

SEQUENCE LISTING

<110> DSM IP Assets B.V.

<120> Increased vitamin production

<130> 26931

<160> 10

<170> PatentIn version 3.3

<210> 1

<211> 834

<212> DNA

<213> Bacillus subtilis 168

<400> 1

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<210> 2

<211> 277

<212> PRT

<213> Bacillus subtilis 168

<400> 2

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Ile Val Met Leu Thr Ala Tyr Asp Tyr Pro Ala Ala Lys Leu Ala Glu
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Gln Ala Gly Val Asp Met Ile Leu Val Gly Asp Ser Leu Gly Met Val
35 40 45

Val Leu Gly Leu Asp Ser Thr Val Gly Val Thr Val Ala Asp Met Ile
50 55 60

His His Thr Lys Ala Val Lys Arg Gly Ala Pro Asn Thr Phe Ile Val
65 70 75 80

Thr Asp Met Pro Phe Met Ser Tyr His Leu Ser Lys Glu Asp Thr Leu
85 90 95

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

Leu Glu Gly Gly Glu Gly Val Phe Glu Ser Ile Arg Ala Leu Thr Leu
115 120 125

Gly Gly Ile Pro Val Val Ser His Leu Gly Leu Thr Pro Gln Ser Val
130 135 140

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

Lys Lys Leu Ile Glu Asp Ser Ile Lys Cys Glu Glu Ala Gly Ala Met
165 170 175

Met Leu Val Leu Glu Cys Val Pro Ala Glu Leu Thr Ala Lys Ile Ala
180 185 190

Glu Thr Leu Ser Ile Pro Val Ile Gly Ile Gly Ala Gly Val Lys Ala
195 200 205

Asp Gly Gln Val Leu Val Tyr His Asp Ile Ile Gly His Gly Val Glu
210 215 220

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

Glu Thr Ala Ile Ser Gly Tyr Val Gln Asp Val Arg His Arg Ala Phe
245 250 255

Pro Glu Gln Lys His Ser Phe Gln Met Asn Gln Thr Val Leu Asp Gly
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Leu Tyr Gly Gly Lys
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<210> 5
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<212> DNA
<213> Bacillus subtilis

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gaaacagcag tcagcggata tgttcaggat gtaagacatc gtgctttccc tgaacaaaag      780
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<210> 6
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<212> PRT
<213> Bacillus subtilis

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<400> 6

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Met Lys Thr Lys Leu Asp Phe Leu Lys Met Lys Glu Ser Glu Glu Pro
1          5          10          15

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Ile Val Met Leu Thr Ala Tyr Asp Tyr Pro Ala Ala Lys Leu Ala Glu
          20          25          30

```

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Gln Ala Gly Val Asp Met Ile Leu Val Gly Asp Ser Leu Gly Met Val
          35          40          45

```

```

Val Leu Gly Leu Asp Ser Thr Val Gly Val Thr Val Ala Asp Met Ile
          50          55          60

```

```

His His Thr Lys Ala Val Lys Arg Gly Ala Pro Asn Thr Phe Ile Val
65          70          75          80

```

```

Thr Asp Met Pro Phe Met Ser Tyr His Leu Ser Lys Glu Asp Thr Leu
          85          90          95

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

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Leu Glu Gly Gly Glu Gly Val Phe Glu Ser Ile Arg Ala Leu Thr Leu
          115          120          125

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Gly Gly Ile Pro Val Val Ser His Leu Gly Leu Thr Pro Gln Ser Val
          130          135          140

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

Lys Lys Leu Ile Glu Asp Ser Ile Lys Cys Glu Glu Ala Gly Ala Met
 165 170 175

Met Leu Val Leu Glu Cys Val Pro Ala Glu Leu Thr Ala Lys Ile Ala
 180 185 190

Glu Thr Leu Ser Ile Pro Val Ile Gly Ile Gly Ala Gly Val Lys Ala
 195 200 205

Asp Gly Gln Val Leu Val Tyr His Asp Ile Ile Gly His Gly Val Glu
 210 215 220

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

Glu Thr Ala Val Ser Gly Tyr Val Gln Asp Val Arg His Arg Ala Phe
 245 250 255

Pro Glu Gln Lys His Ser Phe Gln Met Asn Gln Thr Val Leu Asp Gly
 260 265 270

Leu Tyr Gly Gly Lys
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 <212> DNA
 <213> Bacillus subtilis

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 gtcggtgatt cactcggaaat ggtcgtcctc ggccttgatt caactgtcgg tgtgacagtt 180
 gcggacatga tccatcatatc aaaagctggtt aaaaggggag cgcagaatac ttttattgtg 240
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 gaatccattc gcgcattgac gcttggaggc attccagtag tcagtcactt aggtttgaca 420
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<210> 8
<211> 277
<212> PRT
<213> Bacillus subtilis

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<400> 8
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Met Lys Thr Lys Leu Asp Phe Leu Lys Met Lys Glu Asn Glu Glu Pro
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```

Ile Val Met Leu Thr Ala Tyr Asp Tyr Pro Ala Ala Lys Leu Ala Glu
          20              25              30

```

```

Gln Ala Gly Val Asp Met Ile Leu Val Gly Asp Ser Leu Gly Met Val
          35              40              45

```

```

Val Leu Gly Leu Asp Ser Thr Val Gly Val Thr Val Ala Asp Met Ile
          50              55              60

```

```

His His Thr Lys Ala Val Lys Arg Gly Ala Gln Asn Thr Phe Ile Val
65              70              75              80

```

```

Thr Asp Met Pro Phe Met Ser Tyr His Leu Ser Lys Glu Asp Thr Leu
          85              90              95

```

```

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

```

```

Leu Glu Gly Gly Glu Gly Val Phe Glu Ser Ile Arg Ala Leu Thr Leu
          115              120              125

```

```

Gly Gly Ile Pro Val Val Ser His Leu Gly Leu Thr Pro Gln Ser Val
          130              135              140

```

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

Lys Lys Leu Ile Glu Asp Ser Ile Lys Cys Glu Glu Ala Gly Ala Met
 165 170 175

Met Leu Val Leu Glu Cys Val Pro Ala Glu Leu Thr Ala Lys Ile Ala
 180 185 190

Glu Thr Leu Ser Ile Pro Val Ile Gly Ile Gly Ala Gly Val Lys Ala
 195 200 205

Asp Gly Gln Val Leu Val Tyr His Asp Ile Ile Gly His Gly Val Glu
 210 215 220

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

Glu Thr Ala Ile Ser Gly Tyr Val Gln Asp Val Arg His Arg Ala Phe
 245 250 255

Pro Glu Gln Lys His Ser Phe Gln Met Asn Gln Thr Val Leu Asp Gly
 260 265 270

Leu Tyr Gly Gly Lys
 275

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 <212> DNA
 <213> Bacillus subtilis

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 gtcggtgatt cactcggaaat ggtcgtcctc ggccttgatt caactgtcgg tgtgacagtt 180
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 gaatccattc gcgcattgac gcttggaggc attccagtag tcagtcactt aggtttgaca 420
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ggaatcgggg ctggtgtgaa agcggacgga caagttctcg tttatcatga tattatcggc      660
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gaaacagcag tcagcggata tgttcaggat gtaagacatc gtgctttccc tgaacaaaag      780
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<210> 10
<211> 277
<212> PRT
<213> Bacillus subtilis

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<400> 10

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```

Met Lys Thr Lys Leu Asp Phe Leu Lys Met Lys Glu Asn Glu Glu Pro
1          5          10          15

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```

Ile Val Met Leu Thr Ala Tyr Asp Tyr Pro Ala Ala Lys Leu Ala Glu
          20          25          30

```

```

Gln Ala Gly Val Asp Met Ile Leu Val Gly Asp Ser Leu Gly Met Val
          35          40          45

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Val Leu Gly Leu Asp Ser Thr Val Gly Val Thr Val Ala Asp Met Ile
          50          55          60

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```

His His Thr Lys Ala Val Lys Arg Gly Ala Gln Asn Thr Phe Ile Val
65          70          75          80

```

```

Thr Asp Met Pro Phe Met Ser Tyr His Leu Ser Lys Glu Asp Thr Leu
          85          90          95

```

```

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

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```

Leu Glu Gly Gly Glu Gly Val Phe Glu Ser Ile Arg Ala Leu Thr Leu
          115          120          125

```

```

Gly Gly Ile Pro Val Val Ser His Leu Gly Leu Thr Pro Gln Ser Val
          130          135          140

```

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

Lys Lys Leu Ile Glu Asp Ser Ile Lys Cys Glu Glu Ala Gly Ala Met
165 170 175

Met Leu Val Leu Glu Cys Val Pro Ala Glu Leu Thr Ala Lys Ile Ala
180 185 190

Glu Thr Leu Ser Ile Pro Val Ile Gly Ile Gly Ala Gly Val Lys Ala
195 200 205

Asp Gly Gln Val Leu Val Tyr His Asp Ile Ile Gly His Gly Val Glu
210 215 220

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

Glu Thr Ala Val Ser Gly Tyr Val Gln Asp Val Arg His Arg Ala Phe
245 250 255

Pro Glu Gln Lys His Ser Phe Gln Met Asn Gln Thr Val Leu Asp Gly
260 265 270

Leu Tyr Gly Gly Lys
275