phe Val Asp Ile Ser Gly Ser Met Leu
340 345 350

Gly Thr Pro Lys Thr Leu Val Ala Leu Leu Ser Gly Glu Met Lys Asp
355 360 365

Thr Val Gln Leu Asn Ala Met Ala Val Tyr Gly Leu Glu Gln Phe Phe
370 375 380

Ser Arg Arg Glu Arg Ala Asp Leu Leu Arg Thr Trp Gly Gly Ile Ala
385 390 395 400

Ser Met Ile Pro Lys Gly Gly Lys Ala Ile Trp Gly Asp His Ser Gly
405 410 415

```
Ala Pro Asp Asp Glu Pro Gly Gln Asn Val Thr Phe Gly Asn Phe Ile
            420                 425                 430

Lys Phe Lys Glu Ser Leu Thr Glu Tyr Ser Ala Lys Asn Leu Thr Met
        435                 440                 445

Asp Glu Thr Val Asp Phe Leu Tyr Ser Gln Ser Pro Glu Trp Phe Val
    450                 455                 460

Asn Arg Thr Glu Gly Ala Tyr Ser Phe Gly Ile Ala Lys Thr Arg Lys
465                 470                 475                 480

Gln Val Glu Gln Asn Glu Lys Arg Pro Ser Thr Trp Ser Asn Pro Leu
                485                 490                 495

Glu Ala Ala Leu Pro Asn Ala Pro Asp Leu Lys Ile Tyr Cys Phe Tyr
            500                 505                 510

Gly Val Gly Lys Asp Thr Glu Arg Ala Tyr Tyr Tyr Gln Asp Glu Pro
        515                 520                 525

Asn Pro Glu Gln Thr Asn Leu Asn Val Ser Ile Ala Gly Asn Asp Pro
    530                 535                 540

Asp Gly Val Leu Met Gly Gln Gly Asp Gly Thr Val Ser Leu Val Thr
545                 550                 555                 560

His Thr Met Cys His Arg Trp Lys Asp Glu Asn Ser Lys Phe Asn Pro
                565                 570                 575

Gly Asn Ala Gln Val Lys Val Val Glu Met Leu His Gln Pro Asp Arg
            580                 585                 590

Leu Asp Ile Arg Gly Gly Ala Gln Thr Ala Glu His Val Asp Ile Leu
        595                 600                 605

Gly Arg Ser Glu Leu Asn Glu Met Val Leu Lys Val Ala Ser Gly Lys
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610 615 620

Gly Asn Glu Ile Glu Glu Arg Val Ile Ser Asn Ile Asp Glu Trp Val
625 630 635 640

Trp Lys Ile Asp Leu Gly Ser Asn
645

<210> 75
<211> 3632
<212> DNA
<213> Yarrowia lipolytica

<400> 75
gccgacaatc tctcttcctc attaccgcgc tttaatagcg aggagctatt agtttgattt 60

catccaaacc ccgcgggacg tattggcggg ccaaccaaaa aaagagtctt catttagcgc 120

gaaaaaaaca agaggttgaa ggcaatattt ctgctcaatt agacgacaca tgatctcttg 180

tccaacagca atacggttcc tggacgccgc gggtcacgtg aagggtatcc ccggcttgtg 240

gatctctgga cacctgtgga tctatcgacc ctatggactt agctggtctg tgatcatgcg 300

atgaggccaa gacttttgtg cagatgaatc atgtgtctgg gtgagacttg ggtcggtctt 360

gtagcaaggc tggcggggcg ccacaccgac ggcgaggaag ggggggttct cgttgactcc 420

ggcctccgac tgcgagctgt gaaatcgcgc gaccgttcgc tggtgcctta cagatgcatc 480

taaaaaaagc ctcgttgttg ctgggtaagt caaacctcgg taagcacgat gggctgccca 540

gagagagcga gtgcactgca gcccggaagg ttgactgaag aaatcttata ccgtttatct 600

tctttaattt ttttgtcagc gcctttaaac tcggcggctt aattagtgac cgttttgggc 660

acctaaaatg gcgcacgagg ttattgttga ggtcagtagg tgtgagagag tctgagggcg 720

ggggccggac aagtgctcac ttatatagtt gtctcccatg acacgggtct ggtaacacgc 780

cggcgcctga cacggctcag atttggttca gcttggcaca atttggtttc aagcttgcac 840

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agatgcaaat gacgcacggc cctacatata gcggggtcta tcgtggcgac ggggcaaaaa 960

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gcccgacggc caggaaatgg acctgggcca ggtcaacaag aacctcaatg ccgcatacgc 1200

caaggccgag aaggactcgg acgacgagaa ggaaaagaag gaggagggcg tggtggacga 1260

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catcaccttt tctaactact tctggtactc catgttccca acgctcgtct acgaaattga 1980

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tgttattcaa atgcgagacg aacccttctg gaacaaggtc cgaatctatc ccattttcct 2160

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tatgaacaag tcagttgaca gctacaatgc ttccactgaa gttatcctcc cccactgtat 2760

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aaaaaaacgg tttacgccct ccgagccgat actacggaga tatcggagtt acagacactt 2940

tgggagcaaa gtctgcaata caagcccacg gaactagagg tgggtcgtca gtaaaggccg 3000

acgatactca gctggctgca taacttccgg attgaaagag agccagtctt tcgaacctcg 3060

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gcggtcagtt ggattgcaaa gtggaagggc aagagtactg ctgccttgtt taattggtat 3180

ccactatgca ttttgctttt tgcaagtgga actgggagaa cttgtagcct tgggttgatg 3240

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gaagctgtag aggatatgtg actacaagag tagtatctac gagtgtgtac ttgctgcgaa 3360

agttgatttc gaacgaacca gcttcattga ctaaacagtg atgattttcg agacagcgga 3420

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cgcttctttc tgtaacatac gatgatttgt caggtacagt acagtaccgt tttaagcacc 3540

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<210> 76
<211> 543
<212> PRT
<213> Yarrowia lipolytica

<400> 76

Met Ala Thr Leu His Pro Glu Asp Ala Ala Gly Arg Pro Val Arg Arg
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Arg Pro Arg Pro Ser Ser Ser Gly Gly Ser Arg Ser Pro Ser Thr Lys
            20                  25                  30

Arg His Ser Ile Val Arg Glu His Leu Gly Glu Glu Leu Asn Val Pro
        35                  40                  45

Asp Gly Gln Glu Met Asp Leu Gly Gln Val Asn Lys Asn Leu Asn Ala
    50                  55                  60

Ala Tyr Ala Lys Ala Glu Lys Asp Ser Asp Asp Glu Lys Glu Lys Lys
65                  70                  75                  80

Glu Glu Gly Val Val Asp Glu Leu Pro Glu Lys Tyr Ser Tyr Pro Arg
                85                  90                  95

Phe Ser Lys Asn Asn Arg Arg Tyr Arg Phe Thr Asp Ile Lys Phe Lys
            100                 105                 110

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

Phe Gly Phe Tyr Thr Leu Leu Trp Met Val Phe Ala Phe Cys Val Phe
    130                 135                 140

Arg Thr Gly Leu Leu Asn Tyr Thr Asn Glu Gly Ile Leu Phe Arg Gly
145                 150                 155                 160

Gln Ile Phe Ala Ile Leu Ser Lys Asp Leu Trp Lys Val Ala Leu Val
                165                 170                 175

Asp Leu Gly Met Tyr Leu Thr Thr Tyr Leu Ser Val Phe Leu Gln Leu
            180                 185                 190

Ala Val Lys His Gly Leu Val Asp Trp Asn Ser Phe Gly Trp Ile Ile
        195                 200                 205

Gln Asn Val His Gln Thr Leu Phe Leu Phe Phe Tyr Leu Trp Val Ala
```

```
    210                 215                 220

Lys Ser Ser Asn Leu Pro Trp Ile Gly Asn Ile Phe Ile Val Leu His
225                 230                 235                 240

Ala Phe Val Met Leu Met Lys Gln His Ser Tyr Ala Phe Tyr Asn Gly
                245                 250                 255

Tyr Leu Trp Thr Val Glu Asp Glu Leu Ser His Ala Lys Gln Arg Leu
            260                 265                 270

Thr Glu Asp Ile Pro Val Ser Glu Lys Glu Asp Leu Lys Leu Asp Ile
        275                 280                 285

Glu Phe Cys Glu Thr Glu Leu Lys Val Gln Ser Arg His Thr Pro Phe
    290                 295                 300

Pro Thr Asn Ile Thr Phe Ser Asn Tyr Phe Trp Tyr Ser Met Phe Pro
305                 310                 315                 320

Thr Leu Val Tyr Glu Ile Glu Phe Pro Arg Thr Pro Arg Ile Lys Trp
                325                 330                 335

Thr Tyr Val Leu Glu Lys Val Ala Ala Val Phe Gly Val Phe Phe Leu
            340                 345                 350

Met Ile Trp Val Ala Glu Ser Tyr Leu Tyr Pro Pro Val Val Ala Val
        355                 360                 365

Ile Gln Met Arg Asp Glu Pro Phe Trp Asn Lys Val Arg Ile Tyr Pro
    370                 375                 380

Ile Phe Leu Ser Asp Ile Leu Leu Pro Phe Val Ile Glu Tyr Met Leu
385                 390                 395                 400

Val Phe Tyr Ile Ile Trp Asp Ala Ile Leu Asn Gly Ile Ala Glu Leu
                405                 410                 415
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Thr Arg Phe Ala Asp Arg Asp Phe Tyr Gly Pro Trp Trp Asn Cys Thr
            420                 425                 430

Ser Trp Glu Gln Phe Ser Arg Glu Trp Asn Ile Pro Val Tyr Gln Phe
        435                 440                 445

Leu Lys Arg His Val Tyr His Ser Ser Ile Ser Ala Phe Lys Phe Ser
    450                 455                 460

Lys Gly Ala Ala Thr Leu Thr Thr Phe Leu Leu Ser Ser Leu Val His
465                 470                 475                 480

Glu Leu Val Met Phe Ala Ile Phe Lys Lys Phe Arg Gly Tyr Leu Leu
                485                 490                 495

Leu Leu Gln Met Thr Gln Leu Pro Leu Ala Met Leu Gln Lys Thr Lys
            500                 505                 510

Trp Ile Gln Asp Arg Pro Val Phe Gly Asn Ala Phe Phe Trp Phe Ser
        515                 520                 525

Leu Met Ile Gly Pro Ser Leu Met Cys Ser Met Tyr Leu Leu Phe
    530                 535                 540
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<210> 77
<211> 4103
<212> DNA
<213> Yarrowia lipolytica

<400> 77
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tgtacaagtg gaaaaaccac tacgagtagc ggatttgata ccacaagtag cagagatata 120

cagcaatggt gggagtgcaa gtatcggaat gtactgtacc tcctgtactc gtactcgtac 180

ggcactcgta gaaacggggc aatacggggg agaagcgatc gcccgtctgt tcaatcgcca 240

caagtccgag taatgctcga gtatcgaagt cttgtacctc cctgtcaatc atggcaccac 300

tggtcttgac ttgtctattc atactggaca agcgccagag ttaagcttgt agcgaatttc 360

gccctcggac atcaccccat acgacggaca cacatgcccg acaaacagcc tctcttattg 420

tagctgaaag tatattgaat gtgaacgtgt acaatatcag gtaccagcgg gaggttacgg 480

ccaaggtgat accggaataa ccctggcttg gagatggtcg gtccattgta ctgaagtgtc 540

cgtgtcgttt ccgtcactgc cccaattgga catgtttgtt tttccgatct ttcgggcgcc 600

ctctccttgt ctccttgtct gtctcctgga ctgttgctac cccatttctt tggcctccat 660

tggttcctcc ccgtctttca cgtcgtctat ggttgcatgg tttcccttat acttttcccc 720

acagtcacat gttatggagg ggtctagatg gaggcctaat tttgacgtgc aaggggcgaa 780

ttggggcgag aaacacgtcg tggacatggt gcaaggcccg cagggttgat tcgacgcttt 840

tccgcgaaaa aaacaagtcc aaatacccccc gtttattctc cctcggctct cggtatttca 900

catgaaaact ataacctaga ctacacgggc aaccttaacc ccagagtata cttatatacc 960

aaagggatgg gtcctcaaaa atcacacaag caacgacgcc atgaacccca acaacactgg 1020

caccattgaa atcaacggta aggagtacaa caccttcacc gagcccccg tggccatggc 1080

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cgagaagaac accctcaaaa acgagcagat catggaggag attgagcgag accctctttt 1200

caacaacgac aactactacg atctcaacaa ggagcagatc cgagagctca ccatggagcg 1260

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catcaacacc cctcacattg ccgccaccaa gtggtggatt ggaggagccg cccacaccgc 1620

cacccacact gtcgtgttcg cccgactcat tgtcaagggc aaggactacg gtgtcaagac 1680

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cgtgcgaatc ccccgacaga acctgctcat gaagtacaca aaggtcgacc gagagggtaa 1860

cgtgacccag cctcctctgg ctcagcttac ctacggttct cttatcactg gtcgagtctc 1920

catggcctct gattctcacc aggtcggaaa gcgattcatc accattgctc tgcgatacgc 1980

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cccctaccat cagcgacgac ttctgcctct tctggcctat gtctatgctc ttaagatgac 2100

tgccgatgag gttggagctc tcttctcccg aaccatgctt aagatggacg acctcaagcc 2160

cgacgacaag gccggcctca atgaggttgt ttccgacgtc aaggagctct tctccgtctc 2220

cgccggtctc aaggccttct ccacctgggc ttgtgccgac gtcattgaca agacccgaca 2280

ggcttgcggt ggccacggtt actctggata caacggtttc ggccaggcct acgccgactg 2340

ggttgtccag tgcacctggg agggtgacaa caacattctc acccttttctg ccggccgagc 2400

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caaggtcctc gtcgaggcct gggaggttgc tgccggtaac atcatcaacc gagccaccga 2580

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gtatgaataa agattatgta ttgattgcaa aaaagtgcat ttgtagatgt ggtttattgt 3180

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tgtacaagca cgtactactt gtactccaca atgtggagtg ggagcaaaaa aattggacga 3360

caccggaatc gaaccgggga cctcgcgcat gctaagcgca tgtgataacc aactacacca 3420

gacgcccaag aactttcttg gtgattatgg aatacgtggt ctgctatatc tcaattttgc 3480

tgtaatgaat cattagaatt aaaaaaaaaa ccccattttt gtgtgattgt cggccaagag 3540

atggaacagg aagaatacgt gaacaagcga gcacgaatgc catatgctct tctgaacaac 3600

cgagtccgaa tccgatttgt gggtatcaca tgtctcaagt agctgaaatg tatttcgcta 3660

gaataaaata aatgagatta agaattaaaa atattggaat atattttcct agaatagaaa 3720

ctttggattt tttttcggct attacagtct gaactggaca aacggctgac tatatataaa 3780

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cgagtataga gtggcctgac tggagaaaat gcagtagtat ggacagtagg tactgccagc 3900

cagagaagtt tttggaattg atacttgagt cattttcca ttccccattc cccattccaa 3960

cacaatcaac tgtttctgaa cattttccaa aacgcggaga tgtatgtcac ttggcactgc 4020

aagtctcgat tcaaaatgca tctctttcag accaaagtgt catcagcttt gtttggcccc 4080

aaattaccgc aaatacttgt cga 4103

<210> 78
<211> 700
<212> PRT
<213> Yarrowia lipolytica

<400> 78

Met Asn Pro Asn Asn Thr Gly Thr Ile Glu Ile Asn Gly Lys Glu Tyr
1 5 10 15

Asn Thr Phe Thr Glu Pro Pro Val Ala Met Ala Gln Glu Arg Ala Lys
20 25 30

Thr Ser Phe Pro Val Arg Glu Met Thr Tyr Phe Leu Asp Gly Gly Glu
35 40 45

Lys Asn Thr Leu Lys Asn Glu Gln Ile Met Glu Glu Ile Glu Arg Asp
50 55 60

```
Pro Leu Phe Asn Asn Asp Asn Tyr Tyr Asp Leu Asn Lys Glu Gln Ile
65                  70                  75                  80

Arg Glu Leu Thr Met Glu Arg Val Ala Lys Leu Ser Leu Phe Val Arg
                85                  90                  95

Asp Gln Pro Glu Asp Asp Ile Lys Lys Arg Phe Ala Leu Ile Gly Ile
            100                 105                 110

Ala Asp Met Gly Thr Tyr Thr Arg Leu Gly Val His Tyr Gly Leu Phe
        115                 120                 125

Phe Gly Ala Val Arg Gly Thr Gly Thr Ala Glu Gln Phe Gly His Trp
    130                 135                 140

Ile Ser Lys Gly Ala Gly Asp Leu Arg Lys Phe Tyr Gly Cys Phe Ser
145                 150                 155                 160

Met Thr Glu Leu Gly His Gly Ser Asn Leu Ala Gly Leu Glu Thr Thr
                165                 170                 175

Ala Ile Tyr Asp Glu Glu Thr Asp Glu Phe Ile Ile Asn Thr Pro His
            180                 185                 190

Ile Ala Ala Thr Lys Trp Trp Ile Gly Gly Ala Ala His Thr Ala Thr
        195                 200                 205

His Thr Val Val Phe Ala Arg Leu Ile Val Lys Gly Lys Asp Tyr Gly
    210                 215                 220

Val Lys Thr Phe Val Val Gln Leu Arg Asn Ile Asn Asp His Ser Leu
225                 230                 235                 240

Lys Val Gly Ile Ser Ile Gly Asp Ile Gly Lys Lys Met Gly Arg Asp
                245                 250                 255

Gly Ile Asp Asn Gly Trp Ile Gln Phe Thr Asn Val Arg Ile Pro Arg
```

260 265 270

Gln Asn Leu Leu Met Lys Tyr Thr Lys Val Asp Arg Glu Gly Asn Val
275 280 285

Thr Gln Pro Pro Leu Ala Gln Leu Thr Tyr Gly Ser Leu Ile Thr Gly
290 295 300

Arg Val Ser Met Ala Ser Asp Ser His Gln Val Gly Lys Arg Phe Ile
305 310 315 320

Thr Ile Ala Leu Arg Tyr Ala Cys Ile Arg Arg Gln Phe Ser Thr Thr
325 330 335

Pro Gly Gln Pro Glu Thr Lys Ile Ile Asp Tyr Pro Tyr His Gln Arg
340 345 350

Arg Leu Leu Pro Leu Leu Ala Tyr Val Tyr Ala Leu Lys Met Thr Ala
355 360 365

Asp Glu Val Gly Ala Leu Phe Ser Arg Thr Met Leu Lys Met Asp Asp
370 375 380

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

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

Ala Cys Ala Asp Val Ile Asp Lys Thr Arg Gln Ala Cys Gly Gly His
420 425 430

Gly Tyr Ser Gly Tyr Asn Gly Phe Gly Gln Ala Tyr Ala Asp Trp Val
435 440 445

Val Gln Cys Thr Trp Glu Gly Asp Asn Asn Ile Leu Thr Leu Ser Ala
450 455 460

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

Val Gly Asn Ala Val Ser Tyr Leu Lys Arg Tyr Lys Asp Leu Ala Asn
                485                 490                 495

Ala Lys Leu Asn Gly Arg Ser Leu Thr Asp Pro Lys Val Leu Val Glu
            500                 505                 510

Ala Trp Glu Val Ala Ala Gly Asn Ile Ile Asn Arg Ala Thr Asp Gln
        515                 520                 525

Tyr Glu Lys Leu Ile Gly Glu Gly Leu Asn Ala Asp Gln Ala Phe Glu
    530                 535                 540

Val Leu Ser Gln Gln Arg Phe Gln Ala Ala Lys Val His Thr Arg Arg
545                 550                 555                 560

His Leu Ile Ala Ala Phe Phe Ser Arg Ile Asp Thr Glu Ala Gly Glu
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Ala Ile Lys Gln Pro Leu Leu Asn Leu Ala Leu Leu Phe Ala Leu Trp
            580                 585                 590

Ser Ile Glu Glu Asp Ser Gly Leu Phe Leu Arg Glu Gly Phe Leu Glu
        595                 600                 605

Pro Lys Asp Ile Asp Thr Val Thr Glu Leu Val Asn Lys Tyr Cys Thr
    610                 615                 620

Thr Val Arg Glu Glu Val Ile Gly Tyr Thr Asp Ala Phe Asn Leu Ser
625                 630                 635                 640

Asp Tyr Phe Ile Asn Ala Pro Ile Gly Cys Tyr Asp Gly Asp Ala Tyr
                645                 650                 655

Arg His Tyr Phe Gln Lys Val Asn Glu Gln Asn Pro Ala Arg Asp Pro
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90

660 665 670

Arg Pro Pro Tyr Tyr Ala Ser Thr Leu Lys Pro Phe Leu Phe Arg Glu
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<212> DNA
<213> Saccharomyces cerevisiae

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aagtggtcac tctcgaaagt agttgatctg aagtcaagga attgagggga aattcctaag 300

gacatcagat cgaccaattc ggtaaattca atgggtaggt cactcattgg ttagaacttt 360

cgtgataatt tatttttata gttgaatatc ttctttctct ctcaactctg atccggattg 420

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aactttaaaa cctataatgt gctaatattt tattataaac ctccttttttt tgcgttcaaa 660

ccctgacaca ttttaagccc tatatttacg gtattagttg attaaactcc gaagcgaaag 720

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<212> PRT
<213> Saccharomyces cerevisiae

<400> 80

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Gln Val Asn Thr Phe Leu Glu Ser Ser Pro Glu Arg Arg Thr Leu Thr
35 40 45

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

Thr Asp Tyr Tyr Asp Ala Lys Lys Met Gln Glu Arg Glu Ile Thr Ala
65 70 75 80

Lys Lys Ile Ala Arg Leu Ala Ser Tyr Met Glu His Asp Ile Lys Thr
85 90 95

Val Arg Lys His Phe Arg Asp Thr Asp Leu Met Lys Glu Leu Gln Ala
100 105 110

Asn Asp Pro Asp Lys Ala Ser Pro Leu Thr Asn Lys Asp Leu Phe Ile
115 120 125

Phe Asp Lys Arg Leu Ser Leu Val Ala Asn Ile Asp Pro Gln Leu Gly

130 135 140

Thr Arg Val Gly Val His Leu Gly Leu Phe Gly Asn Cys Ile Lys Gly
145 150 155 160

Asn Gly Thr Asp Glu Gln Ile Arg Tyr Trp Leu Gln Glu Arg Gly Ala
165 170 175

Thr Leu Met Lys Gly Ile Tyr Gly Cys Phe Ala Met Thr Glu Leu Gly
180 185 190

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

Gln Asn Asp Thr Phe Val Ile Asp Thr Pro Asp Leu Thr Ala Thr Lys
210 215 220

Trp Trp Ile Gly Gly Ala Ala His Ser Ala Thr His Ala Ala Val Tyr
225 230 235 240

Ala Arg Leu Ile Val Glu Gly Lys Asp Tyr Gly Val Lys Thr Phe Val
245 250 255

Val Pro Leu Arg Asp Pro Ser Thr Phe Gln Leu Leu Ala Gly Val Ser
260 265 270

Ile Gly Asp Ile Gly Ala Lys Met Gly Arg Asp Gly Ile Asp Asn Gly
275 280 285

Trp Ile Gln Phe Arg Asn Val Val Ile Pro Arg Glu Phe Met Leu Ser
290 295 300

Arg Phe Thr Lys Val Val Arg Ser Pro Asp Gly Ser Val Thr Val Lys
305 310 315 320

Thr Glu Pro Gln Leu Asp Gln Ile Ser Gly Tyr Ser Ala Leu Leu Ser
325 330 335

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Gly Arg Val Asn Met Val Met Asp Ser Phe Arg Phe Gly Ser Lys Phe
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Ala Thr Ile Ala Val Arg Tyr Ala Val Gly Arg Gln Gln Phe Ala Pro
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Arg Lys Gly Leu Ser Glu Thr Gln Leu Ile Asp Tyr Pro Leu His Gln
    370                 375                 380

Tyr Arg Val Leu Pro Gln Leu Cys Val Pro Tyr Leu Val Ser Pro Val
385                 390                 395                 400

Ala Phe Lys Leu Met Asp Asn Tyr Tyr Ser Thr Leu Asp Glu Leu Tyr
                405                 410                 415

Asn Ala Ser Ser Ser Ala Tyr Lys Ala Ala Leu Val Thr Val Ser Lys
            420                 425                 430

Lys Leu Lys Asn Leu Phe Ile Asp Ser Ala Ser Leu Lys Ala Thr Asn
        435                 440                 445

Thr Trp Leu Ile Ala Thr Leu Ile Asp Glu Leu Arg Gln Thr Cys Gly
    450                 455                 460

Gly His Gly Tyr Ser Gln Tyr Asn Gly Phe Gly Lys Gly Tyr Asp Asp
465                 470                 475                 480

Trp Val Val Gln Cys Thr Trp Glu Gly Asp Asn Asn Val Leu Ser Leu
                485                 490                 495

Thr Ser Ala Lys Ser Ile Leu Lys Lys Phe Ile Asp Ser Ala Thr Lys
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Gly Arg Phe Asp Asn Thr Leu Asp Val Asp Ser Phe Ser Tyr Leu Lys
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Pro Gln Tyr Ile Gly Ser Val Val Ser Gly Glu Ile Lys Ser Gly Leu
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Lys Glu Leu Gly Asp Tyr Thr Glu Ile Trp Ser Ile Thr Leu Ile Lys
545 550 555 560

Leu Leu Ala His Ile Gly Thr Leu Val Glu Lys Ser Arg Ser Ile Asp
565 570 575

Ser Val Ser Lys Leu Leu Val Leu Val Ser Lys Phe His Ala Leu Arg
580 585 590

Cys Met Leu Lys Thr Tyr Tyr Asp Lys Leu Asn Ser Arg Asp Ser His
595 600 605

Ile Ser Asp Glu Ile Thr Lys Glu Ser Met Trp Asn Val Tyr Lys Leu
610 615 620

Phe Ser Leu Tyr Phe Ile Asp Lys His Ser Gly Glu Phe Gln Gln Phe
625 630 635 640

Lys Ile Phe Thr Pro Asp Gln Ile Ser Lys Val Val Gln Pro Gln Leu
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Leu Ala Leu Leu Pro Ile Val Arg Lys Asp Cys Ile Gly Leu Thr Asp
660 665 670

Ser Phe Glu Leu Pro Asp Ala Met Leu Asn Ser Pro Ile Gly Tyr Phe
675 680 685

Asp Gly Asp Ile Tyr His Asn Tyr Phe Asn Glu Val Cys Arg Asn Asn
690 695 700

Pro Val Glu Ala Asp Gly Ala Gly Lys Pro Ser Tyr His Ala Leu Leu
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tcttttctaa ttcgtagttt ttcaagttct tagatgcttt ctttttctct tttttacaga 540

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cgatttcaac atataaatag cttttgataa tggcaatatt aatcaaattt attttacttc 420

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<212> DNA
<213> Saccharomyces cerevisiae

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<213> Saccharomyces cerevisiae

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<211> 282
<212> DNA
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<212> DNA
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<212> DNA
<213> Yarrowia lipolytica

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<400> 88

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35 40 45

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Asp Cys Asn Leu Gln Gln Ala Arg Lys Gln Thr Met Glu Arg Val Ala
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Ala Leu Ser Pro Tyr Leu Val Thr Asp Thr Glu Lys Leu Ser Leu Trp
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Arg Ala Gln Leu His Gly Met Val Asp Met Ser Thr Arg Thr Arg Leu
                85                  90                  95

Ser Ile His Asn Asn Leu Phe Ile Gly Ser Ile Arg Gly Ser Gly Thr
            100                 105                 110

Pro Glu Gln Phe Lys Tyr Trp Val Lys Lys Gly Ala Val Ala Val Lys
        115                 120                 125

Gln Phe Tyr Gly Cys Phe Ala Met Thr Glu Leu Gly His Gly Ser Asn
    130                 135                 140

Leu Lys Gly Leu Glu Thr Thr Ala Thr Tyr Asp Gln Asp Ser Asp Gln
145                 150                 155                 160

Phe Ile Ile Asn Thr Pro His Ile Gly Ala Thr Lys Trp Trp Ile Gly
                165                 170                 175

Gly Ala Ala His Thr Ser Thr His Cys Val Cys Phe Ala Lys Leu Ile
            180                 185                 190

Val His Gly Lys Asp Tyr Gly Thr Arg Asn Phe Val Val Pro Leu Arg
        195                 200                 205

Asn Val His Asp His Ser Leu Lys Val Gly Val Ser Ile Gly Asp Ile
    210                 215                 220

Gly Lys Lys Met Gly Arg Asp Gly Val Asp Asn Gly Trp Ile Gln Phe
225                 230                 235                 240

Thr Asn Val Arg Ile Pro Arg Gln Asn Met Leu Met Arg Tyr Ala Lys
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                245                 250                 255

Val Ser Asp Thr Gly Val Val Thr Lys Pro Ala Leu Asp Gln Leu Thr
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Tyr Gly Ala Leu Ile Arg Gly Arg Val Ser Met Ile Ala Asp Ser Phe
        275                 280                 285

His Val Ser Lys Arg Phe Leu Thr Ile Ala Leu Arg Tyr Ala Cys Val
    290                 295                 300

Arg Arg Gln Phe Gly Thr Ser Gly Asp Thr Lys Glu Thr Lys Ile Ile
305                 310                 315                 320

Asp Tyr Pro Tyr His Gln Arg Arg Leu Leu Pro Leu Leu Ala Tyr Cys
                325                 330                 335

Tyr Ala Met Lys Met Gly Ala Asp Glu Ala Gln Lys Thr Trp Ile Glu
            340                 345                 350

Thr Thr Asp Arg Ile Leu Ala Leu Asn Pro Asn Asp Pro Ala Gln Lys
        355                 360                 365

Asn Asp Leu Glu Lys Ala Val Thr Asp Thr Lys Glu Leu Phe Ala Ala
    370                 375                 380

Ser Ala Gly Met Lys Ala Phe Thr Thr Trp Gly Cys Ala Lys Ile Ile
385                 390                 395                 400

Asp Glu Cys Arg Gln Ala Cys Gly Gly His Gly Tyr Ser Gly Tyr Asn
                405                 410                 415

Gly Phe Gly Gln Gly Tyr Ala Asp Trp Val Val Gln Cys Thr Trp Glu
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Gly Asp Asn Asn Val Leu Cys Leu Ser Met Gly Arg Gly Leu Val Gln
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Ser Ala Leu Gln Ile Leu Ala Gly Lys His Val Gly Ala Ser Ile Gln
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Tyr Val Gly Asp Lys Ser Lys Ile Ser Gln Asn Gly Gln Gly Thr Pro
465                 470                 475                 480

Arg Glu Gln Leu Leu Ser Pro Glu Phe Leu Val Glu Ala Phe Arg Thr
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Ala Ser Arg Asn Asn Ile Leu Arg Thr Thr Asp Lys Tyr Gln Glu Leu
            500                 505                 510

Val Lys Thr Leu Asn Pro Asp Gln Ala Phe Glu Glu Leu Ser Gln Gln
        515                 520                 525

Arg Phe Gln Cys Ala Arg Ile His Thr Arg Gln His Leu Ile Ser Ser
    530                 535                 540

Phe Tyr Ala Arg Ile Ala Thr Ala Lys Asp Asp Ile Lys Pro His Leu
545                 550                 555                 560

Leu Lys Leu Ala Asn Leu Phe Ala Leu Trp Ser Ile Glu Glu Asp Thr
                565                 570                 575

Gly Ile Phe Leu Arg Glu Asn Ile Leu Thr Pro Gly Asp Ile Asp Leu
            580                 585                 590

Ile Asn Ser Leu Val Asp Glu Leu Cys Val Ala Val Arg Asp Gln Val
        595                 600                 605

Ile Gly Leu Thr Asp Ala Phe Gly Leu Ser Asp Phe Phe Ile Asn Ala
    610                 615                 620

Pro Ile Gly Ser Tyr Asp Gly Asn Val Tyr Glu Lys Tyr Phe Ala Lys
625                 630                 635                 640

Val Asn Gln Gln Asn Pro Ala Thr Asn Pro Arg Pro Pro Tyr Tyr Glu
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Lys Val Lys Phe Pro Ile Lys Asp Met Thr Glu Phe Leu His Gly Gly
35 40 45

Glu Glu Asn Val Thr Met Ile Glu Arg Leu Met Thr Glu Leu Glu Arg
50 55 60

Asp Pro Val Leu Asn Val Ser Gly Asp Tyr Asp Met Pro Lys Glu Gln
65 70 75 80

Leu Arg Glu Thr Ala Val Ala Arg Ile Ala Ala Leu Ser Gly His Trp
85 90 95

Lys Lys Asp Thr Glu Lys Glu Ala Leu Leu Arg Ser Gln Leu His Gly
100 105 110

Ile Val Asp Met Gly Thr Arg Ile Arg Leu Gly Val His Thr Gly Leu
115 120 125

Phe Met Gly Ala Ile Arg Gly Ser Gly Thr Lys Glu Gln Tyr Asp Tyr
130 135 140

Trp Val Arg Lys Gly Ala Ala Asp Val Lys Gly Phe Tyr Gly Cys Phe

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Ala Met Thr Glu Leu Gly His Gly Ser Asn Val Ala Gly Leu Glu Thr
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Thr Ala Thr Tyr Ile Gln Asp Thr Asp Glu Phe Ile Ile Asn Thr Pro
            180                 185                 190

Asn Thr Gly Ala Thr Lys Trp Trp Ile Gly Gly Ala Ala His Ser Ala
        195                 200                 205

Thr His Thr Ala Cys Phe Ala Arg Leu Leu Val Asp Gly Lys Asp Tyr
    210                 215                 220

Gly Val Lys Ile Phe Val Val Gln Leu Arg Asp Val Ser Ser His Ser
225                 230                 235                 240

Leu Met Pro Gly Ile Ala Leu Gly Asp Ile Gly Lys Lys Met Gly Arg
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Asp Ala Ile Asp Asn Gly Trp Ile Gln Phe Thr Asn Val Arg Ile Pro
            260                 265                 270

Arg Gln Asn Met Leu Met Lys Tyr Ala Lys Val Ser Ser Thr Gly Lys
        275                 280                 285

Val Ser Gln Pro Pro Leu Ala Gln Leu Thr Tyr Gly Ala Leu Ile Gly
    290                 295                 300

Gly Arg Val Thr Met Ile Ala Asp Ser Phe Phe Val Ser Gln Arg Phe
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Ile Thr Ile Ala Leu Arg Tyr Ala Cys Val Arg Arg Gln Phe Gly Thr
                325                 330                 335

Thr Pro Gly Gln Pro Glu Thr Lys Ile Ile Asp Tyr Pro Tyr His Gln
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Arg Arg Leu Leu Pro Leu Leu Ala Phe Thr Tyr Ala Met Lys Met Ala
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Ala Asp Gln Ser Gln Ile Gln Tyr Asp Gln Thr Thr Asp Leu Leu Gln
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Thr Ile Asp Pro Lys Asp Lys Gly Ala Leu Gly Lys Ala Ile Val Asp
385                 390                 395                 400

Leu Lys Glu Leu Phe Ala Ser Ser Ala Gly Leu Lys Ala Phe Thr Thr
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Trp Thr Cys Ala Asn Ile Ile Asp Gln Cys Arg Gln Ala Cys Gly Gly
            420                 425                 430

His Gly Tyr Ser Gly Tyr Asn Gly Phe Gly Gln Ala Tyr Ala Asp Trp
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Val Val Gln Cys Thr Trp Glu Gly Asp Asn Asn Val Leu Cys Leu Ser
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Met Gly Arg Gly Leu Ile Gln Ser Cys Leu Gly His Arg Lys Gly Lys
465                 470                 475                 480

Pro Leu Gly Ser Ser Val Gly Tyr Leu Ala Asn Lys Gly Leu Glu Gln
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Ala Thr Leu Ser Gly Arg Asp Leu Lys Asp Pro Lys Val Leu Ile Glu
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Ala Trp Glu Lys Val Ala Asn Gly Ala Ile Gln Arg Ala Thr Asp Lys
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Phe Val Glu Leu Thr Lys Gly Gly Leu Ser Pro Asp Gln Ala Phe Glu
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Glu Leu Ser Gln Gln Arg Phe Gln Cys Ala Lys Ile His Thr Arg Lys
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His Leu Val Thr Ala Phe Tyr Glu Arg Ile Asn Ala Ser Ala Lys Ala
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Asp Val Lys Pro Tyr Leu Ile Asn Leu Ala Asn Leu Phe Thr Leu Trp
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Ser Ile Glu Glu Asp Ser Gly Leu Phe Leu Arg Glu Gly Phe Leu Gln
595 600 605

Pro Lys Asp Ile Asp Gln Val Thr Glu Leu Val Asn His Tyr Cys Lys
610 615 620

Glu Val Arg Asp Gln Val Ala Gly Tyr Thr Asp Ala Phe Gly Leu Ser
625 630 635 640

Asp Trp Phe Ile Asn Ala Pro Ile Gly Asn Tyr Asp Gly Asp Val Tyr
645 650 655

Lys His Tyr Phe Ala Lys Val Asn Gln Gln Asn Pro Ala Gln Asn Pro
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<400> 92

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Gly Ala Ser Val Val Val Asn Asp Leu Gly Gly Asp Phe Lys Gly Asp
35 40 45

Gly Ala Gln Ala Gly Ser Gly Lys Arg Val Ala Asp Val Val Val Asp
50 55 60

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

Glu Asn Gly Asp Lys Ile Val Glu Thr Ala Val Lys Ala Phe Gly Ser
85 90 95

Val His Ile Val Ile Asn Asn Ala Gly Ile Leu Arg Asp Ile Ser Phe
100 105 110

Lys Lys Met Thr Asp Lys Asp Trp Asp Leu Val Tyr Lys Val His Val
115 120 125

Phe Gly Ala Tyr Lys Val Thr Arg Ala Ala Trp Pro Tyr Phe Arg Lys
130 135 140

Gln Lys Tyr Gly Arg Val Ile Ser Thr Ser Ser Ala Ala Gly Leu Tyr
145 150 155 160

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Gly Asn Phe Gly Gln Thr Asn Tyr Ser Ala Ala Lys Leu Ala Leu Val
                165                 170                 175

Gly Phe Gly Glu Thr Leu Ala Lys Glu Gly Ala Lys Tyr Asn Ile Thr
            180                 185                 190

Ser Asn Val Ile Ala Pro Leu Ala Ala Ser Arg Met Thr Glu Thr Val
        195                 200                 205

Met Pro Glu Asp Ile Leu Lys Leu Leu Lys Pro Glu Tyr Val Val Pro
    210                 215                 220

Leu Val Gly Tyr Leu Thr His Asp Ser Val Thr Glu Ser Tyr Gly Ile
225                 230                 235                 240

Tyr Glu Val Gly Ala Gly Tyr Met Ala Lys Ile Arg Trp Glu Arg Gly
                245                 250                 255

Asn Gly Ala Val Phe Lys Gly Asp Asp Thr Phe Thr Pro Ser Ala Ile
            260                 265                 270

Leu Lys Arg Trp Asp Glu Val Thr Ser Phe Glu Ser Pro Thr Tyr Pro
        275                 280                 285

Asn Gly Pro Ala Asp Phe Phe Lys Tyr Ala Glu Glu Ser Val Lys Arg
    290                 295                 300

Pro Glu Asn Pro Gln Gly Pro Thr Val Ser Phe Lys Asp Gln Val Val
305                 310                 315                 320

Ile Val Thr Gly Ala Gly Ala Gly Ile Gly Arg Ala Tyr Ser His Leu
                325                 330                 335

Leu Ala Lys Leu Gly Ala Lys Val Val Val Asn Asp Phe Gly Asn Pro
            340                 345                 350

Gln Lys Val Val Asp Glu Ile Lys Ala Leu Gly Gly Ile Ala Val Ala
```

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        355                 360                 365

Asp Lys Asn Asn Val Ile His Gly Glu Lys Val Val Gln Thr Ala Ile
    370                 375                 380

Asp Ala Phe Gly Ala Val His Ala Val Val Asn Asn Ala Gly Ile Leu
385                 390                 395                 400

Arg Asp Lys Ser Phe Ala Asn Met Asp Asp Glu Met Trp Gln Leu Ile
                405                 410                 415

Phe Asp Val His Leu Asn Gly Thr Tyr Ser Val Thr Lys Ala Ala Trp
            420                 425                 430

Pro His Phe Leu Lys Gln Lys Tyr Gly Arg Val Ile Asn Thr Thr Ser
        435                 440                 445

Thr Ser Gly Ile Tyr Gly Asn Phe Gly Gln Ala Asn Tyr Ser Ala Ala
    450                 455                 460

Lys Ala Gly Ile Leu Gly Phe Ser Arg Ala Leu Ala Arg Glu Gly Glu
465                 470                 475                 480

Lys Tyr Asn Ile Leu Val Asn Thr Ile Ala Pro Asn Ala Gly Thr Ala
                485                 490                 495

Met Thr Ala Ser Val Phe Thr Glu Glu Met Leu Glu Leu Phe Lys Pro
            500                 505                 510

Asp Phe Ile Ala Pro Ile Thr Val Leu Leu Ala Ser Asp Gln Ala Pro
        515                 520                 525

Val Thr Gly Asp Leu Phe Glu Thr Gly Ser Ala Trp Ile Gly Gln Thr
    530                 535                 540

Arg Trp Gln Arg Ala Gly Gly Lys Ala Phe Asn Thr Lys Lys Gly Val
545                 550                 555                 560
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Thr Pro Glu Met Val Arg Asp Ser Trp Ala Lys Ile Val Asp Phe Asp
                565                 570                 575

Asp Gly Asn Ser Thr His Pro Thr Thr Pro Ser Glu Ser Thr Thr Gln
            580                 585                 590

Ile Leu Glu Asn Ile Phe Asn Val Pro Asp Glu Glu Val Glu Glu Thr
        595                 600                 605

Ala Leu Val Ala Gly Pro Gly Gly Pro Gly Ile Leu Asn Lys Glu Gly
    610                 615                 620

Glu Pro Phe Asp Tyr Thr Tyr Thr Tyr Arg Asp Leu Ile Leu Tyr Asn
625                 630                 635                 640

Leu Gly Leu Gly Ala Lys Ala Asn Glu Leu Lys Tyr Val Phe Glu Gly
                645                 650                 655

Asp Asp Asp Phe Gln Thr Val Pro Thr Phe Gly Val Ile Pro Tyr Met
            660                 665                 670

Gly Gly Leu Ile Thr Thr Asn Tyr Gly Asp Phe Val Pro Asn Phe Asn
        675                 680                 685

Pro Met Met Leu Leu His Gly Glu Gln Tyr Leu Glu Ile Arg Gln Trp
    690                 695                 700

Pro Ile Pro Thr Asn Ala Thr Leu Glu Asn Lys Ala Lys Val Ile Asp
705                 710                 715                 720

Val Val Asp Lys Gly Lys Ala Ala Leu Leu Val Thr Ala Thr Thr Thr
                725                 730                 735

Thr Asn Lys Glu Thr Gly Glu Glu Val Phe Tyr Asn Glu Ser Ser Leu
            740                 745                 750

Phe Ile Arg Gly Ser Gly Gly Phe Gly Gly Lys Ser Thr Gly Thr Asp
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120
755 760 765

Arg Gly Ala Ala Thr Ala Ala Asn Lys Pro Pro Ala Arg Ala Pro Asp
770 775 780

Phe Val Lys Glu Ile Lys Ile Gln Glu Asp Gln Ala Ala Ile Tyr Arg
785 790 795 800

Leu Ser Gly Asp Tyr Asn Pro Leu His Ile Asp Pro Ala Phe Ala Ala
805 810 815

Val Gly Asn Phe Asp Arg Pro Ile Leu His Gly Leu Cys Ser Phe Gly
820 825 830

Val Ser Gly Lys Ala Leu Tyr Asp Gln Phe Gly Pro Phe Lys Asn Ala
835 840 845

Lys Val Arg Phe Ala Gly His Val Phe Pro Gly Glu Thr Leu Lys Val
850 855 860

Glu Gly Trp Lys Glu Gly Asn Lys Val Ile Phe Gln Thr Lys Val Val
865 870 875 880

Glu Arg Gly Thr Thr Ala Ile Ser Asn Ala Ala Ile Glu Leu Phe Pro
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Lys Asp Ala Lys Leu
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<213> Yarrowia lipolytica

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<210> 94
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<213> Yarrowia lipolytica

<400> 94

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Gln Leu His Thr Arg Ser Asn Met Ser Asp Asn Thr Thr Ile Lys Lys
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Pro Ile Arg Pro Lys Pro Ile Arg Thr Glu Arg Leu Pro Tyr Ala Gly
        35                  40                  45


Ala Ala Glu Ile Ile Arg Ala Asn Gln Lys Asp His Tyr Phe Glu Ser
    50                  55                  60


Val Leu Glu Gln His Leu Val Thr Phe Leu Gln Lys Trp Lys Gly Val
65                  70                  75                  80


Arg Phe Ile His Gln Tyr Lys Glu Glu Leu Glu Thr Ala Ser Lys Phe
                85                  90                  95


Ala Tyr Leu Gly Leu Cys Thr Leu Val Gly Ser Lys Thr Leu Gly Glu
            100                 105                 110


Glu Tyr Thr Asn Leu Met Tyr Thr Ile Arg Asp Arg Thr Ala Leu Pro
        115                 120                 125


Gly Val Val Arg Arg Phe Gly Tyr Val Leu Ser Asn Thr Leu Phe Pro
    130                 135                 140


Tyr Leu Phe Val Arg Tyr Met Gly Lys Leu Arg Ala Lys Leu Met Arg
145                 150                 155                 160


Glu Tyr Pro His Leu Val Glu Tyr Asp Glu Asp Glu Pro Val Pro Ser
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                165                 170                 175

Pro Glu Thr Trp Lys Glu Arg Val Ile Lys Thr Phe Val Asn Lys Phe
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Asp Lys Phe Thr Ala Leu Glu Gly Phe Thr Ala Ile His Leu Ala Ile
        195                 200                 205

Phe Tyr Val Tyr Gly Ser Tyr Tyr Gln Leu Ser Lys Arg Ile Trp Gly
    210                 215                 220

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

Gly Tyr Glu Met Leu Gly Leu Leu Ile Phe Ala Arg Phe Ala Thr Ser
                245                 250                 255

Phe Val Gln Thr Gly Arg Glu Tyr Leu Gly Ala Leu Leu Glu Lys Ser
            260                 265                 270

Val Glu Lys Glu Ala Gly Glu Lys Glu Asp Glu Lys Glu Ala Val Val
        275                 280                 285

Pro Lys Lys Lys Ser Ser Ile Pro Phe Ile Glu Asp Thr Glu Gly Glu
    290                 295                 300

Thr Glu Asp Lys Ile Asp Leu Glu Asp Pro Arg Gln Leu Lys Phe Ile
305                 310                 315                 320

Pro Glu Ala Ser Arg Ala Cys Thr Leu Cys Leu Ser Tyr Ile Ser Ala
                325                 330                 335

Pro Ala Cys Thr Pro Cys Gly His Phe Phe Cys Trp Asp Cys Ile Ser
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Glu Trp Val Arg Glu Lys Pro Glu Cys Pro Leu Cys Arg Gln Gly Val
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aaaaagtcta actaaaa 3917

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<211> 638
<212> PRT
<213> Yarrowia lipolytica

<400> 96

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Phe Tyr Ser Pro Thr Asp Ser Tyr Ala Pro Gly Ser Val Asp Cys Pro
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Ser Asn Ser Thr Gln Ile Val Arg Lys Gly Glu Gly Leu Ser Ser Gln
        35                  40                  45

Glu Arg Glu Trp Val Gln Asn Arg His Glu Gln Thr Arg Pro Glu Leu
    50                  55                  60

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

Phe Leu Gly Gln Asp Thr Asn Ile Thr Ile Gly Leu Ser Phe Ser Gly
                85                  90                  95

Gly Gly Tyr Arg Ala Met Leu Ala Gly Ala Gly Gln Phe Ala Ala Leu
            100                 105                 110

Asp Ala Arg Thr Pro Asn Ala Thr Glu Pro Gly His Val Gly Gly Leu
        115                 120                 125

Val Gln Ala Ala Thr Tyr Leu Val Gly Leu Ser Gly Gly Asn Trp Met
    130                 135                 140

Val Gly Ser Val Val Ile Asn Asn Phe Thr Thr Ile Pro Asp Leu Gln
145                 150                 155                 160

His Ser Ser Asp Val Trp Asp Leu Glu His Ser Met Ile Asn Pro Gly
                165                 170                 175

Gly Ile Asn Ile Phe Lys Thr Gly Ser Tyr Trp Asp Asp Ile Asn Asp
            180                 185                 190

Asp Val Asn Asp Lys Gln His Ala Gly Tyr Asn Thr Ser Phe Thr Asp
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Ile Trp Gly Arg Gly Leu Ser Tyr Gln Phe Phe Asn Ala Ser Asn Thr
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Ala Arg Leu Thr Trp Ser Glu Ile Gln Asn Tyr Asp His Phe Lys Asn
225 230 235 240

His Ser Met Pro Tyr Pro Ile Val Val Ala Asp Gly Arg Ala Pro Gly
245 250 255

Thr Arg Ile Ile Ser Gly Asn Ser Thr Ile Phe Glu Leu Ala Pro Phe
260 265 270

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

Trp Leu Gly Thr Asn Met Thr Asn Gly Arg Pro Asn Gly Thr Cys Val
290 295 300

His Gly Phe Asp Asn Ala Gly Phe Ile Val Gly Thr Ser Ser Ser Leu
305 310 315 320

Phe Asn Gln Phe Ile Leu Gln Leu Asn Ser Thr Gly Val Thr Gly Val
325 330 335

Val Tyr Asp Leu Ala His Ser Ile Leu Lys Arg Leu Asp Lys Asp Ser
340 345 350

Asp Asp Ile Ala Ile Tyr Ser Pro Asn Pro Phe Lys Gly Met Ser Tyr
355 360 365

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

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

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Glu Arg Ala Val Asp Val Val Ile Ser Tyr Asp Asn Ser Ala Asp Thr
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Asp Phe Asn Trp Pro Asn Gly Thr Ser Ala Val Gln Thr Tyr Arg Arg
            420                 425                 430

Gln Phe Glu Asn Gln Ala Asn Gly Thr Ile Phe Pro Tyr Val Pro Asp
        435                 440                 445

Val Asn Thr Phe Ile Asn Glu Asn Leu Thr Ser Arg Pro Ala Phe Phe
    450                 455                 460

Gly Cys Asp Val Gln Asn Met Thr Ser Leu Asp Lys Asn Gly Tyr Thr
465                 470                 475                 480

Asp Val Asn Ser Ser Ala Ala Leu Pro Pro Leu Ile Val Tyr Ile Ala
                485                 490                 495

Asn Tyr Pro Trp Thr Phe Phe Ser Asn Thr Ser Thr Met Ser Lys Leu
            500                 505                 510

Ser Tyr Asn Lys Lys Glu Val Ala Gly Met Ile Glu Asn Gly Tyr Ser
        515                 520                 525

Thr Ser Thr Gln Phe Asn Gly Thr Val Asp Pro Asp Trp Pro Val Cys
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Leu Gly Ser Asp Cys Asp Lys Cys Phe Ser Lys Tyr Cys Trp Asn Gly
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Lys Thr Asp Asp Asp Ala Glu Lys Ala Leu Lys Phe Ala Pro Ala Ile
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Tyr Ala Asn Gly Pro Asn Val Ser Ser Asn Ala Ser Ile Gly Gln Ala
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Tyr His Leu Ala Thr His Glu Lys Val Ala Leu Lys Ile Ile Asn Arg
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Lys Thr Leu Ala Lys Ser Asp Met Gln Gly Arg Val Glu Arg Glu Ile
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Ser Tyr Leu Arg Leu Leu Arg His Pro His Ile Ile Lys Leu Tyr Asp
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Val Ile Lys Ser Lys Asp Glu Ile Ile Met Val Ile Glu Phe Ala Gly
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Lys Glu Leu Phe Asp Tyr Ile Val Gln Arg Gly Lys Met Pro Glu Asp
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Glu Ala Arg Arg Phe Phe Gln Gln Ile Ile Ser Ala Val Glu Tyr Cys
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His Arg His Lys Ile Val His Arg Asp Leu Lys Pro Glu Asn Leu Leu
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Leu Asp Glu Asn Leu Asn Val Lys Ile Ala Asp Phe Gly Leu Ser Asn
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Val Gln Gly Ile Met Glu Asp Pro Trp Phe Lys Gln Gly Ile Ala Glu
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Glu Ser Gly Glu Ile Lys Thr Arg Asp Val Ala Gln Val Ser Asn Ser
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Lys Ser Ala Asn Glu Thr Phe Thr Phe Ser Ala Tyr Pro Phe Leu His
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<213> Yarrowia lipolytica

<400> 100

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Thr Asn Thr Val Phe Tyr Glu Asp Thr Ala Asp Ser Asp Trp Gln Ser
35 40 45

Ser Asp Tyr Asp Ser Glu His Ala Thr Val Asn Val Pro Ile Arg Ser
50 55 60

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

Ser Glu Asp Pro His Gln Glu Ser Phe Ser Asp Gly Ser Glu Ala Ala
85 90 95

Gly Pro Ser Ala Pro Pro Ala Asp Gly Tyr Ile Asn Thr Ala Pro Asn
100 105 110

Gly Val Tyr Ser Glu Glu Asp Leu Pro Gly Thr Arg Gln Val Leu Pro
115 120 125

Gly Pro Gln Glu Val Pro Asp Val Thr Ser Thr Pro Gln Met Asn Arg
130 135 140

His Pro Thr Ala Asp Glu Ser Thr Pro Gln Gly Ser Arg Trp Ser Arg

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145                 150                 155                 160

Gly Arg Glu Gly Phe Gly His Leu Gly Ser Pro Ser Phe Phe Arg Arg
                165                 170                 175

His Ser Ala Thr Ala Glu Asp Met Thr Pro Gly Gly Gly Pro Arg Arg
            180                 185                 190

Leu Phe Lys Arg Pro Gln Leu Asn Ser Ser Asn Thr Thr Ser Gly Gln
        195                 200                 205

Arg Trp Arg Asp Ile Lys Ala Gly Leu Arg Gln Arg Phe Arg Lys Lys
    210                 215                 220

Lys Asp Ala Lys Phe Ser Ala Glu Lys Ala Tyr Asn Gln Ala Ile Leu
225                 230                 235                 240

Gly Gln Leu Ala Ala Gly Ser Pro Ala Ala Leu Met Val Ala Ser Ser
                245                 250                 255

Met Val Arg Asp Glu Lys Asn Met Lys Arg Val Pro Ile Leu Leu Glu
            260                 265                 270

Gln Val Arg Phe Ala Leu Arg Asp Val Thr Lys Asn Pro His Glu Lys
        275                 280                 285

Asn Arg Gln Tyr Arg Ile Asp Leu Ser Tyr Gly Ser Gly His Thr Met
    290                 295                 300

Leu Ala Trp Thr Ile Tyr Lys Asp Tyr Lys Asp Phe Met Phe Leu His
305                 310                 315                 320

Ser Arg Leu Arg Thr Met Ala Phe Asn Ala Lys Asn Pro Phe Asn Ser
                325                 330                 335

Ser Lys Gln Pro Leu Gln Ile Pro Ile Phe Pro Thr Arg Asn Lys Val
            340                 345                 350
```

```
Gly Lys Lys Lys Lys Gly Lys Arg Asp Lys Ser Asn Pro Gly Asp Glu
        355                 360                 365

Asp Tyr Thr Asp Thr Asp Gly Glu Ser Glu Cys Asp Pro Ala Glu Gln
    370                 375                 380

Gln Gln Asn Gln His Thr Pro Gly Gly Gly Ser Ser His Gly Pro Arg
385                 390                 395                 400

Met Val Asn Gln Phe Phe Asp Lys Arg Arg Lys Asn Arg Asn Met Ile
                405                 410                 415

Asn Glu Arg Ile Lys Gly Glu Leu Glu Arg Tyr Leu Arg Gln Leu Phe
            420                 425                 430

Lys Leu Leu Leu Phe Arg Gly Glu Ala Asn Lys Leu Phe Gln Phe Leu
        435                 440                 445

Glu Leu Ser Asn Met Ser Ile Arg Leu Ala Pro Glu Asp His Phe His
    450                 455                 460

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

Trp Arg Val Ser His Trp Arg Val Asp Asp Ile Arg Gln Met Val Ala
                485                 490                 495

Arg His Thr Ser Lys Trp Phe Met Val Arg His Ser Tyr Ile Val Cys
            500                 505                 510

Val Asp Asn Leu Tyr Ser Thr Thr Pro Leu Glu Val Phe Leu Leu Asp
        515                 520                 525

Ser Lys Phe Lys Val Ser His Asn Leu Lys Lys Lys Asn Lys Asp Gly
    530                 535                 540

Val Leu Ser Gly Gly Ser Asn Pro Asn Thr Ser Gly Glu Ser Asp Leu
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                                                145
545                 550                 555                 560

Glu Glu Leu Gln Lys Pro Gly Ser Thr His Ile Thr Leu Lys Val Glu
                565                 570                 575

Asn Ala Ser Arg Gln Leu Lys Leu Val Ala Thr Ser Asp Lys Gln Leu
            580                 585                 590

Ala Gln Trp Met Glu Ser Ile Asn Leu Ile Lys Glu Arg Ser Ile Trp
        595                 600                 605

Ala Gln Gln Lys Arg Phe Asp Ser Phe Ala Pro Val Arg Thr Asn Cys
    610                 615                 620

Lys Ala Gln Trp Phe Val Asp Ala Arg Asp Tyr Phe Trp Thr Leu Ser
625                 630                 635                 640

Cys Ala Leu Asp Met Ala Lys Glu Val Ile Tyr Ile His Asp Trp Trp
                645                 650                 655

Leu Ser Pro Glu Ile Tyr Leu Arg Arg Pro Pro Glu Gly Asn Gln Glu
            660                 665                 670

Trp Arg Leu Asp Arg Val Leu Lys Arg Lys Ala Glu Gln Gly Val Lys
        675                 680                 685

Ile Phe Val Ile Val Tyr Arg Asn Val Gly Gln Thr Ile Pro Ile Asp
    690                 695                 700

Ser Gln Tyr Thr Lys Phe Ser Leu Leu Asp Leu Ser Pro Asn Ile Tyr
705                 710                 715                 720

Val Met Arg Ser Pro Asn Gln Leu Ile Gln Asn Thr Tyr Phe Trp Ala
                725                 730                 735

His His Glu Lys Leu Cys Leu Ile Asp His Thr Cys Ala Phe Val Gly
            740                 745                 750
```

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Gly Ile Asp Leu Cys Phe Gly Arg Tyr Asp Thr Ala Glu His Val Leu
        755                 760                 765

Val Asp Asp Ala Pro Thr Phe Val Asn Ala Asp Lys Lys Asp Gly Tyr
    770                 775                 780

Thr Gly Arg Thr Gln Leu Phe Pro Gly Lys Asp Tyr Ser Asn Pro Arg
785                 790                 795                 800

Thr Lys Asp Phe Phe Ser Leu Asp Lys Pro Phe Glu Asp Met Tyr Asp
                805                 810                 815

Arg Gln Lys Val Pro Arg Met Pro Trp His Asp Ile His Met Met Val
            820                 825                 830

Val Gly Gln Pro Ala Arg Asp Leu Val Arg His Phe Val Gln Arg Trp
        835                 840                 845

Asn Tyr Val Leu Arg Gln Lys Arg Pro Ser Arg Phe Thr Pro Leu Leu
    850                 855                 860

Leu Pro Pro Pro Asp Phe Lys Glu Glu Glu Leu Ala Glu Tyr Lys Leu
865                 870                 875                 880

Asn Gly Thr Cys Glu Val Gln Ile Leu Arg Ser Ala Cys Ser Trp Asn
                885                 890                 895

Thr Gly Val Lys Glu His Glu Gln Ser Ile Gln Asn Ala Tyr Ile Lys
            900                 905                 910

Ser Ile Glu Gln Ser Glu His Phe Val Tyr Ile Glu Asn Gln Phe Phe
        915                 920                 925

Ile Thr His Thr Ser Trp His Asn Ile Val Ile Glu Asn Lys Ile Gly
    930                 935                 940

Asp Ala Leu Val Asn Arg Ile Ile Lys Ala His Gln Asn Asp Glu Asp
```

945 950 955 960

Trp Arg Ala Ile Ile Val Ile Pro Leu Met Pro Gly Phe Glu Ala Glu
965 970 975

Val Asp Glu Ser Glu Gly Ser Ser Val Arg Val Ile Met Gln Cys Gln
980 985 990

Tyr Met Ser Ile Ser Arg Gly Ala Asn Cys Ile Phe Ala Arg Leu Glu
995 1000 1005

Asn Ala Gly Ile His Pro Glu Asp Tyr Ile Cys Phe Phe Ser Leu
1010 1015 1020

Arg Lys Trp Gly Lys Ile Gly Pro His Asp Lys Leu Val Thr Glu
1025 1030 1035

Gln Leu Tyr Ile His Ala Lys Ala Met Val Val Asp Asp Arg Ile
1040 1045 1050

Ala Ile Ile Gly Ser Ala Asn Ile Asn Glu Arg Ser Gln Arg Gly
1055 1060 1065

Thr Arg Asp Ser Glu Val Ala Ala Ile Val Arg Asp Thr His Thr
1070 1075 1080

Val Asp Ser Val Met Ala Gly Arg Pro Tyr Lys Val Gly His Phe
1085 1090 1095

Ala His Thr Leu Arg Leu His Leu Met Arg Glu His Met Gly Val
1100 1105 1110

Asp Val Asp His Val Glu Phe Ile Glu Arg Lys Ala Glu Leu Leu
1115 1120 1125

Glu Lys His Lys Arg Ala Glu Ala Thr Gln Asp Glu Pro Gln Glu
1130 1135 1140

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Leu Pro  Ile Ile Lys Asn Lys  Ser Thr Arg Arg Ala  Arg Gly Arg
    1145                1150                1155

Gly Arg  Arg Ser Gln Arg Gly  Gly Glu Asp Ser Asp  Gly Ala Ser
    1160                1165                1170

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

Gly Glu  Thr Val Gln Ala Ala  Lys Ala Ala Asn Gly  Asn Gly Asn
    1190                1195                1200

Gly Asn  Gly Asn Gly Ala Asp  Ala Ser Ala Ala Glu  Ser Val Pro
    1205                1210                1215

Ser Val  Met Ala Pro Thr Arg  Arg Tyr Ser Tyr Gln  Asp Gly Val
    1220                1225                1230

Pro Ala  Ser Pro Ser Ile Asp  Glu Asp Cys Val Val  Glu Gly Thr
    1235                1240                1245

Thr Leu  Asp Asn Ala Asp Gln  Gln Leu Ala Asn Leu  Asp Asp Ala
    1250                1255                1260

Tyr Asp  Ser Asp Ala Glu Val  Leu Leu Arg Asp Tyr  Asp Glu Asp
    1265                1270                1275

Val Asp  Gln Ile Asn Arg Gly  Leu Asp Ile Tyr Thr  Phe Asn Ser
    1280                1285                1290

Leu Ala  Gly Val Asp Asn Lys  Gly Ile Arg Glu Lys  Lys Leu Val
    1295                1300                1305

Ser Ser  Asp Asn Arg Ile Gln  Gly Asn Glu Lys His  Arg Ala Asp
    1310                1315                1320

Val Glu  Gly Arg Gly Leu Asp  Arg Gly Ala Asn Ser  Lys Glu Ser
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1325 1330 1335

Ala Glu Asp Phe Arg Ile Arg Ile Gln Arg His Ala Gln Phe Ala
1340 1345 1350

Asn Lys Leu Thr Glu His Glu Leu Gln Gln Thr Ser Glu Thr Val
1355 1360 1365

Asp Asp Val Thr Glu Leu Lys Lys Arg Val Tyr Tyr Glu Gln Met
1370 1375 1380

Glu Leu Lys Gln Arg Tyr His Asn Ser His Met Glu Ala Glu Lys
1385 1390 1395

Ala Phe Asn Asn Pro Pro Gln Leu Glu Asp Cys Glu Asn Glu Lys
1400 1405 1410

Asn Gly Val Asn Gly Val Asn Gly Asn Ser Gly Ser Thr Asp Ser
1415 1420 1425

Thr Ala Pro Val Asn Leu Val Ser Asp Ala Asn Gly Asn Ile His
1430 1435 1440

Pro Glu His Pro Glu Thr Ser Asp His Ser Ser Asp Ser Phe Glu
1445 1450 1455

Asp Glu Gly Phe Glu Ile Pro Lys Ile Pro Pro Pro Val Asp Pro
1460 1465 1470

Tyr Cys Phe Lys Asp Pro Leu Asp Asp Asp Phe Tyr Tyr Asp Ile
1475 1480 1485

Trp Leu Ala Thr Ala Glu Lys Asn Thr Arg Leu Phe Arg Glu Val
1490 1495 1500

Phe Arg Cys Gln Pro Asp Asp Glu Val Thr Thr Trp Arg Asp Tyr
1505 1510 1515

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Lys Asp  Phe Thr Thr Tyr Ala  Glu Arg Phe Ser Met  Ser Gln Asp
    1520                1525                1530

Thr Gly  Asp Leu Lys Ser Ser  Tyr Ala Asp Glu His  Gln Ala His
    1535                1540                1545

Ser Pro  Leu Ala Val Lys Ile  Asn Gly Asn Asp Lys  Glu Asp Glu
    1550                1555                1560

Lys Lys  Gln Asn Lys His Lys  Ala Thr His Asp Tyr  Asp Lys Tyr
    1565                1570                1575

Tyr Ala  Arg His Gln His His  Arg Ser Ser Ser Pro  His Tyr Arg
    1580                1585                1590

Arg Ser  His Val Pro Leu Lys  Thr Gly Ala Asn Phe  Thr Asp Arg
    1595                1600                1605

Leu Ala  His Gly Val Asp Asp  Ala Ala Gly His Leu  Lys Tyr Ala
    1610                1615                1620

Leu Gly  Arg Ala Asn Arg Arg  Gly Ser His His Asp  Thr Val Asp
    1625                1630                1635

Val Asp  Asp Ser Pro Pro Arg  Asp Phe Leu Pro Asp  Asp Phe Asn
    1640                1645                1650

Asp Pro  Ile Pro Val Glu Glu  Val Asp Asn Thr Asn  Leu Asn Asn
    1655                1660                1665

Asn Gln  Gln Leu Asn Gln Glu  Leu Tyr Glu Ser Gln  Val Glu Gly
    1670                1675                1680

Glu Asn  Pro Arg Phe Val Pro  Ser His Ala Ile Asp  Gly Gln His
    1685                1690                1695

Pro Arg  Lys Arg Glu Lys Arg  His Ile Gly Glu Val  Asp Gln Pro
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1700 1705 1710

Ala Glu Lys Pro Pro Ile Asn Glu Ala Tyr Ser Thr Gly Val Ser
1715 1720 1725

Gly Arg Leu Gly Gln His Gln Gln Pro His Leu Lys Gln Glu Val
1730 1735 1740

Asp Thr Asp Phe Lys Asp Thr Ser Ser Ala Ala His Thr Pro Phe
1745 1750 1755

His His Thr Pro Asn Ala Arg Arg Arg Arg Arg Arg Arg Ala Arg
1760 1765 1770

Gln Arg Ser Gly Met Asp Lys Val His Asp Lys Ala Thr Ala Glu
1775 1780 1785

Lys Ile Leu Asn Gly Ile Gln Gly His Leu Val Met Phe Pro Thr
1790 1795 1800

His Trp Leu Tyr Lys Glu Leu Asp Ser Gly Asn Trp Phe Tyr Asn
1805 1810 1815

Leu Asp Arg Ile Pro Pro Ile Glu Ile Tyr Asp
1820 1825

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<213> Yarrowia lipolytica

<400> 101
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catttgtcat tggcggttgg tcattggtca ttggtcattg gtcattggtg attagcgatt 180

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ggtgtgtgag ctcacaccgt ttggtatgtt tggtatcact atgtcaatgc ttctgccaat 420

gtcatgtagt ctccagaatg aggcacttgt tttccttctc tgtcgtttgt ggcacctcct 480

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gatagaagga gaagaaatac gaggtgcaga agtgtcatcc tccgccgtga ttgcattttg 1080

cgtggtaata accacgagcc acgcactttg tccacgcaca tgtctatggt gtaattgtac 1140

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tgttggtgtt ggtgtctgta gaa 3863

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<211> 620
<212> PRT
<213> Yarrowia lipolytica

<400> 102

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Glu Val Ser Ser Ser Ala Val Ile Ala Phe Cys Val Val Ile Thr Thr
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Ser His Ala Leu Cys Pro Arg Thr Cys Leu Trp Cys Asn Cys Thr Phe
35 40 45

Pro Pro Asn Ala Pro Asn Pro Asn Leu Asn Pro Lys Leu His Lys Thr
50 55 60

His Glu Arg Asp Thr Ala Asn Phe Pro Ser Asp Lys Gly Ala Val Ser
65 70 75 80

Ile Ser Ser Gln His Asn His Ile Ser Asn Thr Asn Thr Thr Phe Ala

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                                                155
                85                  90                  95

Thr Ser Gly Ala Gln Ser Gln Tyr His Arg Leu Ser Asn Asn Thr Lys
            100                 105                 110

Thr Phe Thr Arg Asp Ser Pro Tyr His Ser Arg Thr Pro Ser Val Asp
        115                 120                 125

Asp Asp Gly Ile Arg Gln Ala Ser Phe Leu Asn Arg Val Tyr Gln Ser
    130                 135                 140

Ser Lys Ser Tyr Ser Pro Arg Phe Arg Tyr Gly Ala Glu Ile Val Glu
145                 150                 155                 160

Arg Trp Ala Ser Ser Glu Asn Thr Asn Ala Ala Thr Pro Ser Ala Ser
                165                 170                 175

Thr Thr Asn Ser Asn Asn Ser Asn His Ser Asn Thr Pro Val Ser Thr
            180                 185                 190

Thr Pro Ser Ser Thr Thr Met Pro Lys Ala Leu Ser Ser Lys Ser Leu
        195                 200                 205

Asp Ala Ala Ser Ile His Met Ala Ser Asn Gly Ala Pro Pro Leu Ile
    210                 215                 220

Gln Lys Ser Ser Leu His Asp Phe Glu Arg Leu Lys Ser Gly Ile Asp
225                 230                 235                 240

Asp Ile Gln Asn Ser Asp Thr Asn Gly Thr Gln Tyr Ser Val Asp Val
                245                 250                 255

Gly Ser Gln Gly Leu Arg Met Arg Ile Gln Thr Gln Gly Tyr Ala Pro
            260                 265                 270

Ser Gly Asn Ser Asn Arg Gly Ser Pro Val Pro Pro Ser Pro Ala Leu
        275                 280                 285
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Ser Thr Ser Thr Ser Ser Gly Ser Thr Ser Ala Ala Ala Ser Arg Ser
    290                 295                 300

Thr Ser Ser Pro Val Pro Gln Gln Pro Gln Thr Ala Ala Thr Ala Ala
305                 310                 315                 320

Gly Gly Pro Arg Pro Gly Gln Pro Arg Ser Ala Trp Gln Glu Val Leu
                325                 330                 335

Ile Ser Ala Thr Ser Leu Ala Ser Leu Ser Gln Asp Ser Arg Lys Arg
            340                 345                 350

Leu Arg Tyr Cys Leu His Leu Leu Lys Leu Ala Asn Ala His Leu Ala
        355                 360                 365

Ser Thr Val Thr Lys Leu Gln Gly Ala Ile Ala Glu Glu Thr Ala Tyr
    370                 375                 380

Ser Leu Ala Gln Ser Ile Ala Ala Asn His Val Pro His Asn Glu Arg
385                 390                 395                 400

Gln Ala Tyr Leu His Gln Pro Pro Ser Ala Glu Pro Ala Leu Ser Ile
                405                 410                 415

Thr Ala Leu Lys Ala Asp Val Val Ser Thr Ile Arg Lys Ile Ile Lys
            420                 425                 430

Val Val Ser Gln Tyr Ala Gly Asn Ser Leu Pro Glu Pro Ala Arg Ser
        435                 440                 445

His Ile Arg Thr Tyr Ile Leu Gly Leu Pro Ser Arg Trp Ala Ser Thr
    450                 455                 460

Thr Ala Ser Thr Asn Ile Thr Pro Thr Arg Ser Pro Ala Gly Ser Gln
465                 470                 475                 480

Ser Pro Val Gly Ser Pro Lys Glu Cys Val Thr Pro Asp His Gln Gly
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485 490 495

Pro Pro Leu Pro Thr Asn Thr Val Ser Ser Pro Val Pro Glu Gly Pro
500 505 510

Ser Asp Glu Gln Leu Ser Arg His Arg Ile Glu Val Glu Ala Gly Gly
515 520 525

Lys Val Leu Ile Leu Ala Asn Glu Ala Leu Asp Met Leu Gly Asn Ile
530 535 540

Ile Ser Ile Val Asp Gly Thr Leu Glu Arg Ala Glu Gly Trp Cys Glu
545 550 555 560

Gly Ile Asn Arg Val Lys Gln Arg Val Gly Leu Gly Glu Thr Ala Pro
565 570 575

Gly Ala Ala Gly Glu Pro Gly Ala Ser Thr Glu Ala Ser Ala Glu Ala
580 585 590

Ser Ala Glu Ala Ser Ala Ser Ala Ala Ala Ala Tyr Ser Ala Val Asp
595 600 605

Thr Ser Thr Asp Gln Asp Val Glu Met Gly Asp Ala
610 615 620

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tcatctcact ggaggccggc ggctgtaaaa agcccgtttg gtcacctttg ggatttatac 120

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<210> 104
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<212> DNA
<213> Mucor hiemalis 14183 isolate 1

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tcctattaat tatttaccaa atgaatttcc tattattatt gaaagataag cgtgaaaacc 240

ttgggatcca acttttaaca acggatctct tgtttctcgc atcgattaat aacgtattta 300

agcgccataa ctagtgtgaa ttgcatattc attgaatcat ctagtctttg aaaacaactt 360

gcgctcaatg gtattccatt gagcacgcct gtttcagtat caaaaacacc ccacattcat 420

aattttgttg tgaatggaac tgaaaatttc cacttgtttg aattctttaa acttattacg 480

cctgaactat tgttctttct gcctgaacat ttttttaata taaaggaatg ctctagtatt 540

aaaactatct ctggggcctc ccaaataaaa ctttcttaaa tttgatctga aatcaggcgg 600

gattacccgc tgaacttaag catatcataa aaaggggaaa 640

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<211> 669
<212> DNA
<213> Mortierella alpina 14183 isolate 2, designated strain yNI0133

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ggtcaccttt gggatttata tctactcaga actttagtga ttttgtctga aacatattat 180

gaatacttaa ttcaaaatac aactttcaac aacggatctc ttggctctcg catcgatgaa 240

gaacgcagcg aaatgcgata cgtaatgtga attgcagaat tcagtgaatc atcgaatctt 300

tgaacgcata ttgcgctctc tggtattccg gagagcatgc ttgtttgagt atcagtaaac 360

acctcaactt ccatatcttt tgtgaaatgg gagttggact tgagtgatcc caacgctttt 420

cctcaccgaa aagtggcggg ttacttgaaa tgcaggtgca gctggacttt tctctgagct 480

ataagcatat ctatttagtc tgcctaaaaa acagattatt acctttgctg cagctaacat 540

aaaggagatt agttcttgtg ctgactgatg caggattcac aaagacaggc ttcggccgac 600

tttgtaaact cgatctcaaa tcaagtaaga ctacccgctg aacttaagca tatctaaaag 660

gggggaaa 669

<210> 106
<211> 671
<212> DNA
<213> Mortierella alpina 14183 isolate 3, designated strain yNI0134

<400> 106
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atatccacct tgtgtgcaat gtcatctctc tgggggctgc cggctgtcaa aagccgtgtg 120

gtcacctttg ggatttatat ctactcagaa ctttagtgat tttgtctgaa acatattatg 180

aatacttaat tcaaaataca actttcaaca acggatctct tggctctcgc atcgatgaag 240

aacgcagcga aatgcgatac gtaatgtgaa ttgcagaatt cagtgaatca tcgaatcttt 300

gaacgcatat tgcgctctct ggtattccgg agagcatgct tgtttgagta tcagtaaaca 360

cctcaacttc catatctttt gtgaaatggg agttggactt gagtgatccc aacgcttttc 420

ctcaccgaaa agtggcgggt tacttgaaat gcaggtgcag ctggactttt ctctgagcta 480

taagcatatc tatttagtct gcctaaaaaa cagattatta cctttgctgc agctaacata 540

aaggagatta gttcttgtgc tgactgatgc aggattcaca aagacaggct tcggccgact 600

ttgtaaactc gatctcaaat caagtaagac tacccgctga acttaagcat atcaaaaacg 660

gggggagaaa a 671

<210> 107
<211> 672
<212> DNA
<213> Mortierella alpina 14183 isolate 4, designated strain yNI0135

<400> 107
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catatccacc ttgtgtgcaa tgtcatctct ctgggggctg ccggctgtca aaagccgtgt 120

ggtcaccttt gggatttata tctactcaga actttagtga ttttgtctga aacatattat 180

gaatacttaa ttcaaaatac aactttcaac aacggatctc ttggctctcg catcgatgaa 240

gaacgcagcg aaatgcgata cgtaatgtga attgcagaat tcagtgaatc atcgaatctt 300

tgaacgcata ttgcgctctc tggtattccg gagagcatgc ttgtttgagt atcagtaaac 360

acctcaactt ccatatcttt tgtgaaatgg gagttggact tgagtgatcc caacgctttt 420

cctcaccgaa aagtggcggg ttacttgaaa tgcaggtgca gctggacttt tctctgagct 480

ataagcatat ctatttagtc tgcctaaaaa acagattatt acctttgctg cagctaacat 540

aaaggagatt agttcttgtg ctgactgatg caggattcac aaagacaggc ttcggccgac 600

tttgtaaact cgatctcaaa tcaagtaaga ctacccgctg aacttaagca tactaaaagg 660

gggggaaat ag 672

<210> 108
<211> 668
<212> DNA
<213> Mortierella alpina 14183 isolate 21

<400> 108
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atatccacct tgtgtgcaat gtcatctctc tgggggctgc cggctgtcaa aagccgtgtg 120

gtcacctttg ggatttatat ctactcagaa ctttagtgat tttgtctgaa acatattatg 180

aatacttaat tcaaaataca actttcaaca acggatctct tggctctcgc atcgatgaag 240

aacgcagcga aatgcgatac gtaatgtgaa ttgcagaatt cagtgaatca tcgaatcttt 300

gaacgcatat tgcgctctct ggtattccgg agagcatgct tgtttgagta tcagtaaaca 360

cctcaacttc catatctttt gtgaaatggg agttggactt gagtgatccc aacgctttc 420

ctcaccgaaa agtggcgggt tacttgaaat gcaggtgcag ctggactttt ctctgagcta 480

taagcatatc tatttagtct gcctaaaaaa cagattatta cctttgctgc agctaacata 540

aaggagatta gttcttgtgc tgactgatgc aggattcaca aagacaggct tcggccgact 600

ttgtaaactc gatctcaaat caagtaagac tacccgctga acttaagcat ataaaaatgg 660

gggggaaa 668

<210> 109
<211> 671
<212> DNA
<213> Mortierella alpina 14183 isolate 22

<400> 109
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ccatatccac cttgtgtgca atgtcatctc tctgggggct gccggctgtc aaaagccgtg 120

tggtcacctt tgggatttat atctactcag aactttagtg attttgtctg aaacatatta 180

tgaatactta attcaaaata caactttcaa caacggatct cttggctctc gcatcgatga 240

agaacgcagc gaaatgcgat acgtaatgtg aattgcagaa ttcagtgaat catcgaatct 300

ttgaacgcat attgcgctct ctggtattcc ggagagcatg cttgtttgag tatcagtaaa 360

cacctcaact tccatatctt ttgtgaaatg ggagttggac ttgagtgatc ccaacgcttt 420

tcctcaccga aaagtggcgg gttacttgaa atgcaggtgc agctggactt ttctctgagc 480

tataagcata tctatttagt ctgcctaaaa aacagattat tacctttgct gcagctaaca 540

taaaggagat tagttcttgt gctgactgat gcaggattca caaagacagg cttcggccga 600

ctttgtaaac tcgatctcaa atcaagtaag actacccgct gaacttaagc atatctaaag 660

cgggggggaa a 671

<210> 110
<211> 670
<212> DNA
<213> Mortierella alpina 14183 isolate 23

<400> 110
ttcgatagtg acctgcggaa gacattcata atcaagtgtt tttatggcac tttcaaaaat 60

ccatatccac cttgtgtgca atgtcatctc tctgggggct gccggctgtc aaaagccgtg 120

tggtcacctt tgggatttat atctactcag aactttagtg attttgtctg aaacatatta 180

tgaatactta attcaaaata caactttcaa caacggatct cttggctctc gcatcgatga 240

agaacgcagc gaaatgcgat acgtaatgtg aattgcagaa ttcagtgaat catcgaatct 300

ttgaacgcat attgcgctct ctggtattcc ggagagcatg cttgtttgag tatcagtaaa 360

cacctcaact tccatatctt ttgtgaaatg ggagttggac ttgagtgatc ccaacgcttt 420

tcctcaccga aaagtggcgg gttacttgaa atgcaggtgc agctggactt ttctctgagc 480

tataagcata tctatttagt ctgcctaaaa aacagattat tacctttgct gcagctaaca 540

taaaggagat tagttcttgt gctgactgat gcaggattca caaagacagg cttcggccga 600

ctttgtaaac tcgatctcaa atcaagtaag actacccgct gaacttaagc atacaaaagg 660

gggggggaaa 670

<210> 111
<211> 824
<212> DNA
<213> Trichoderma asperellum

<400> 111
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ttttggtttg ggcaaaagca ggaaaccttt taggggggaa aaaaacaaaa aagggaaagc 120

ccccccgggc cgggccccaa gggggggggcc tggccgggct ggtgagtttc ttcctgcctt 180

tcccaaaggg ggaaaaattc ctgggttttg gttaaggaac aataaaaacc gttcaccccc 240

acccccgggg gggttttctt aaccttggca ctttttcctt ggggcttcca acaaacgggg 300

ccccaaaggt caccaaaccc caccattttt ttctttcctt taatttttgg caaaaaacaa 360

aatttttcca accgggaatt tttaaaaatt aaaaaatttt caccaccggt cctttgggtc 420

cccccaccaa gaaaaaaccc accaaaaggc aaaccgaagg ggaaatggca aaatcccggg 480

aaccaccaaa cctttaaccc cccttggccc ccctgggttt cccgggggggc agcccggtta 540

aaccccttttt tcctccccaa actttcggtt gggaaggggg gaaccctctt gggagtaaac 600

tggaaatggc gggcttttcc attggagttt ttttttcccc aaaaagggtt tcccctgggg 660

gttggaggaa aaggccagac ggccttttag ttttcccccg ggggtaatct ttttatccgg 720

ggggatggaa cgtatcaaaa aaaaaagccc caggcaaaaa tggtcttaaa tttgccctca 780

atcgggagga acccccctga cttagcaatc aaaaaggggg aaaa 824

<210> 112
<211> 668

<212> DNA
<213> Mortierella alpina 14183 isolate 25

<400> 112
tcgatagtga ctgcggagac attcataatc aagtgttttt atggcacttt caaaaatcca 60

tatccacctt gtgtgcaatg tcatctctct gggggctgcc ggctgtcaaa agccgtgtgg 120

tcacctttgg gatttatatc tactcagaac tttagtgatt ttgtctgaaa catattatga 180

atacttaatt caaaatacaa ctttcaacaa cggatctctt ggctctcgca tcgatgaaga 240

acgcagcgaa atgcgatacg taatgtgaat tgcagaattc agtgaatcat cgaatctttg 300

aacgcatatt gcgctctctg gtattccgga gagcatgctt gtttgagtat cagtaaacac 360

ctcaacttcc atatcttttg tgaaatggga gttggacttg agtgatccca acgcttttcc 420

tcaccgaaaa gtggcgggtt acttgaaatg caggtgcagc tggacttttc tctgagctat 480

aagcatatct atttagtctg cctaaaaaac agattattac ctttgctgca gctaacataa 540

aggagattag ttcttgtgct gactgatgca ggattcacaa agacaggctt cggccgactt 600

tgtaaactcg atctcaaatc aagtaagact acccgctgaa cttaagcata tctaaaaggg 660

ggggaaaa 668

<210> 113
<211> 644
<212> DNA
<213> Mucor hiemalis Namadji I isolate 1

<400> 113
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tggttcattc ttttttactg tgaactgttt taatttttca gcgtctgagg aatgtctttt 120

agccataggg ataggctact agaatgttaa ccgagctgaa agtcaggctt aggcctggta 180

tcctattaat tatttaccaa aagaattcag tattataatt gtaacataag cgtaaaaaac 240

ttataaaaca acttttaaca acggatctct tggttctcgc atcgatgaag aacgtagcaa 300

agtgcgataa ctagtgtgaa ttgcatattc agtgaatcat cgagtctttg aacgcaactt 360

gcgctcaatg gtattccatt gagcacgcct gtttcagtat caaaaacacc ccacattcat 420

aattttgttg tgaatggaat tgagagtttc ggctttattg ctgaattctt taaaattatt 480

aggcctgaac tattgttctt tctgcctgaa cattttttta atataaagga atgctctagt 540

aaaaagacta tctctggggc ctcccaaata aatcattctt aaatttgatc tgaaatcagg 600

cgggattacc cgctgaactt aagcattcaa aaaggggggg gaaa 644

<210> 114
<211> 639
<212> DNA
<213> Mucor hiemalis Namadji I isolate 3

<400> 114
cttaagtgac tgcggaagac atttaataat ttagatggcc tcctagaact tgttctagtt 60

aggttcattc ttttttactg tgaactgttt taattttcag cgtttgagga atgtctttta 120

gtcataggga tagactatta gaatgttaac cgagctgaag tcaggtttag acctggtatc 180

ctattaatta tttaccaaaa gaattcagta ttattattgt aacataagcg taaaaaactt 240

ataaaacaac ttttaacaac ggatctcttg gttctcgcat cgatgaagaa cgtagcaaag 300

tgcgataact agtgtgaatt gcatattcag tgaatcatcg agtctttgaa cgcaacttgc 360

gctcaatggt attccattga gcacgcctgt ttcagtatca aaaacacccc acattcataa 420

ttttgttgtg aatggaactg agaatttcga cttgtttgaa ttctttaaac ttattaggcc 480

tgaactattg ttctttctgc ctgaacattt ttttaatata aaggaatgct ctagtattaa 540

gactatctct ggggcctccc aaataaaact ttcttaaatt tgatctgaaa tcaggcggga 600

ttacccgctg aacttaagca tactaaaatg gggggaaaa 639

<210> 115
<211> 647
<212> DNA
<213> Mucor hiemalis Namadji I isolate 4

<400> 115
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tagttaggtt catttctttt ttactgtgaa ctgttttaat ttttcagcgt ttgaggaatg 120

tcttttagtc atagggatag actattagaa tgttaaccga gctgaagtca ggtttagacc 180

tggtatccta ttaattattt accaaaagaa ttcagtatta ttattgtaac ataagcgtaa 240

aaaacttata aaacaacttt taacaacgga tctcttggtt ctcgcatcga tgaagaacgt 300

agcaaagtgc gataactagt gtgaattgca tattcagtga atcatcgagt ctttgaacgc 360

aacttgcgct caatggtatt ccattgagca cgcctgtttc agtatcaaaa acaccccaca 420

ttcataattt tgttgtgaat ggaactgaga atttcgactt gtttgaattc tttaaactta 480

ttaggcctga actattgttc tttctgcctg aacatttttt taatataaag gaatgctcta 540

gtattaagac tatctctggg gcctcccaaa taaaactttc ttaaatttga tctgaaatca 600

ggcgggatta cccgctgaac ttaagcatac taaaaggggg ggggaaa 647

<210> 116
<211> 639
<212> DNA
<213> Mucor hiemalis Namadji I isolate 5

<400> 116
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taggttcatt ctttttttact gtgaactgtt ttaattttca gcgtttgagg aatgtctttt 120

agtcataggg atagactatt agaatgttaa ccgagctgaa gtcaggttta gacctggtat 180

cctattaatt atttaccaaa agaattcagt attattattg taacataagc gtaaaaaact 240

tataaaacaa cttttaacaa cggatctctt ggttctcgca tcgatgaaga acgtagcaaa 300

gtgcgataac tagtgtgaat tgcatattca gtgaatcatc gagtctttga acgcaacttg 360

cgctcaatgg tattccattg agcacgcctg tttcagtatc aaaaacaccc cacattcata 420

attttgttgt gaatggaact gagaatttcg acttgtttga attctttaaa cttattaggc 480

ctgaactatt gttctttctg cctgaacatt tttttaatat aaaggaatgc tctagtatta 540

agactatctc tggggcctcc caaataaaac tttcttaaat ttgatctgaa atcaggcggg 600

attacccgct gaacttaagc atatcaaaag ccgggggaa 639

<210> 117
<211> 640
<212> DNA
<213> Mucor hiemalis Namadji I isolate 6

<400> 117
tcgttagtga ctgcggacga cattaataat ttagatgacc tcctagaact tgttctagtt 60

aggttcattc ttttttactg tgaactgttt taattttcag cgtttgagga atgtctttta 120

gtcataggga tagactatta gaatgttaac cgagctgaag tcaggtttag acctggtatc 180

ctattaatta tttaccaaaa gaattcagta ttattattgt aacataagcg taaaaaactt 240

ataaaacaac ttttaacaac ggatctcttg gttctcgcat cgatgaagaa cgtagcaaag 300

tgcgataact agtgtgaatt gcatattcag tgaatcatcg agtctttgaa cgcaacttgc 360

gctcaatggt attccattga gcacgcctgt ttcagtatca aaaacacccc acattcataa 420

ttttgttgtg aatggaattg agaatttcga cttgtttgaa ttctttaaac ttattaggcc 480

tgaactattg ttctttctgc ctgaacattt ttttaatata aaggaatgct ctagtattaa 540

gactatctct ggggcctccc aaataaaact ttcttaaatt tgatctgaaa tcaggcggga 600

ttacccgctg aacttaagca tatctaaaag ggggggggaaa 640

<210> 118
<211> 639
<212> DNA
<213> Mucor hiemalis Namadji I isolate 8

<400> 118
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ggttcattct tttttactgt gaactgtttt aattttcagc gtttgaggaa tgtcttttag 120

tcatagggat agactattag aatgttaacc gagctgaagt caggtttaga cctggtatcc 180

tattaattat ttaccaaaag aattcagtat tattattgta acataagcgt aaaaaactta 240

taaaacaact tttaacaacg gatctcttgg ttctcgcatc gatgaagaac gtagcaaagt 300

gcgataacta gtgtgaattg catattcagt gaatcatcga gtctttgaac gcaacttgcg 360

ctcaatggta ttccattgag cacgcctgtt tcagtatcaa aaacacccca cattcataat 420

tttgttgtga atggaattga gaatttcgac ttgtttgaat tctttaaact tattaggcct 480

gaactattgt tctttctgcc tgaacatttt tttaatataa aggaatgctc tagtattaag 540

actatctctg gggcctccca aataaaactt tcttaaattt gatctgaaat caggcgggat 600

tacccgctga acttaagcat atctaaaagg gggggggaa 639

<210> 119
<211> 646
<212> DNA
<213> Mucor hiemalis Namadji I isolate 9

<400> 119
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ggttcattct tttttactgt gaactgtttt aatttttcag cgtctgagga atgtctttta 120

gccataggga taggctacta gaatgttaac cgagctgaaa gtcaggctta ggcctggtat 180

cctattaatt atttaccaaa agaattcagt attataattg taacataagc gtaaaaaact 240

tataaaacaa cttttaacaa cggatctctt ggttctcgca tcgatgaaga acgtagcaaa 300

gtgcgataac tagtgtgaat tgcatattca gtgaatcatc gagtctttga acgcaacttg 360

cgctcaatgg tattccattg agcacgcctg tttcagtatc aaaaacaccc cacattcata 420

attttgttgt gaatggaaat gagagtttcg gctttattgc tgaattcttt aaaattatta 480

ggcctgaact attgttcttt ctgcctgaac atttttttaa tataaaggaa tgctctagta 540

aaaagactat ctctggggcc tcccaaataa atcattctta aatttgatct gaaatcaggc 600

gggattaccc gctgaactta agcatatcta aaaaggcggg ggggaa 646

<210> 120
<211> 645
<212> DNA
<213> Mucor hiemalis Namadji I isolate 10

<400> 120
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gttaggttca ttctttttta ctgtgaactc gttttaattt tcagcgtttg aggaatgtct 120

tttagtcata gggatagact attagaatgt taaccgagct gaagtcaggt ttagacctgg 180

tatcctatta attatttacc aaaagaattc agtattatta ttgtaacata agcgtaaaaa 240

acttataaaa caacttttaa caacggatct cttggttctc gcatcgatga agaacgtagc 300

aaagtgcgat aactagtgtg aattgcatat tcagtgaatc atcgagtctt tgaacgcaac 360

ttgcgctcaa tggtattcca ttgagcacgc ctgtttcagt atcaaaaaca ccccacattc 420

ataattttgt tgtgaatgga actgagaatt tcgacttgtt tgaattcttt aaacttatta 480

ggcctgaact attgttcttt ctgcctgaac atttttttaa tataaaggaa tgctctagta 540

ttaagactat ctctggggcc tcccaaataa aactttctta aatttgatct gaaatcaggc 600

gggattaccc gctgaactta agcatatcta aagtgggggg ggaaa 645

<210> 121
<211> 659
<212> DNA
<213> Mortierella elongata Namadji I isolate 11

<400> 121
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ttttaaattc catattccac ctttgtgtgc aatgtcagtc gatcttcttc atggagatcg 120

accaaacatc aacctttatt ttttaactct ttgtctgaaa aatattatga ataaacaatt 180

caaaatacaa ctttcaacaa cggatctctt ggctctcgca tcgatgaaga acgcagcgaa 240

atgcgatacg taatgtgaat tgcagaattc agtgaatcat cgaatctttg aacgcatatt 300

gcgctctttg gtattccgaa gagcatgctt gtttgagtat cagtaaacac ctcaaagctt 360

ttggattttt taatcgaaaa gctttggact tgagcaatcc caacaccaat ctttttgaga 420

tcggtggcgg gttgcttgaa atgcaggtgc agctggacat tctcctgagc taaaagcata 480

ttcatttagt cccgtcaaac ggattattac ttttgctgca gctaacataa agggagtttg 540

accgtattgg ctgactgatg caggatttca caagggtcgg caacgattct tgttaaactc 600

gatctcaaat caagtaagac tacccgctga acttaagcat taaaaagggg gggggagaa 659

<210> 122
<211> 639
<212> DNA
<213> Mucor hiemalis Namadji I isolate 12

<400> 122
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ggttcattct tttttactgt gaactgtttt aattttcagc gtttgaggaa tgtcttttag 120

tcatagggat agactattag aatgttaacc gagctgaagt caggtttaga cctggtatcc 180

tattaattat ttaccaaaag aattcagtat tattattgta acataagcgt aaaaaactta 240

taaaacaact tttaacaacg gatctcttgg ttctcgcatc gatgaagaac gtagcaaagt 300

gcgataacta gtgtgaattg catattcagt gaatcatcga gtctttgaac gcaacttgcg 360

ctcaatggta ttccattgag cacgcctgtt tcagtatcaa aaacacccca cattcataat 420

tttgttgtga atggaattga gaatttcgac ttgtttgaat tctttaaact tattaggcct 480

gaactattgt tctttctgcc tgaacatttt tttaatataa aggaatgctc tagtattaag 540

actatctctg gggcctccca aataaaactt tcttaaattt gatctgaaat caggcgggat 600

tacccgctga acttaagcat atcaaaaacc gggggggaaa 639

<210> 123
<211> 640
<212> DNA
<213> Mucor hiemalis Namadji I isolate 14

<400> 123
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taggttcatt ctttttttact gtgaactgtt ttaattttca gcgtttgagg aatgtctttt 120

agtcataggg atagactatt agaatgttaa ccgagctgaa gtcaggttta gacctggtat 180

cctattaatt atttaccaaa agaattcagt attattattg taacataagc gtaaaaaact 240

tataaaacaa cttttaacaa cggatctctt ggttctcgca tcgatgaaga acgtagcaaa 300

gtgcgataac tagtgtgaat tgcatattca gtgaatcatc gagtctttga acgcaacttg 360

cgctcaatgg tattccattg agcacgcctg tttcagtatc aaaaacaccc cacattcata 420

attttgttgt gaatggaatt gagaatttcg acttgtttga attctttaaa cttattaggc 480

ctgaactatt gttctttctg cctgaacatt tttttaatat aaaggaatgc tctagtatta 540

agactatctc tggggcctcc caaataaaac tttcttaaat ttgatctgaa atcaggcggg 600

attacccgct gaacttaagc atatcaaaaa accgggggaa 640

<210> 124
<211> 639

<212> DNA
<213> Mucor hiemalis Namadji I isolate 15

<400> 124
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ggttcattct tttttactgt gaactgtttt aattttcagt gtttgaggaa tgtcttttag 120

tcatagggat agactattag aatgttaacc gagctgaagt caggtttaga cctggtatcc 180

tattaattat ttaccaaaag aattcagtat tattattgta acataagcgt aaaaaactta 240

taaaacaact tttaacaacg gatctcttgg ttctcgcatc gatgaagaac gtagcaaagt 300

gcgataacta gtgtgaattg catattcagt gaatcatcga gtctttgaac gcaacttgcg 360

ctcaatggta ttccattgag cacgcctgtt tcagtatcaa aaacacccca cattcataat 420

tttattgtga atggaattga gaatttcgac ttgtttgaat tctttaaacc tattaggcct 480

gaactattgt tctttctgcc tgaacatttt tttaatataa aggaatgctc tagtattaag 540

actatctctg gggcctccca aataaaactt tcttaaattt gatctgaaat caggcgggat 600

tacccgctga acttaagcat atcaaaaaac cgggggaaa 639

<210> 125
<211> 639
<212> DNA
<213> Mucor hiemalis Namadji I isolate 21

<400> 125
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aggttcattc ttttttactg tgaactgttt taattttcag cgtttgagga atgtctttta 120

gtcataggga tagactatta gaatgttaac cgagctgaag tcaggtttag acctggtatc 180

ctattaatta tttaccaaaa gaattcagta ttattattgt aacataagcg taaaaaactt 240

ataaaacaac ttttaacaac ggatctcttg gttctcgcat cgatgaagaa cgtagcaaag 300

tgcgataact agtgtgaatt gcatattcag tgaatcatcg agtctttgaa cgcaacttgc 360

gctcaatggt attccattga gcacgcctgt ttcagtatca aaaacacccc acattcataa 420

ttttgttgtg aatggaactg agaatttcga cttgtttgaa ttctttaaac ttattaggcc 480

tgaactattg ttctttctgc ctgaacattt ttttaatata aaggaatgct ctagtattaa 540

gactatctct ggggcctccc aaataaaact ttcttaaatt tgatctgaaa tcaggcggga 600

ttacccgctg aacttaagca tatcaaaaaa ccgggggaa 639

<210> 126
<211> 637
<212> DNA
<213> Mortierella sp. Namadji II isolate 1

<400> 126
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atttttaac tgtctgtctg aaaactatta tgaataaaca attcaaatac aactttcaac 180

aacggatctc ttggctctcg catcgatgaa gaacgcagcg aaatgcgata cgtaatgtga 240

attgcagaat tcagtgaatc atcgaatctt tgaacgcata ttgcgctctt tggtattccg 300

aagagcatgc ttgtttgagt atcagtaaac acctcaaagc ctttaattca gtttgaaagc 360

tttggacttg agcaatccca acaccagtct cgcgactggc ggagggctgc ttgaaatgca 420

ggtgcagctg gacattctcc tgagctataa gcatatttat ttagtcccgt caaacggatt 480

attacttttg ctgcagctaa cataaaggga gtctgaccgt attggctgac tgatgcagga 540

tttcacaagt gctggcaaca gcttcttgta aaactcgatc tcaaatcaag taagactacc 600

cgctgaactt aagcataata aaaacggggg ggagaaa 637

<210> 127
<211> 640
<212> DNA
<213> Mortierella sp. Namadji II isolate 2

<400> 127
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attccatatt ccaccttgtg tgcaatgtca gccgttttct ttatgaaagc ggccaaacat 120

caacttattt tttaactgtc tgtctgaaaa ctattatgaa taaacaattc aaatacaact 180

ttcaacaacg gatctcttgg ctctcgcatc gatgaagaac gcagcgaaat gcgatacgta 240

atgtgaattg cagaattcag tgaatcatcg aatctttgaa cgcatattgc gctctttggt 300

attccgaaga gcatgcttgt ttgagtatca gtaaacacct caaagccttt aattcagttt 360

gaaagctttg gacttgagca atcccaacac cagtctcgcg actggcggag ggctgcttga 420

aatgcaggtg cagctggaca ttctcctgag ctataagcat atttatttag tcccgtcaaa 480

cggattatta cttttgctgc agctaacata aagggagtct gaccgtattg gctgactgat 540

gcaggatttc acaagtgctg gcaacagctt cttgtaaaac tcgatctcaa atcaagtaag 600

actacccgct gaacttaagc atacaaaacg gggggaaaac 640

<210> 128
<211> 629
<212> DNA
<213> Mortierella sp. Namadji II isolate 3

<400> 128
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caccttgtgt gcaatgtcag ccgttttctt tatgaaagcg gccaaacatc aacttatttt 120

ttaactgtct gtctgaaaac tattatgaat aaacaattca aatacaactt tcaacaacgg 180

atctcttggc tctcgcatcg atgaagaacg cagcgaaatg cgatacgtaa tgtgaattgc 240

agaattcagt gaatcatcga atctttgaac gcatattgcg ctctttggta ttccgaagag 300

catgcttgtt tgagtatcag taaacacctc aaagccttta attcagtttg aaagctttgg 360

acttgagcaa tcccaacacc agtctcgcga ctggcggagg gctgcttgaa atgcaggtgc 420

agctggacat tctcctgagc tataagcata tttatttagt cccgtcaaac ggattattac 480

ttttgctgca gctaacataa agggagtctg accgtattgg ctgactgatg caggatttca 540

caagtgctgg caacagcttc ttgtaaaact cgatctcaaa tcaagtaaga ctacccgctg 600

aacttaagca tatcaaaaag gggggggaa 629

<210> 129
<211> 640
<212> DNA
<213> Mortierella sp. Namadji II isolate 4

<400> 129
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atcccatatc caccttgtgt gcaatgtcag ccgttttctt tatgaaagcg gccaaacatc 120

aacttatttt ttaactgtct gtctgaaaac tattatgaat aaacaattca aatacaactt 180

tcaacaacgg atctcttggc tctcgcatcg atgaagaacg cagcgaaatg cgatacgtaa 240

tgtgaattgc agaattcagt gaatcatcga atctttgaac gcatattgcg ctctttggta 300

ttccgaagag catgcttgtt tgagtatcag taaacacctc aaagccttta attcagtttg 360

aaagctttgg acttgagcaa tcccaacacc agtctcgcga ctggcggagg gctgcttgaa 420

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ggattattac ttttgctgca gctaacataa agggagtctg accgtattgg ctgactgatg 540

caggatttca caagtgctgg caacagcttc ttgtaaaact cgatctcaaa tcaagtaaga 600

ctacccgctg aacttaagca tacaaaaaag gggggggaaa 640

<210> 130
<211> 640
<212> DNA
<213> Mortierella sp. Namadji II isolate 5

<400> 130
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tcccatatcc accttgtgtg caatgtcagc cgttttcttt atgaaagcgg ccaaacatca 120

acttattttt taactgtctg tctgaaaact attatgaata aacaattcaa atacaacttt 180

caacaacgga tctcttggct ctcgcatcga tgaagaacgc agcgaaatgc gatacgtaat 240

gtgaattgca gaattcagtg aatcatcgaa tctttgaacg catattgcgc tctttggtat 300

tccgaagagc atgcttgttt gagtatcagt aaacacctca aagcctttaa ttcagtttga 360

aagctttgga cttgagcaat cccaacacca gtctcgcgac tggcggaggg ctgcttgaaa 420

tgcaggtgca gctggacatt ctcctgagct ataagcatat ttatttagtc ccgtcaaacg 480

gattattact tttgctgcag ctaacataaa gggagtctga ccgtattggc tgactgatgc 540

aggatttcac aagtgctggc aacagcttct tgtaaaactc gatctcaaat caagtaagac 600

tacccgctga acttaagcat ttaaaaaggg ggggagaaaa 640

<210> 131
<211> 630
<212> DNA
<213> Mortierella sp. Namadji II isolate 6

<400> 131
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caccttgtgt gcaatgtcag ccgttttctt tatgaaagcg gccaaacatc aacttatttt 120

ttaactgtct gtctgaaaac tattatgaat aaacaattca aatacaactt tcaacaacgg 180

atctcttggc tctcgcatcg atgaagaacg cagcgaaatg cgatacgtaa tgtgaattgc 240

agaattcagt gaatcatcga atctttgaac gcatattgcg ctctttggta ttccgaagag 300

catgcttgtt tgagtatcag taaacacctc aaagccttta attcagtttg aaagctttgg 360

acttgagcaa tcccaacacc agtctcgcga ctggcggagg gctgcttgaa atgcaggtgc 420

agctggacat tctcctgagc tataagcata tttatttagt cccgtcaaac ggattattac 480

ttttgctgca gctaacataa agggagtctg accgtattgg ctgactgatg caggatttca 540

caagtgctgg caacagcttc ttgtaaaact cgatctcaaa tcaagtaaga ctacccgctg 600

aacttaagca tatctaaaag gggggggaaa 630

<210> 132
<211> 646
<212> DNA
<213> Mortierella sp. Namadji II isolate 7

<400> 132
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ttaaattcca tattccacct ttgtgtgcaa tgtcagccgt tttctttatg aaagcggcca 120

aacatcaact tatttttaa ctgtctgtct gaaaactatt atgaataaac aattcaaata 180

caactttcaa caacggatct cttggctctc gcatcgatga agaacgcagc gaaatgcgat 240

acgtaatgtg aattgcagaa ttcagtgaat catcgaatct ttgaacgcat attgcgctct 300

ttggtattcc gaagagcatg cttgtttgag tatcagtaaa cacctcaaag cctttaattc 360

agtttgaaag ctttggactt gagcaatccc aacaccagtc tcgcgactgg cggagggctg 420

cttgaaatgc aggtgcagct ggacattctc ctgagctata agcatattta tttagtcccg 480

tcaaacggat tattactttt gctgcagcta acataaaggg agtctgaccg tattggctga 540

ctgatgcagg atttcacaag tgctggcaac agcttcttgt aaaactcgat ctcaaatcaa 600

gtaagactac ccgctgaact taagcattta aaaaggggggg ggaaaa 646

<210> 133
<211> 630
<212> DNA
<213> Mortierella sp. Namadji II isolate 8

<400> 133
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ccaccttgtg tgcaatgtca gccgttttct ttatgaaagc ggccaaacat caacttattt 120

tttaactgtc tgtctgaaaa ctattatgaa taaacaattc aaatacaact ttcaacaacg 180

gatctcttgg ctctcgcatc gatgaagaac gcagcgaaat gcgatacgta atgtgaattg 240

cagaattcag tgaatcatcg aatctttgaa cgcatattgc gctctttggt attccgaaga 300

gcatgcttgt ttgagtatca gtaaacacct caaagccttt aattcagttt gaaagctttg 360

gacttgagca atcccaacac cagtctcgcg actggcggag ggctgcttga aatgcaggtg 420

cagctggaca ttctcctgag ctataagcat atttatttag tcccgtcaaa cggattatta 480

cttttgctgc agctaacata aagggagtct gaccgtattg gctgactgat gcaggatttc 540

acaagtgctg gcaacagctt cttgtaaaac tcgatctcaa atcaagtaag actacccgct 600

gaacttaagc atatcaaaaa acgggggggaa 630

<210> 134
<211> 643
<212> DNA
<213> Mortierella elongata Namadji II isolate 9

<400> 134
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tccaccttgt gtgcaatgtc agtcgatctt cttcatggag atcgaccaaa catcaacctt 120

tatcttttaa ctctttgtct gaaaaatatt atgaataaac aattcaaaat acaactttca 180

acaacggatc tcttggctct cgcatcgatg aagaacgcag cgaaatgcga tacgtaatgt 240

gaattgcaga attcagtgaa tcatcgaatc tttgaacgca tattgcgctc tttggtattc 300

cgaagagcat gcttgtttga gtatcagtaa acacctcaaa gcttttggat tttttaatcg 360

aaaagctttg gacttgagca atcccaacac caatcttttt gagatcggtg gcgggttgct 420

tgaaatgcag gtgcagctgg acattctcct gagctaaaag catattcatt tagtcccgtc 480

aaacggatta ttacttttgc tgcagctaac ataaagggag tttgaccgta ttggctgact 540

gatgcaggat ttcacaaggg tcggcaacga ttcttgttaa actcgatctc aaatcaagta 600

agactacccg ctgaacttaa gcatatctaa aagcgggggg aaa 643

<210> 135
<211> 652
<212> DNA
<213> Mortierella sp. Namadji II isolate 10

<400> 135
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tccaccttgt gtgaaatgtc tgtcgctttt ctctttttc cttggaaaaa aacgaagcgg 120

ctcaacatca actcatttta attactttgt ctgaaaacta ttatgaataa actaattcaa 180

aatacaactt tcaacaacgg atctcttggc tctcgcatcg atgaagaacg cagcgaaatg 240

cgatacgtaa tgtgaattgc agaattcagt gaatcatcga atctttgaac gcatattgcg 300

ctctttggta ttccgaagag catgcttgtt tgagtatcag taaacacctc aacactctcg 360

atttgtttcg aatgagtatt ggatttgagc aaacccaacg cctttctgct agccagactt 420

gcggcgggtt gcttgaaatg caggtgcagc tgagttttct tctgagctaa tagcatactt 480

aattagtccc gtaaaaagga ttattaatct gctgaagctt acaccaaagg aagagttctc 540

tggctgactg atgcagaatt acgcatagcc ggtaaaacgg ctttgtaaaa ctcgatctca 600

aatcaagtaa gactacccgc tgaacttaag catatcaaaa aaccgggggga aa 652

<210> 136
<211> 633
<212> DNA
<213> Mortierella sp. Namadji II isolate 11

<400> 136
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atccaccttg tgtgcaatgt cagccgtttt ctttatgaaa gcggccaaac atcaacttat 120

tttttaactg tctgtctgaa aactattatg aataaacaat tcaaatacaa ctttcaacaa 180

cggatctctt ggctctcgca tcgatgaaga acgcagcgaa atgcgatacg taatgtgaat 240

tgcagaattc agtgaatcat cgaatctttg aacgcatatt gcgctctttg gtattccgaa 300

gagcatgctt gtttgagtat cagtaaacac ctcaaagcct ttaattcagt ttgaaagctt 360

tggacttgag caatcccaac accagtctcg cgactggcgg agggctgctt gaaatgcagg 420

tgcagctgga cattctcctg agctataagc atatttattt agtcccgtca aacggattat 480

tacttttgct gcagctaaca taaagggagt ctgaccgtat tggctgactg atgcaggatt 540

tcacaagtgc tggcaacagc ttcttgtaaa actcgatctc aaatcaagta agactacccg 600

ctgaacttaa gcatatctaa aaggggggggg aaa 633

<210> 137
<211> 639
<212> DNA
<213> Mortierella sp. Namadji II isolate 12

<400> 137
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atccaccttg tgtgcaatgt cagccgtttt ctttatgaaa gcggccaaac atcaacttat 120

tttttaactg tctgtctgaa aactattatg aataaacaat tcaaatacaa ctttcaacaa 180

cggatctctt ggctctcgca tcgatgaaga acgcagcgaa atgcgatacg taatgtgaat 240

tgcagaattc agtgaatcat cgaatctttg aacgcatatt gcgctctttg gtattccgaa 300

gagcatgctt gtttgagtat cagtaaacac ctcaaagcct ttaattcagt ttgaaagctt 360

tggacttgag caatcccaac accagtctcg cgactggcgg agggctgctt gaaatgcagg 420

tgcagctgga cattctcctg agctataagc atatttattt agtcccgtca aacggattat 480

tacttttgct gcagctaaca taaagggagt ctgaccgtat tggctgactg atgcaggatt 540

tcacaagtgc tggcaacagc tttcttcgta aaactcgatc tcaaatcaag taagactacc 600

cgctgaactt taagcattta aaaatggggg aaaaaatgc 639

<210> 138
<211> 638
<212> DNA
<213> Mortierella sp. Namadji II isolate 13

<400> 138
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ccatatccac cttgtgtgca atgtcagccg ttttctttat gaaagcggcc aaacatcaac 120

ttatttttta actgtctgtc tgaaaactat tatgaataaa caattcaaat acaactttca 180

acaacggatc tcttggctct cgcatcgatg aagaacgcag cgaaatgcga tacgtaatgt 240

gaattgcaga attcagtgaa tcatcgaatc tttgaacgca tattgcgctc tttggtattc 300

cgaagagcat gcttgtttga gtatcagtaa acacctcaaa gcctttaatt cagtttgaaa 360

gctttggact tgagcaatcc caacaccagt ctcgcgactg gcggagggct gcttgaaatg 420

caggtgcagc tggacattct cctgagctat aagcatattt atttagtccc gtcaaacgga 480

ttattacttt tgctgcagct aacataaagg gagtctgacc gtattggctg actgatgcag 540

gatttcacaa gtgctggcaa cagcttcttg taaaactcga tctcaaatca agtaagacta 600

cccgctgaac ttaagcattt aaaaaggggg ggagaaaa 638

<210> 139
<211> 644
<212> DNA
<213> Mortierella sp. Namadji II isolate 14

<400> 139
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atcaacttat tttttaactg tctgtctgaa aactattatg aataaacaat tcaaatacaa 180

ctttcaacaa cggatctctt ggctctcgca tcgatgaaga acgcagcgaa atgcgatacg 240

taatgtgaat tgcagaattc agtgaatcat cgaatctttg aacgcatatt gcgctctttg 300

gtattccgaa gagcatgctt gtttgagtat cagtaaacac ctcaaagcct ttaattcagt 360

ttgaaagctt tggacttgag caatcccaac accagtctcg cgactggcgg agggctgctt 420

gaaatgcagg tgcagctgga cattctcctg agctataagc atatttattt agtcccgtca 480

aacggattat tacttttgct gcagctaaca taaagggagt ctgaccgtat tggctgactg 540

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agactacccg ctgaacttaa gcatttaaaa acgggggggag aaaa 644

<210> 140
<211> 644
<212> DNA
<213> Mortierella sp. Namadji II isolate 15

<400> 140
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catcaactta ttttttaact gtctgtctga aaactattat gaataaacaa ttcaaataca 180

actttcaaca acggatctct tggctctcgc atcgatgaag aacgcagcga aatgcgatac 240

gtaatgtgaa ttgcagaatt cagtgaatca tcgaatcttt gaacgcatat tgcgctcttt 300

ggtattccga agagcatgct tgtttgagta tcagtaaaca cctcaaagcc tttaattcag 360

tttgaaagct ttggacttga gcaatcccaa caccagtctc gcgactggcg gagggctgct 420

tgaaatgcag gtgcagctgg acattctcct gagctataag catatttatt tagtcccgtc 480

aaacggatta ttacttttgc tgcagctaac ataaagggag tctgaccgta ttggctgact 540

gatgcaggat ttcacaagtg ctggcaacag cttcttgtaa aactcgatct caaatcaagt 600

aagactaccc gctgaactta agcatttaaa aaggggggggg aaaa 644

<210> 141
<211> 641
<212> DNA
<213> Mortierella sp. Namadji II isolate 16

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caacttattt tttaactgtc tgtctgaaaa ctattatgaa taaacaattc aaatacaact 180

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attccgaaga gcatgcttgt ttgagtatca gtaaacacct caaagccttt aattcagttt 360

gaaagctttg gacttgagca atcccaacac cagtctcgcg actggcggag ggctgcttga 420

aatgcaggtg cagctggaca ttctcctgag ctataagcat atttatttag tcccgtcaaa 480

cggattatta cttttgctgc agctaacata aagggagtct gaccgtattg gctgactgat 540

gcaggatttc acaagtgctg gcaacagctt cttgtaaaac tcgatctcaa atcaagtaag 600

actacccgct gaacttaagc attaaaaaag ggggggaaaa a 641

<210> 142
<211> 640
<212> DNA
<213> Mortierella sp. Namadji II isolate 17

<400> 142
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atccatatcc accttgtgtg caatgtcagc cgttttcttt atgaaagcgg ccaaacatca 120

acttattttt taactgtctg tctgaaaact attatgaata aacaattcaa atacaacttt 180

caacaacgga tctcttggct ctcgcatcga tgaagaacgc agcgaaatgc gatacgtaat 240

gtgaattgca gaattcagtg aatcatcgaa tctttgaacg catattgcgc tctttggtat 300

tccgaagagc atgcttgttt gagtatcagt aaacacctca aagcctttaa ttcagtttga 360

aagctttgga cttgagcaat cccaacacca gtctcgcgac tggcggaggg ctgcttgaaa 420

tgcaggtgca gctggacatt ctcctgagct ataagcatat ttatttagtc ccgtcaaacg 480

gattattact tttgctgcag ctaacataaa gggagtctga ccgtattggc tgactgatgc 540

aggatttcac aagtgctggc aacagcttcc ttgtaaaact cgatctcaaa tcaagtaaga 600

ctacccgctg aacttaagca tttaaaacgg ggggaggaaa 640

<210> 143

<211> 645
<212> DNA
<213> Mortierella sp. Namadji II isolate 18

<400> 143
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catcaactta ttttttaact gtctgtctga aaactattat gaataaacaa ttcaaataca 180

actttcaaca acggatctct tggctctcgc atcgatgaag aacgcagcga aatgcgatac 240

gtaatgtgaa ttgcagaatt cagtgaatca tcgaatcttt gaacgcatat tgcgctcttt 300

ggtattccga agagcatgct tgtttgagta tcagtaaaca cctcaaagcc tttaattcag 360

tttgaaagct ttggacttga gcaatcccaa caccagtctc gcgactggcg gagggctgct 420

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aaacggatta ttacttttgc tgcagctaac ataaagggag tctgaccgta ttggctgact 540

gatgcaggat ttcacaagtg ctggcaacag cttcttgtaa aactcgatct caaatcaagt 600

aagactaccc gctgaactta agcatacaaa aagggggggg ggaaa 645

<210> 144
<211> 643
<212> DNA
<213> Mortierella sp. Namadji II isolate 19

<400> 144
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aattccatat tccaccttgt gtgcaatgtc agccgttttc tttatgaaag cggccaaaca 120

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