BELL018_ST25
SEQUENCE LISTING

<110> Bell Biosystems, Inc.

<120> Host Cell Modification with Artificial Endosymbionts

<130> BELL.019

<150> 61/873,308
<151> 2013-09-03

<160> 300

<170> PatentIn version 3.5

<210> 1
<211> 3730
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (449)..(449)
<223> Xaa can be any naturally occurring amino acid

<400> 1

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala Ala Thr
35 40 45

Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
100 105 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

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

```
Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

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

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
            340                 345                 350

Ala Ser Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430
```

```
Ser Asn Asp Arg Pro Ala Gly Met Gln Ala Cys Thr Ala Val Val Tyr
        435                 440                 445

Xaa Val Asn Asp Gly Ser Ala Ser Leu His Ala Cys Arg Ser Thr Val
    450                 455                 460

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
465                 470                 475                 480

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                485                 490                 495

Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            500                 505                 510

Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser
        515                 520                 525

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
    530                 535                 540

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
545                 550                 555                 560

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                565                 570                 575

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            580                 585                 590

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        595                 600                 605

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    610                 615                 620

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val
625                 630                 635                 640

Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr
                645                 650                 655

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly
            660                 665                 670

Ser Asn Asp Gly Pro Val Val Ser Gly Pro Val Asp Leu Gly Ala Thr
        675                 680                 685

Ala Glu Asp His Ser Ile Thr Phe Thr Ala Gln Gln Leu Leu Gly His
    690                 695                 700
```

```
Ala Ser Asp Ile Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Ser Ala
705                 710                 715                 720

Gly Asn Gly Thr Ile Ser Gln Asn Ala Asp Gly Ser Tyr Thr Phe Thr
                725                 730                 735

Pro Asn Ala Asp Phe Asn Gly Glu Val Asn Val Thr Tyr Thr Val Ser
            740                 745                 750

Asp Gly His Gly Gly Thr Thr Ser Gly Ser Ala Ser Phe Asp Val Thr
        755                 760                 765

Ser Val Asn Asp Gly Pro Thr Thr Ser Asp Val Thr Leu Ala Ser Gly
    770                 775                 780

Thr Glu Asp Arg Ser Val Thr Ile Lys Ala Ser Asp Leu Leu Gly Asn
785                 790                 795                 800

Ala His Asp Val Asp Gly Asp Thr Leu Ser Val Ser Asn Leu Ser Ala
                805                 810                 815

Ser Asn Gly Thr Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr
            820                 825                 830

Pro Asn His Asp Phe Ser Gly Asn Val Asp Leu Ser Tyr Thr Val Ser
        835                 840                 845

Asp Gly Gln Gly Gly Ser Thr Ala Gly Thr Ala His Phe Gly Met Ala
    850                 855                 860

Ala Val Ala Asp Ser Pro Val Leu Ser Ala Ser Asn Ile Thr Val Asp
865                 870                 875                 880

Leu Gly Ala Gly Gln Ala Gln Thr Leu Asn Gly Thr Thr Gly Asn Asp
                885                 890                 895

Thr Leu Ser Gly Gly Ser Gly Asn Asp Val Val Asn Gly Ser Ser Gly
            900                 905                 910

Asp Asp Val Leu Tyr Gly Asp Gly Thr Gly Ser Val Thr Val Pro Leu
        915                 920                 925

Asn Ile Ser Asp Arg Leu Ser Asp Thr Asp Gly Ser Glu Ser Leu Gly
    930                 935                 940

Ser Val Thr Ile Gly Gly Leu Pro Ala Gly Ala Ser Leu Ser Ala Gly
945                 950                 955                 960

Thr His Asn Ser Asp Gly Thr Trp Thr Leu Thr Pro Ala Gln Leu Thr
                965                 970                 975
```

```
Gly Leu Ser Val Thr Thr Thr Glu Gly Thr Ala Leu His Leu Ser Val
           980                 985                 990

Thr Ala Thr Ser Thr Glu Ala Ser  Asn Gly Ser Thr Ala  Thr Thr Thr
        995                 1000                1005

Thr Ser  Phe Asp Val Ser Phe  Ser Gly Thr Ala Ala  Gly Asn Asp
    1010                1015                1020

Thr Leu  Asp Gly Gly Ala Gly  Asn Asp Thr Leu Phe  Gly Gly Ala
    1025                1030                1035

Gly Asn  Asp Thr Leu Thr Gly  Gly Ala Gly Ala Asp  Leu Leu Glu
    1040                1045                1050

Gly Gly  Asp Gly Asn Asp Val  Leu Asn Tyr Ser Thr  Asp Gly Thr
    1055                1060                1065

Trp Ser  Gly Gly Phe Val Ser  Gln Asn Val Gly Asp  Thr Thr His
    1070                1075                1080

Ala Gly  Thr Asn Glu Thr Tyr  Thr Ile Thr Gly Asp  Asn Asp Ser
    1085                1090                1095

Gln Asp  Val Phe Arg Gly Gly  Ala Gly Thr Asp Thr  Leu Val Met
    1100                1105                1110

Gly Ser  Gly Asn Asp Ala Leu  Phe Leu Asp Asp Gly  Tyr Ser Gly
    1115                1120                1125

Ser Pro  Thr Gly Gly Ala Arg  Ile Asp Gly Ile Glu  Ser Ile Val
    1130                1135                1140

Ala Gly  Glu Gly Asn Asp Val  Val Asp Leu Thr Ser  Ser Lys Tyr
    1145                1150                1155

Thr Tyr  Gly Asp Val Thr Ile  Asp Gly Gly Ala Gly  Asn Asp Val
    1160                1165                1170

Leu Met  Gly Asn Ala Gly Asn  Asp Val Ile Asp Gly  Gly Thr Gly
    1175                1180                1185

Asn Asp  Val Leu Tyr Gly Ala  Ser Gly Asn Asp Thr  Leu Arg Gly
    1190                1195                1200

Gly Asp  Gly Ala Asp Thr Leu  Asp Gly Gly Tyr Gly  Ala Asp Thr
    1205                1210                1215

Ile Asp  Ala Gly Ala Gly Asn  Asp Leu Gly Ile Ile  Lys Gly Gly
    1220                1225                1230
```

```
Gln Ser  Ala Gly Asp Asn Tyr  Asp Gly Gly Thr Gly  Thr Asp Thr
    1235                 1240                 1245

Leu Arg  Ile Asp Leu Ser Gly  Ser Gln Tyr Thr Ala  Ala Val Arg
    1250                 1255                 1260

Ala Glu  Leu Gln Gln Phe Gln  Ser Phe Ile Ala Asp  Pro Ala His
    1265                 1270                 1275

Ala Gly  Gln Ser Phe His Phe  Asn Thr Leu Gly Val  Asp Ala Lys
    1280                 1285                 1290

Asn Trp  Glu Ser Leu Lys Leu  Thr Val Asp Gly Arg  Asp Val Ser
    1295                 1300                 1305

Leu Glu  Asn Ala Pro Thr Val  Thr Ser Ala Thr Ala  Val Ser Thr
    1310                 1315                 1320

Asp Glu  Asp His Ser Gly Ala  Gly Arg Val Val Gly  Thr Asp Gln
    1325                 1330                 1335

Asp Val  Gly Asp Ser Val Arg  Tyr His Leu Met Asp  Ala Ser Gly
    1340                 1345                 1350

Asn Gln  Val Asp Ser Leu Ser  Thr Ala His Gly Thr  Val Thr Ile
    1355                 1360                 1365

Asn Ser  Ala Thr Gly Glu Tyr  Thr Phe Thr Pro Asn  Ala Asp Ala
    1370                 1375                 1380

Gln Ser  Leu Arg Ala Gly Asp  Val Gln Thr Asp Ser  Phe Lys Val
    1385                 1390                 1395

Val Ala  Thr Asp Gly Thr Met  Thr Ser Ala Pro Ser  Thr Val Gly
    1400                 1405                 1410

Val Thr  Ile Thr Gly Ser Asn  Asp Gly Ala Val Ile  Thr Gly Thr
    1415                 1420                 1425

Ser Val  Gly Thr Val Gly Glu  Asp Gly Asn Arg Ser  Val Thr Gly
    1430                 1435                 1440

Thr Leu  Asn Val Ala Asp Val  Asp Gln Gly Gln Ala  His Val Thr
    1445                 1450                 1455

Ala Gln  Thr Val Gln Thr Asp  Gln Gly Thr Phe Ser  Ile Gly Glu
    1460                 1465                 1470

Asn Gly  Gln Trp Thr Phe Gln  Val Asn Ser Gly Asn  Ala Asp Val
    1475                 1480                 1485
```

```
Gln Ala  Leu Gly Ala Gly Glu  Ser Met Thr Lys Thr  Phe Ala Val
    1490                1495                1500

Ala Ser  Ala Asp Gly Thr Ala  Thr Gln Asn Val Thr  Val Thr Ile
    1505                1510                1515

Asn Gly  Ala Asn Asp Ser Ala  Thr Ile Ser Gly Ser  Thr Thr Gly
    1520                1525                1530

Ala Val  Ala Glu Asp Gly Asn  Gly Arg Ala Thr Gly  Thr Leu Asn
    1535                1540                1545

Val Ala  Asp Val Asp His Gly  Gln Ala His Val Thr  Ala Gln Thr
    1550                1555                1560

Val Gln  Thr Asp Gln Gly Thr  Phe Ser Ile Gly Glu  Asn Gly Gln
    1565                1570                1575

Trp Thr  Phe Gln Val Asn Ser  Gly Asn Ala Asp Val  Gln Ala Leu
    1580                1585                1590

Gly Ala  Gly Glu Ser Met Thr  Lys Thr Phe Ala Val  Ala Ser Ala
    1595                1600                1605

Asp Gly  Thr Ala Thr Gln Asn  Val Thr Val Thr Ile  Asn Gly Ala
    1610                1615                1620

Asn Asp  Ser Ala Thr Ile Ser  Gly Ser Thr Thr Gly  Ala Val Ala
    1625                1630                1635

Glu Asp  Gly Asn Gly Arg Ala  Thr Gly Thr Leu Ser  Val Ala Asp
    1640                1645                1650

Val Asp  His Gly Gln Ala His  Val Thr Ala Gln Thr  Val Gln Thr
    1655                1660                1665

Asp Gln  Gly Thr Phe Ser Ile  Gly Glu Asn Gly Gln  Trp Thr Phe
    1670                1675                1680

Gln Val  Asn Ser Ala Asn Ala  Asp Val Gln Ala Leu  Gly Ala Gly
    1685                1690                1695

Glu Ser  Met Thr Lys Thr Phe  Ala Val Ala Ser Ala  Asp Gly Thr
    1700                1705                1710

Ala Thr  Gln Asn Val Ser Val  Thr Ile Thr Gly Ser  Asn Asp Gly
    1715                1720                1725

Pro Thr  Val Ser Gly Ala Val  Gly Leu Gly His Thr  Ala Glu Asp
    1730                1735                1740
```

```
Asn Ser  Val Thr Phe Thr Lys  Ala Gln Leu Leu Ala  Asn Ala His
    1745                 1750                 1755

Asp Thr  Asp Ala His Asp Thr  Leu Ser Val Ser Asn  Leu Ser Ala
    1760                 1765                 1770

Ala His  Gly Ser Ile Val Asp  Asn Gly Asn Gly Thr  Tyr Thr Phe
    1775                 1780                 1785

Thr Pro  Thr Glu Thr Phe Ser  Gly His Val Asp Val  Ser Tyr Thr
    1790                 1795                 1800

Val Ser  Asp Gly His Gly Gly  Thr Thr Thr Gly Ser  Ala Ala Leu
    1805                 1810                 1815

Asp Val  Asp Ala Val Ala Asp  Arg Ala Thr Val Ser  Val Ala Ile
    1820                 1825                 1830

Gly Ala  Pro Val Glu Thr Pro  Asn Gly Ser Phe Thr  Val Thr Asn
    1835                 1840                 1845

Leu Asp  Ser Thr Ala Ser Ala  Gly Tyr Asn Asn Thr  Tyr Gly Tyr
    1850                 1855                 1860

Tyr Val  Met Asp Asp Ser Gly  Asn Pro Thr Ser Gly  Gly Val Ile
    1865                 1870                 1875

Trp Ser  Asn Val His Ala Ser  Pro Gly Ala Ser Val  Thr Ile Ser
    1880                 1885                 1890

Gly Val  Asp Pro Asp Arg Val  Gly Phe Phe Leu Ile  Pro Asp Gly
    1895                 1900                 1905

Gly Ser  Gln Asn Ser Gly Leu  Ala Asn Gly Ala Ala  Leu Thr Phe
    1910                 1915                 1920

Ser Lys  Asp Ala Ser Gly Asn  Trp Gln Ala Ser Asp  Ser Ala Gly
    1925                 1930                 1935

His Val  Leu Ser Gly Ala Gly  Thr Lys Val Leu Phe  Asp Lys Ser
    1940                 1945                 1950

Ala Leu  Asn Gly Asp His Met  Val His Ser Glu Asp  Thr Ser Ala
    1955                 1960                 1965

Val Ser  Gly Asn Gln Asn Trp  Glu Asp Leu Thr Gly  Gly Gly Asp
    1970                 1975                 1980

Arg Asp  Tyr Asn Asp Val Asn  Met Ser Val Thr Trp  Gly Asn Ala
    1985                 1990                 1995
```

```
Ala Pro  Thr Ala Thr His Pro  Leu Thr Val Ser Ala  Ser Phe Pro
    2000                 2005                 2010

Asp Met  Asp Gly Ser Glu Gly  His Ala Val Lys Ile  Ser Gly Leu
    2015                 2020                 2025

Pro Ser  Gly Ser Thr Leu Tyr  Gln Asn Gly Val Ala  Leu Val Ala
    2030                 2035                 2040

Gly Ala  Asp Gly Ser Tyr Ser  Leu Asn Pro Ala Gln  Leu Gly Gly
    2045                 2050                 2055

Leu Ser  Val Lys Thr Pro Ala  Gly Phe Asn Gly Asp  Leu Asn Val
    2060                 2065                 2070

Asn Val  Thr Ala Val Ala Thr  Asp Gly Thr Ser Val  Ala Ser Ser
    2075                 2080                 2085

Thr Ala  Ser Ala Thr Val His  Asp Asp Leu Ser Asn  His Gly Pro
    2090                 2095                 2100

Asp Ala  Gly Asp Ala Thr Ser  Val His Gly Ala Met  Gly Ala Thr
    2105                 2110                 2115

Ile Thr  Gly Ala Ala Gly Val  Thr Asp Ser Asp Gly  Asp His Leu
    2120                 2125                 2130

Ser Tyr  Ala Val Gly Thr Gly  Thr Ser Gly Pro Gln  His Gly Thr
    2135                 2140                 2145

Val Val  Val Asn Thr Asp Gly  Thr Phe Thr Tyr Thr  Pro Ser Gly
    2150                 2155                 2160

Asn Tyr  Ser Gly Thr Asp Thr  Phe Lys Ile Thr Val  Ser Asp Gly
    2165                 2170                 2175

His Gly  Gly Thr Ala Thr Glu  Thr Val Asn Val Thr  Val Glu Asn
    2180                 2185                 2190

Gly Ala  Pro Thr Leu Thr Thr  Ala Asn Ala Ala Thr  Ala Asn Asp
    2195                 2200                 2205

His Ser  Ala Val Thr Gly His  Val Thr Gly Ser Asp  Thr Pro Gly
    2210                 2215                 2220

Asp Thr  Leu Ser Tyr Ser Leu  Val Asp Ala Asn Gly  Asn His Val
    2225                 2230                 2235

Gly Ser  Leu Val Thr Asp His  Gly Thr Val Ser Ile  Asn Ala Ala
    2240                 2245                 2250
```

```
Thr Gly  Asp Tyr Thr Phe Thr  Pro Asn Ala Ala Asn  Ala Ser Leu
    2255                 2260                 2265

Gly Val  Gly Ala Ser Val Thr  Asp Ser Phe Lys Val  Val Ala Thr
    2270                 2275                 2280

Asp Asn  His Gly Ala Asp Ser  Asn Leu Gly Thr Val  Ala Val Thr
    2285                 2290                 2295

Val Thr  Gly Ser Asn Asp Gly  Pro Val Val Asn Thr  Ala Asn Val
    2300                 2305                 2310

Thr Thr  Ala Asn Asp His Thr  Ala Val Ser Gly His  Ala Ala Gly
    2315                 2320                 2325

Thr Asp  Val Asp Ala Gly Asp  Ser Val Arg Tyr His  Leu Val Asp
    2330                 2335                 2340

Ala Ser  Gly Asn Gln Val Asp  Ser Leu Thr Thr Ala  His Gly Thr
    2345                 2350                 2355

Val Ser  Ile Asn Ala Ala Thr  Gly Asp Tyr Thr Phe  Thr Pro Thr
    2360                 2365                 2370

Gly Asp  Ser Ser Leu Gly Val  Gly Gln Thr Leu Gly  Asp Ser Phe
    2375                 2380                 2385

Lys Val  Val Ala Val Asp Asn  His Gly Ala Ala Ser  Ala Pro Ser
    2390                 2395                 2400

Thr Val  Ala Val Thr Ile Thr  Gly Ser Asn Asp Gly  Pro Val Val
    2405                 2410                 2415

Asp Leu  Val Ser Gly Gly Arg  Gly Thr Glu Asp Ser  Ala Val Arg
    2420                 2425                 2430

Gly Ser  Val Ser Ala His Asp  Val Asp Ala Gly Asp  Arg Leu Ser
    2435                 2440                 2445

Tyr Ser  Leu Val Asp Ser His  Gly Ser Ala Val Gly  Ser Leu Ala
    2450                 2455                 2460

Thr Asp  His Gly Thr Val Ser  Ile Asn Gln Thr Thr  Gly Glu Tyr
    2465                 2470                 2475

Thr Phe  Thr Pro Asn Ala Asn  Trp Ala Gly Asn Glu  Thr Phe Asn
    2480                 2485                 2490

Val Gln  Val Ser Asp Gly His  Gly Gly Thr Ala Thr  Gln Ala Val
    2495                 2500                 2505
```

```
Asn Val  His Val Asp Ala Val  Ala Asp Ala Pro Val  Leu Asn Leu
    2510                 2515                 2520

Gln Leu  Gly Gly Gly Ser Ala  Val Thr Leu Ala Gly  Ala Ser Glu
    2525                 2530                 2535

Asp Val  Thr Ile Thr Thr Ser  Asn Met His Ala Thr  Asn Ser Gly
    2540                 2545                 2550

Phe Ser  Val Ser Ala Leu Asn  Leu Asp Gly Ser Ala  Gly Thr Leu
    2555                 2560                 2565

Ser Thr  His Ser Gly Pro Asp  Gly Phe Gly Val Ala  Gly Asn Ala
    2570                 2575                 2580

Ser Gly  Asp Gln Ala Glu Leu  Gly Gln Ser Gly Gly  Arg Ser Glu
    2585                 2590                 2595

Lys Ile  Val Val Asn Phe Asp  Ser Asp Val Ser Ser  Ala Asn Val
    2600                 2605                 2610

Ser Phe  Ala Trp Met Asn Ser  Gln Glu His Ala His  Tyr Asp Leu
    2615                 2620                 2625

Tyr Gln  Asn Gly Val Lys Val  Gly Glu Gly Thr Val  Thr Gly Ile
    2630                 2635                 2640

Thr Asp  Ser Val Asp Pro Ala  Ile Ser Leu Thr Ala  Ala Asn Gly
    2645                 2650                 2655

Gly Ser  Phe Asp Gln Ile Val  Phe Ser Ala Pro Gly  Gly Gly Asp
    2660                 2665                 2670

Asn Asp  Tyr Leu Ile His Ser  Ile Ser Tyr Glu Ala  Ala Glu Pro
    2675                 2680                 2685

Gly Glu  Arg Val Val Asn Tyr  Pro Leu Asp Val Ser  Ser Ser Leu
    2690                 2695                 2700

Thr Asp  Thr Asp Gly Ser Glu  Arg Leu Ala Val Thr  Leu Asn Gly
    2705                 2710                 2715

Leu Pro  Glu Gly Ala Val Ile  Leu Asp Thr His Gly  Asn Val Val
    2720                 2725                 2730

Gly Thr  Asp Thr Gly Asn Gly  Thr Trp Ser Leu Pro  Gly Gly His
    2735                 2740                 2745

Leu Asp  His Leu Thr Leu Gln  Val Pro Ala Asp Ser  His Ala Phe
    2750                 2755                 2760
```

```
Thr Leu  Gly Ala Thr Ala Thr  Ala Thr Glu Ser Asp  Pro Asn Ala
    2765                 2770                 2775

Ala Val  Ala Thr Ala Thr Thr  Ser Val Ser Val Ala  Val Ala Ala
    2780                 2785                 2790

Phe Asp  His Ala Pro Val Ala  Gly Asp Asp Ser His  Ile Asp Thr
    2795                 2800                 2805

Val Ala  Gln Gly Pro Ala Leu  Ser Val Ser Met Gly  Thr Thr Val
    2810                 2815                 2820

Asp Asp  Val His Thr Thr Thr  Thr Thr Thr Thr Val  Glu Thr Gly
    2825                 2830                 2835

Asn Asn  Val Thr Trp Asn Gly  Leu Asp Ser Met Ser  Asp Pro Thr
    2840                 2845                 2850

Thr Ala  Thr Pro Thr Thr Thr  Val Ser Tyr Asp Leu  Asn Thr Ala
    2855                 2860                 2865

Asn Thr  Gly Ser Ser Asn Ala  Asp Val Ile Ser Val  Gly His Asp
    2870                 2875                 2880

Asn Asn  Ala Ser Ile Ser Thr  Gly Ala Gly Asp Asp  Gln Val Thr
    2885                 2890                 2895

Ile Gly  His Asn Val Asn Ser  Lys Ile Asp Leu Gly  Ser Gly Thr
    2900                 2905                 2910

Asn Ala  Leu Asp Val Gly Ser  Asp Val Asn Ala Ser  Val Ile Ala
    2915                 2920                 2925

Gly Ser  Gly Asn Asp Thr Val  Arg Val Gly Gly Ala  Leu Asn Ser
    2930                 2935                 2940

Asp Ile  Asp Leu Gly Asn Gly  Asp Asn Arg Leu Gln  Leu Gly Gly
    2945                 2950                 2955

Asp Ser  Asn Ala Ser Val Ser  Val Gly Ser Gly Asn  Asp Asp Val
    2960                 2965                 2970

Lys Ile  Val Gly Ser Leu Asn  Ser Asn Val Ser Leu  Gly Ser Gly
    2975                 2980                 2985

Asp Asp  Asp Leu Gln Ile Gly  Gly Tyr Ala Ser Ala  Ser Ile Asp
    2990                 2995                 3000

Ala Gly  Ala Gly Asn Asp Arg  Val Leu Val Gly Arg  Asp Leu Ser
    3005                 3010                 3015
```

```
Ser Lys  Val Asp Leu Gly Ser  Gly Asp Asp Tyr Leu  Glu Val Lys
    3020                 3025                 3030

Gly Asn  Asp Trp Ala Ser Ile  Asp Ala Gly Ser Gly  Asn Asp Thr
    3035                 3040                 3045

Val Lys  Ile Gly Gly Ala Ile  Ser Ser Asn Val Thr  Met Gly Ala
    3050                 3055                 3060

Gly Asp  Asp His Leu Thr Ile  Thr Gly Gln Asn Leu  Trp Ala Thr
    3065                 3070                 3075

Val Ser  Gly Gly Ser Gly Thr  Asp Ser Ile Glu Leu  Thr Gly Val
    3080                 3085                 3090

Thr Lys  Ala Gln Trp Asp Ala  Asn Val Asn Asn Val  Lys Gly Tyr
    3095                 3100                 3105

Val Lys  Asp Phe Glu Asn Ile  Lys Phe Ala Asp Gly  Gln Val Ile
    3110                 3115                 3120

Gly Asp  Ala Thr Ala Phe Gln  Ala Thr Thr Thr Val  Thr Thr Thr
    3125                 3130                 3135

Thr Thr  Thr His Ser Tyr Glu  Thr Pro Ile Thr Val  Gln Ala Thr
    3140                 3145                 3150

Leu Asn  Asp Arg Asp Gly Ser  Glu Thr Leu Ser Pro  Val Thr Ile
    3155                 3160                 3165

Ala Asn  Ile Pro Ala Gly Gly  His Leu Glu Leu Asn  Gly Gln Ala
    3170                 3175                 3180

Leu Thr  Pro Asn Ala Asp Gly  Ser Tyr Thr Leu Asn  Val Ser Ser
    3185                 3190                 3195

Gly Ala  Pro Thr Thr Val Thr  Leu Val Thr Asp Thr  Pro Val Thr
    3200                 3205                 3210

Ala Gly  Ser Leu Asn Leu Thr  Thr Thr Val Ser Ser  Thr Glu Ala
    3215                 3220                 3225

His Gly  Gly Asp Val Ser Val  Thr Thr Leu Val Gly  Val Gly Ser
    3230                 3235                 3240

Asn Ala  Gly Glu Thr Val Val  Asp Asp Arg Ile Ala  Thr Gly Thr
    3245                 3250                 3255

Asp His  Lys Val Thr Ile Asn  Ala Ser Asp Leu Leu  Ala Asn Asp
    3260                 3265                 3270
```

```
Thr Asp  Ala Asp Gly Asp Ala  Leu Ser Ile Val Gly  Val Gly Asn
    3275                 3280                 3285

Ala His  His Gly Ser Val Ser  Ile Asp Asn Ala Gly  His Val Thr
    3290                 3295                 3300

Phe Thr  Ala Glu Asn Gly Phe  Asn Gly Thr Ala Thr  Phe Asp Tyr
    3305                 3310                 3315

Thr Val  Ser Asp Gly His Gly  Gly Thr Asp Val Ala  Thr Val Ser
    3320                 3325                 3330

Val Asn  Val Val Asp Pro Asn  His Ala Pro Val Ile  Asp Ala Ala
    3335                 3340                 3345

His Thr  Thr Ala Thr Leu Val  Val Asp Asp Lys His  Ala Asn Thr
    3350                 3355                 3360

Ala Asn  Ile Gly Gln Val Thr  Ala Thr Asp Val Asp  Gly Asp Asn
    3365                 3370                 3375

Leu Thr  Tyr Ser Val Leu Asp  Gly Gly Ser His His  Gly Ser Leu
    3380                 3385                 3390

Val Val  Asp Ala Asp Ser Gly  Ser Phe Phe Tyr Asn  Ala Asp Asp
    3395                 3400                 3405

Thr Lys  Trp Ser Gly Thr Asp  Thr Phe Thr Val Gln  Val Ser Asp
    3410                 3415                 3420

Gly Glu  Gly Gly Lys Ala Thr  Gln Thr Ile Ser Val  Gln Val Thr
    3425                 3430                 3435

Gly Gly  Ser Lys Gly Gly Ser  Gly Gly Ser Gly Gly  Gly His Ala
    3440                 3445                 3450

Ile Gly  Trp Gly Asn Gly Gly  Gly Arg Asp Glu Ser  Trp Gly Ser
    3455                 3460                 3465

Asn Gly  Ser Trp Glu Val Asp  Gly Ala Gly His Ser  Gly Gly Gly
    3470                 3475                 3480

His Val  Thr His Ala Ser Asp  Asn Gly Ser Asn Trp  Ser Ser Gly
    3485                 3490                 3495

Trp His  Gly Val Asp Val Gly  Asn Gly Gly His Ala  Gly Thr Gly
    3500                 3505                 3510

Asp Ser  Ile Asp Ile Ala Gly  Tyr Asn Arg His Asp  Glu Ser Tyr
    3515                 3520                 3525
```

```
Arg Gly  Ser Gly Gly Asp Thr  Leu Ile Gly Ala Ala  Gly Asn Asp
    3530                 3535                 3540

Tyr Met  Ser Leu Glu Gly Gly  Asp His Ala Gln Lys  Ile Ser Gly
    3545                 3550                 3555

Ile Asp  His Ile Gln Leu Gly  Asp Gly Asp Asn Val  Ile Leu Asp
    3560                 3565                 3570

Met Thr  Thr Thr Arg Tyr Asp  Tyr Gly Asp Leu Thr  Val Ala Gly
    3575                 3580                 3585

Gly Ser  Gly His Asp Val Ile  Trp Ser Ala Ser Gly  Asp Asp Leu
    3590                 3595                 3600

Leu Val  Ala Gly Asn Gly Gly  Asn Thr Ile His Gly  Gly Ala Gly
    3605                 3610                 3615

Asn Asp  Thr Ile Val Ala Gly  Ala Gly Ser Asp Glu  Leu Met Gly
    3620                 3625                 3630

Gln Glu  Gly Asn Asp Thr Phe  Leu Phe Asp Phe Gly  Ser Gly His
    3635                 3640                 3645

Asp Thr  Val Asn Gly Gly Ala  Gly Thr Asn Trp Thr  Asp Thr Ile
    3650                 3655                 3660

Asp Leu  Ser Thr Asp Met His  Ala Gly Ala Asn Ile  Thr Ile Thr
    3665                 3670                 3675

Thr Ala  Asp Asn His Ser Trp  Thr Val Ala Ser Asp  Gly Asp His
    3680                 3685                 3690

Asn Ala  Thr Gly Asn Ile Glu  Leu Gly Gln Asp Lys  Ser Gly Thr
    3695                 3700                 3705

Ile Thr  Val His Ser Gln Asp  Gly Asp Gln Thr Ile  Glu Phe Thr
    3710                 3715                 3720

Asn Ile  Glu Ser Ile Lys Tyr
    3725                 3730
```

<210> 2
<211> 1578
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 2

```
Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1               5                  10                  15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
```

20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
35 40 45

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
100 105 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser
145 150 155 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
165 170 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
180 185 190

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

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
210 215 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225 230 235 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
245 250 255

Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val
260 265 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn

```
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
            340                 345                 350

Ala Ser Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
    450                 455                 460

Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
```

565 570 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
580 585 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
595 600 605

Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
610 615 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Gly
625 630 635 640

Pro Val Val Ser Gly Pro Val Asp Leu Gly Ala Thr Ala Glu Asp His
645 650 655

Ser Ile Thr Phe Thr Ala Gln Gln Leu Leu Gly His Ala Ser Asp Ile
660 665 670

Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Ser Ala Gly Asn Gly Thr
675 680 685

Ile Ser Gln Asn Ala Asp Gly Ser Tyr Thr Phe Thr Pro Asn Ala Asp
690 695 700

Phe Asn Gly Glu Val Asn Val Thr Tyr Thr Val Ser Asp Gly His Gly
705 710 715 720

Gly Thr Thr Ser Gly Ser Ala Ser Phe Asp Val Thr Ser Val Asn Asp
725 730 735

Gly Pro Thr Thr Ser Asp Val Thr Leu Ala Ser Gly Thr Glu Asp Arg
740 745 750

Ser Val Thr Ile Lys Ala Ser Asp Leu Leu Gly Asn Ala His Asp Val
755 760 765

Asp Gly Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ser Asn Gly Thr
770 775 780

Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr Pro Asn His Asp
785 790 795 800

Phe Ser Gly Asn Val Asp Leu Ser Tyr Thr Val Ser Asp Gly Gln Gly
805 810 815

Gly Ser Thr Ala Gly Thr Ala His Phe Gly Met Ala Ala Val Ala Asp
820 825 830

Ser Pro Val Leu Ser Ala Ser Asn Ile Thr Val Asp Leu Gly Ala Gly

```
        835                 840                 845

Gln Ala Gln Thr Leu Asn Gly Thr Thr Gly Asn Asp Thr Leu Ser Gly
    850                 855                 860

Gly Ser Gly Asn Asp Val Val Asn Gly Ser Ser Gly Asp Asp Val Leu
865                 870                 875                 880

Tyr Gly Asp Gly Thr Gly Ser Val Thr Val Pro Leu Asn Ile Ser Asp
                885                 890                 895

Arg Leu Ser Asp Thr Asp Gly Ser Glu Ser Leu Gly Ser Val Thr Ile
            900                 905                 910

Gly Gly Leu Pro Ala Gly Ala Ser Leu Ser Ala Gly Thr His Asn Ser
        915                 920                 925

Asp Gly Thr Trp Thr Leu Thr Pro Ala Gln Leu Thr Gly Leu Ser Val
    930                 935                 940

Thr Thr Thr Glu Gly Thr Ala Leu His Leu Ser Val Thr Ala Thr Ser
945                 950                 955                 960

Thr Glu Ala Ser Asn Gly Ser Thr Ala Thr Thr Thr Thr Ser Phe Asp
                965                 970                 975

Val Ser Phe Ser Gly Thr Ala Ala Gly Asn Asp Thr Leu Asp Gly Gly
            980                 985                 990

Ala Gly Asn Asp Thr Leu Phe Gly  Gly Ala Gly Asn Asp  Thr Leu Thr
        995                 1000                1005

Gly Gly  Ala Gly Ala Asp Leu  Leu Glu Gly Gly Asp  Gly Asn Asp
    1010                1015                1020

Val Leu  Asn Tyr Ser Thr Asp  Gly Thr Trp Ser Gly  Gly Phe Val
    1025                1030                1035

Ser Gln  Asn Val Gly Asp Thr  Thr His Ala Gly Thr  Asn Glu Thr
    1040                1045                1050

Tyr Thr  Ile Thr Gly Asp Asn  Asp Ser Gln Asp Val  Phe Arg Gly
    1055                1060                1065

Gly Ala  Gly Thr Asp Thr Leu  Val Met Gly Ser Gly  Asn Asp Ala
    1070                1075                1080

Leu Phe  Leu Asp Asp Gly Tyr  Ser Gly Ser Pro Thr  Gly Gly Ala
    1085                1090                1095

Arg Ile  Asp Gly Ile Glu Ser  Ile Val Ala Gly Asp  Gly Asn Asp
```

1100 1105 1110

Val Val Asp Leu Thr Ser Ser Lys Tyr Thr Tyr Gly Asp Val Thr
1115 1120 1125

Ile Asp Gly Gly Ala Gly Asn Asp Val Leu Met Gly Asn Ala Gly
1130 1135 1140

Asn Asp Val Ile Asp Gly Gly Thr Gly Asn Asp Val Leu Tyr Gly
1145 1150 1155

Ala Ser Gly Asn Asp Thr Leu Arg Gly Gly Asp Gly Ala Asp Thr
1160 1165 1170

Leu Asp Gly Gly Tyr Gly Ala Asp Thr Ile Asp Ala Gly Ala Gly
1175 1180 1185

Asn Asp Leu Gly Ile Ile Lys Gly Gly Gln Ser Ala Gly Asp Asn
1190 1195 1200

Tyr Asp Gly Gly Thr Gly Thr Asp Thr Leu Arg Ile Asp Leu Ser
1205 1210 1215

Gly Ser Gln Tyr Thr Ala Ala Val Arg Ala Glu Leu Gln Gln Phe
1220 1225 1230

Gln Ser Phe Ile Ala Asp Pro Ala His Ala Gly Gln Ser Phe His
1235 1240 1245

Phe Asn Thr Leu Gly Val Asp Ala Lys Asn Trp Glu Ser Leu Lys
1250 1255 1260

Leu Thr Val Asp Gly Arg Asp Val Ser Leu Glu Asn Ala Pro Thr
1265 1270 1275

Val Thr Ser Ala Thr Ala Val Ser Thr Asp Glu Asp His Ser Gly
1280 1285 1290

Ala Gly Arg Val Val Gly Thr Asp Gln Asp Val Gly Asp Ser Val
1295 1300 1305

Arg Tyr His Leu Met Asp Ala Ser Gly Asn Gln Val Asp Ser Leu
1310 1315 1320

Ser Thr Ala His Gly Thr Val Thr Ile Asn Ser Ala Thr Gly Glu
1325 1330 1335

Tyr Thr Phe Thr Pro Asn Ala Asp Ala Gln Ser Leu Arg Ala Gly
1340 1345 1350

Asp Val Gln Thr Asp Ser Phe Lys Val Val Ala Thr Asp Gly Thr

1355 1360 1365

Met Thr Ser Ala Pro Ser Thr Val Gly Val Thr Ile Thr Gly Ser
1370 1375 1380

Asn Asp Gly Ala Val Ile Thr Gly Thr Ser Val Gly Thr Val Gly
1385 1390 1395

Glu Asp Gly Asn Arg Ser Val Thr Gly Thr Leu Asn Val Ala Asp
1400 1405 1410

Val Asp Gln Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr
1415 1420 1425

Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe
1430 1435 1440

Gln Val Asn Ser Gly Asn Ala Asp Val Gln Ala Leu Gly Ala Gly
1445 1450 1455

Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr
1460 1465 1470

Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser
1475 1480 1485

Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly
1490 1495 1500

Asn Gly Arg Ala Thr Gly Thr Leu Ser Val Ala Asp Val Asp His
1505 1510 1515

Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly
1520 1525 1530

Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn
1535 1540 1545

Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Glu Ser Met
1550 1555 1560

Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Pro Arg
1565 1570 1575

<210> 3
<211> 804
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (666)..(666)

<223> Xaa can be any naturally occurring amino acid

<400> 3

```
Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1               5                   10                  15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
        35                  40                  45

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
    50                  55                  60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
                85                  90                  95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
            100                 105                 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
        115                 120                 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
    130                 135                 140

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser
145                 150                 155                 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

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

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255
```

```
Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
            340                 345                 350

Ala Ser Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
    450                 455                 460

Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525
```

```
Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Ile Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Gly Thr Ala Thr Gly Thr Leu Asn Val Xaa Asp Val Asp Asn Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
            740                 745                 750

Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser
        755                 760                 765

Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
    770                 775                 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785                 790                 795                 800
```

Leu Asn Asn Asp

<210> 4
<211> 790
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (772)..(772)
<223> Xaa can be any naturally occurring amino acid

<400> 4

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala Ala Thr
35 40 45

Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
100 105 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

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

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
165 170 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
180 185 190

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
195 200 205

```
Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Ile
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val
    450                 455                 460

Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480
```

```
Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile Asn Gly Ser Asn Asp Asn Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Ile Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
            740                 745                 750
```

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser
755 760 765

Asp Val Asp Xaa Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
770 775 780

Asp Gln Gly Thr Phe Thr
785 790

<210> 5
<211> 804
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 5

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
35 40 45

Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

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

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

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

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
165 170 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
180 185 190

```
Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser Asp Val
    450                 455                 460
```

```
Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735
```

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
740 745 750

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser
755 760 765

Asp Val Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
770 775 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785 790 795 800

Leu Asn Asn Asp

<210> 6
<211> 804
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 6

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr
35 40 45

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
100 105 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn
145 150 155 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr

```
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

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

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile Asn Gly Ser Asn Asp Asn Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Ile
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
```

```
        435                 440                 445

Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser Asp Val
    450                 455                 460

Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr
```

705 710 715 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
725 730 735

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
740 745 750

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser
755 760 765

Asp Val Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
770 775 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785 790 795 800

Leu Asn Asn Asp

<210> 7
<211> 684
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (109)..(109)
<223> Xaa can be any naturally occurring amino acid

<400> 7

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
1 5 10 15

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

Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
35 40 45

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
50 55 60

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
65 70 75 80

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
85 90 95

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Xaa Asn Asp Thr
100 105 110

```
Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
        115                 120                 125

Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu
    130                 135                 140

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

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
                165                 170                 175

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
            180                 185                 190

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
        195                 200                 205

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
    210                 215                 220

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser
225                 230                 235                 240

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

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
            260                 265                 270

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
        275                 280                 285

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
    290                 295                 300

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
305                 310                 315                 320

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr
                325                 330                 335

Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln
            340                 345                 350

Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
        355                 360                 365

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
    370                 375                 380
```

```
Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
385                 390                 395                 400

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn
                405                 410                 415

Asp Asn Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
            420                 425                 430

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn
        435                 440                 445

Gly Glu Ala His Val Gln Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr
    450                 455                 460

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
465                 470                 475                 480

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
                485                 490                 495

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
            500                 505                 510

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
        515                 520                 525

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
    530                 535                 540

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
545                 550                 555                 560

Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser
                565                 570                 575

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
            580                 585                 590

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
        595                 600                 605

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
    610                 615                 620

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
625                 630                 635                 640

Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His
                645                 650                 655
```

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
660 665 670

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
675 680

<210> 8
<211> 804
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (433)..(433)
<223> Xaa can be any naturally occurring amino acid

<400> 8

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
35 40 45

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
100 105 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn
145 150 155 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
165 170 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
180 185 190

```
Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly
            420                 425                 430

Xaa Asn Asp Thr Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
    450                 455                 460
```

```
Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735
```

```
Asn Gly Ser Asn Asp Asn Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
            740                 745                 750

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser
        755                 760                 765

Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Ile Glu Thr
    770                 775                 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785                 790                 795                 800

Leu Asn Asn Asp
```

<210> 9
<211> 804
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (331)..(331)
<223> Xaa can be any naturally occurring amino acid

<400> 9

```
Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1               5                   10                  15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr
        35                  40                  45

Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln
    50                  55                  60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
                85                  90                  95

Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
            100                 105                 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
        115                 120                 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
    130                 135                 140
```

```
Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn
145                 150                 155                 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Xaa Asn Asp Thr Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415
```

```
Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
    450                 455                 460

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Asn
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685
```

```
Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
            740                 745                 750

Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala
        755                 760                 765

Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
    770                 775                 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785                 790                 795                 800

Leu Asn Asn Asp
```

<210> 10
<211> 806
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (537)..(537)
<223> Xaa can be any naturally occurring amino acid

<400> 10

```
Leu Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr
1               5                   10                  15

Val Thr Val Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly
            20                  25                  30

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

Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His
    50                  55                  60

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

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val
```

85 90 95

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

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
115 120 125

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
130 135 140

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
145 150 155 160

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
165 170 175

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
180 185 190

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
195 200 205

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
210 215 220

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
225 230 235 240

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

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
260 265 270

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

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
290 295 300

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
305 310 315 320

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
325 330 335

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
340 345 350

Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu

```
        355                 360                 365

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
    370                 375                 380

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
385                 390                 395                 400

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
                405                 410                 415

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
            420                 425                 430

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
        435                 440                 445

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser
    450                 455                 460

Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
465                 470                 475                 480

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
                485                 490                 495

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
            500                 505                 510

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
        515                 520                 525

Glu Val Thr Val Thr Ile Asn Gly Xaa Asn Asp Thr Ala Thr Ile Ser
    530                 535                 540

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
545                 550                 555                 560

Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln
                565                 570                 575

Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
            580                 585                 590

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
        595                 600                 605

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
    610                 615                 620

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
```

625 630 635 640

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
645 650 655

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser
660 665 670

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
675 680 685

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
690 695 700

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
705 710 715 720

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
725 730 735

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
740 745 750

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn
755 760 765

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
770 775 780

Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser
785 790 795 800

Phe Ala Leu Asn Asn Asp
805

<210> 11
<211> 727
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (662)..(662)
<223> Xaa can be any naturally occurring amino acid

<400> 11

Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr
1 5 10 15

Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile Asn Ala Thr Tyr
20 25 30

```
Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly Ser Ala Ser Leu
        35                  40                  45

His Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala
    50                  55                  60

Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala
65                  70                  75                  80

Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr Ala Asp
                85                  90                  95

Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser Phe Ala
            100                 105                 110

Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu Thr Arg
        115                 120                 125

Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val Thr Val
    130                 135                 140

Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly Asp Ala Lys
145                 150                 155                 160

Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr Ala Thr Gly
                165                 170                 175

Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala
            180                 185                 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
        195                 200                 205

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

Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp
225                 230                 235                 240

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
                245                 250                 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
            260                 265                 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly
        275                 280                 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
    290                 295                 300
```

```
Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305                 310                 315                 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
                325                 330                 335

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
            340                 345                 350

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
        355                 360                 365

Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val
    370                 375                 380

Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
385                 390                 395                 400

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
                405                 410                 415

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu
            420                 425                 430

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
        435                 440                 445

Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile
    450                 455                 460

Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala
465                 470                 475                 480

Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val
                485                 490                 495

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
            500                 505                 510

Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln
        515                 520                 525

Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser
    530                 535                 540

Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser
545                 550                 555                 560

Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu
                565                 570                 575
```

Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp
580 585 590

Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly
595 600 605

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

Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys
625 630 635 640

Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr
645 650 655

Val Thr Ile Asn Gly Xaa Asn Asp Thr Ala Thr Ile Ser Gly Asp Ile
660 665 670

Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu
675 680 685

Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser
690 695 700

Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp
705 710 715 720

Ser Phe Ala Leu Asn Asn Asp
725

<210> 12
<211> 257
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 12

Ser Leu Ser Thr Ala His Gly Thr Val Thr Ile Asn Ser Ala Thr Gly
1 5 10 15

Glu Tyr Thr Phe Thr Pro Asn Ala Asp Ala Gln Ser Leu Arg Ala Gly
20 25 30

Asp Val Gln Thr Asp Ser Phe Lys Val Val Ala Thr Asp Gly Thr Met
35 40 45

Thr Ser Ala Pro Ser Thr Val Gly Val Thr Ile Thr Gly Ser Asn Asp
50 55 60

Gly Ala Val Ile Thr Gly Thr Ser Val Gly Thr Val Gly Glu Asp Gly
65 70 75 80

Asn Arg Ser Val Thr Gly Thr Leu Asn Val Ala Asp Val Asp Gln Gly

85 90 95

Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe
100 105 110

Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly Asn
115 120 125

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

Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr
145 150 155 160

Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly
165 170 175

Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val
180 185 190

Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln
195 200 205

Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe
210 215 220

Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Glu
225 230 235 240

Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Pro
245 250 255

Arg

<210> 13
<211> 172
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 13

Asp Ile Gln Ala Val Ala Val Asn His Ala Pro Ile Val Ala Gly Val
1 5 10 15

Ala Asp Ile Gly Thr Ile Asp Glu Asp His Pro Leu Thr Met Thr Ala
20 25 30

Ala Glu Trp Gln Ala Lys Leu Leu Ala Asn Ala Thr Asp Ser Asp Gly
35 40 45

Asp Thr Leu Ser Ile Leu Ser Leu Asp Asp Ile Arg Ile Asp His Gly
50 55 60

```
Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr Thr Phe Thr Pro Asp Ala
65                  70                  75                  80

Asn Phe Asn Gly Glu Ile Asn Ala Thr Tyr Thr Ile Ser Asp Gly His
                85                  90                  95

Gly Gly Leu Ala Thr Gly Ser Ala Ser Leu His Val Asn Ala Val Asn
            100                 105                 110

Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala Val Val Val Gly Glu Asp
        115                 120                 125

Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala Thr Asp Ile Asp Ser Pro
    130                 135                 140

Ala Thr Phe Val Ala Ala Thr Thr Ala Asp Asp Tyr Gly Thr Phe Ser
145                 150                 155                 160

Val Asp Glu Ser Gly Gln Trp Ser Phe Ala Met Asn
                165                 170


<210>  14
<211>  1113
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1

<400>  14

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1               5                   10                  15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
        35                  40                  45

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
    50                  55                  60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
                85                  90                  95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
            100                 105                 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
        115                 120                 125
```

```
Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
    130                 135                 140

Gly Thr Ser Thr Ala Ser Gly Thr Leu Asn Val Ser Asp Val Asp Asn
145                 150                 155                 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

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

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Ser Gly Thr Leu Asn
                245                 250                 255

Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

```
Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

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

Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Gly
625                 630                 635                 640

Pro Val Val Ser Gly Pro Val Asp Leu Gly Ala Thr Ala Glu Asp His
                645                 650                 655

Ser Ile Thr Phe Thr Ala Gln Gln Leu Leu Gly His Ala Ser Asp Ile
            660                 665                 670
```

```
Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Ser Ala Gly Asn Gly Thr
        675                 680                 685

Ile Ser Gln Asn Ala Asp Gly Ser Tyr Thr Phe Thr Pro Asn Ala Asp
    690                 695                 700

Phe Asn Gly Glu Val Asn Val Thr Tyr Thr Val Ser Asp Gly His Gly
705                 710                 715                 720

Gly Thr Thr Ser Gly Ser Ala Ser Phe Asp Val Thr Ser Val Asn Asp
                725                 730                 735

Gly Pro Thr Thr Ser Asp Val Thr Leu Ala Ser Gly Thr Glu Asp Arg
            740                 745                 750

Ser Val Thr Ile Lys Ala Ser Asp Leu Leu Gly Asn Ala His Asp Val
        755                 760                 765

Asp Gly Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ser Asn Gly Thr
    770                 775                 780

Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr Pro Asn His Asp
785                 790                 795                 800

Phe Ser Gly Asn Val Asp Leu Ser Tyr Thr Val Ser Asp Gly Gln Gly
                805                 810                 815

Gly Ser Thr Ala Gly Thr Ala His Phe Gly Met Ala Ala Val Ala Asp
            820                 825                 830

Ser Pro Val Leu Ser Ala Ser Asn Ile Thr Val Asp Leu Gly Ala Gly
        835                 840                 845

Gln Ala Gln Thr Leu Asn Gly Thr Thr Gly Asn Asp Thr Leu Ser Gly
    850                 855                 860

Gly Ser Gly Asn Asp Val Val Asn Gly Ser Ser Gly Asp Asp Val Leu
865                 870                 875                 880

Tyr Gly Asp Gly Thr Gly Ser Val Thr Val Pro Leu Asn Ile Ser Asp
                885                 890                 895

Arg Leu Ser Asp Thr Asp Gly Ser Glu Ser Leu Gly Ser Val Thr Ile
            900                 905                 910

Gly Gly Leu Pro Ala Gly Ala Ser Leu Ser Ala Gly Thr His Asn Ser
        915                 920                 925

Asp Gly Thr Trp Thr Leu Thr Pro Ala Gln Leu Thr Gly Leu Ser Val
    930                 935                 940
```

```
Thr Thr Thr Glu Gly Thr Ala Leu His Leu Ser Val Thr Ala Thr Ser
945                 950                 955                 960


Thr Glu Ala Ser Asn Gly Ser Thr Ala Thr Thr Thr Thr Ser Phe Asp
                965                 970                 975


Val Ser Phe Ser Gly Thr Ala Ala Gly Asn Asp Thr Leu Asp Gly Gly
            980                 985                 990


Ala Gly Asn Asp Thr Leu Phe Gly  Gly Ala Gly Asn Asp  Thr Leu Thr
        995                 1000                1005


Gly Gly  Ala Gly Ala Asp Leu  Leu Glu Gly Gly Asp  Gly Asn Asp
    1010                1015                1020


Val Leu  Asn Tyr Ser Thr Asp  Gly Thr Trp Ser Gly  Gly Phe Val
    1025                1030                1035


Ser Gln  Asn Val Gly Asp Thr  Thr His Ala Gly Thr  Asn Glu Thr
    1040                1045                1050


Tyr Thr  Ile Thr Gly Asp Asn  Asp Ser Gln Asp Val  Phe Arg Gly
    1055                1060                1065


Gly Ala  Gly Thr Asp Thr Leu  Val Met Gly Ser Gly  Asn Asp Ala
    1070                1075                1080


Leu Phe  Leu Asp Asp Gly Tyr  Ser Gly Ser Pro Thr  Gly Gly Ala
    1085                1090                1095


Arg Ile  Asp Gly Ile Glu Ser  Ile Val Ala Gly Glu  Gly Asn Asp
    1100                1105                1110


<210>  15
<211>  804
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1


<220>
<221>  misc_feature
<222>  (130)..(130)
<223>  Xaa can be any naturally occurring amino acid

<400>  15

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1               5                   10                  15


Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30


Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala Ala Thr
        35                  40                  45
```

```
Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu Ala His Val Gln
    50                  55                  60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
                85                  90                  95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
            100                 105                 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
        115                 120                 125

Asp Xaa Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
    130                 135                 140

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

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320
```

```
Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser Asp Val
    450                 455                 460

Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590
```

```
Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
            740                 745                 750

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser
        755                 760                 765

Asp Val Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
    770                 775                 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785                 790                 795                 800

Leu Asn Asn Asp
```

<210> 16
<211> 906
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (538)..(538)
<223> Xaa can be any naturally occurring amino acid

<400> 16

```
Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1               5                  10                  15

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr
        35                  40                  45

Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln
    50                  55                  60

Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
65                  70                  75                  80

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
                85                  90                  95

Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
            100                 105                 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
        115                 120                 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
    130                 135                 140

Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser
145                 150                 155                 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val
```

260 265 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
290 295 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305 310 315 320

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
325 330 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
340 345 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
355 360 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
370 375 380

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

Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr Val Thr
405 410 415

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly
420 425 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
435 440 445

Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp Val
450 455 460

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465 470 475 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
485 490 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
500 505 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
515 520 525

Thr Val Thr Ile His Gly Ser Asn Asp Xaa Ala Thr Ile Ser Gly Asp

```
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    690                 695                 700

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
705                 710                 715                 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                725                 730                 735

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
            740                 745                 750

Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser
        755                 760                 765

Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
    770                 775                 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785                 790                 795                 800

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
```

805 810 815

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
820 825 830

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
835 840 845

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr
850 855 860

Gly Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln
865 870 875 880

Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
885 890 895

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
900 905

<210> 17
<211> 804
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 17

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
35 40 45

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
100 105 110

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
130 135 140

```
Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn
145                 150                 155                 160

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
            180                 185                 190

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Ser
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Ile
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
    290                 295                 300

Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr
                405                 410                 415
```

```
Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
            420                 425                 430

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
        435                 440                 445

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
    450                 455                 460

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
465                 470                 475                 480

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
                485                 490                 495

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
            500                 505                 510

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
        515                 520                 525

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
    530                 535                 540

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr
545                 550                 555                 560

Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
                565                 570                 575

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            580                 585                 590

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        595                 600                 605

Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    610                 615                 620

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
625                 630                 635                 640

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                645                 650                 655

Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu
            660                 665                 670

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        675                 680                 685
```

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
690 695 700

Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr
705 710 715 720

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
725 730 735

Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
740 745 750

Val Gly Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala
755 760 765

Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
770 775 780

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
785 790 795 800

Leu Asn Asn Asp

<210> 18
<211> 780
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 18

Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala Val
1 5 10 15

Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala Thr
20 25 30

Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr Ala Asp Asp
35 40 45

Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser Phe Ala Met
50 55 60

Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu Thr Arg Thr
65 70 75 80

Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val Thr Val Thr
85 90 95

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

```
Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr Ala Thr Gly Thr
        115                 120                 125

Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
    130                 135                 140

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
145                 150                 155                 160

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

Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
            180                 185                 190

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
        195                 200                 205

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
    210                 215                 220

Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu
225                 230                 235                 240

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

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
            260                 265                 270

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
        275                 280                 285

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
    290                 295                 300

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
305                 310                 315                 320

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

Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
            340                 345                 350

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
        355                 360                 365

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
    370                 375                 380
```

```
Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
385                 390                 395                 400

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
                405                 410                 415

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr
            420                 425                 430

Gly Thr Leu Ser Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln
        435                 440                 445

Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
    450                 455                 460

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
465                 470                 475                 480

Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
                485                 490                 495

Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn
            500                 505                 510

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
        515                 520                 525

Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Asn
    530                 535                 540

Gly Glu Ala His Val Gln Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr
545                 550                 555                 560

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

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
            580                 585                 590

Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val
        595                 600                 605

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
    610                 615                 620

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
625                 630                 635                 640

Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val
                645                 650                 655
```

```
Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser
            660                 665                 670

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
        675                 680                 685

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
    690                 695                 700

Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr
705                 710                 715                 720

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
                725                 730                 735

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
            740                 745                 750

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
        755                 760                 765

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
    770                 775                 780
```

<210> 19
<211> 172
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 19

```
Asp Ile Gln Ala Val Ala Val Asn His Ala Pro Ile Val Ala Gly Val
1               5                   10                  15

Ala Asp Ile Gly Thr Ile Asp Glu Asp His Pro Leu Thr Met Thr Ala
            20                  25                  30

Ala Glu Trp Gln Ala Lys Leu Leu Ala Asn Ala Thr Asp Ser Asp Gly
        35                  40                  45

Asp Thr Leu Ser Ile Leu Ser Leu Asp Asp Ile Arg Ile Asp His Gly
    50                  55                  60

Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr Thr Phe Thr Pro Asp Ala
65                  70                  75                  80

Asn Phe Asn Gly Glu Ile Asn Ala Thr Tyr Thr Ile Ser Asp Gly His
                85                  90                  95

Gly Gly Leu Ala Thr Gly Ser Ala Ser Leu His Val Asn Ala Val Asn
            100                 105                 110
```

```
Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala Val Val Val Gly Glu Asp
        115                 120                 125


Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala Thr Asp Ile Asp Ser Pro
    130                 135                 140


Ala Thr Phe Val Ala Ala Thr Thr Ala Asp Asp Tyr Gly Thr Phe Ser
145                 150                 155                 160


Val Asp Glu Ser Gly Gln Trp Ser Phe Ala Met Asn
                165                 170


<210>  20
<211>  1230
<212>  PRT
<213>  Magnetospirillum magnetotacticum

<400>  20

Thr Gln Ala Val Asn Val His Ala Asp Ala Val Ala Asp Ala Pro Thr
1               5                   10                  15


Leu Ser Leu Gln Leu Gly Gly Gly Ser Ala Val Thr Leu Pro Gly Val
            20                  25                  30


Ser Glu His Val Thr Ile Asp Thr Ser Asn Met His Ala Thr Asn Ser
        35                  40                  45


Gly Phe Thr Val Ser Ala Leu Asn Leu Asp Gly Ser Ala Gly Asn Leu
    50                  55                  60


Ser Thr His Ser Gly Pro Ala Gly Phe Gly Val Thr Gly Asn Ala Ser
65                  70                  75                  80


Gly Asp Gln Thr Glu Leu Gly Gln Ser Gly Gly His Ser Glu Lys Ile
                85                  90                  95


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


Trp Leu Asn Asn Gln Glu His Ala His Tyr Asp Leu Tyr Gln Asn Gly
        115                 120                 125


Val Lys Val Gly Glu Gly Thr Val Thr Gly Ile Thr Asp Asn Val Asp
    130                 135                 140


Pro Ala Ile Ser Leu Thr Ala Ala Asn Gly Gly Ser Phe Asp Gln Ile
145                 150                 155                 160


Val Phe Ser Ala Pro Ser Gly Gly Asp Asn Asp Tyr Leu Ile His Ser
                165                 170                 175


Ile Ser Tyr Asp Val Ala Glu Pro Gly Glu Arg Val Val Asn Tyr Pro
```

```
            180                 185                 190

Leu Asn Val Ser Ser Gly Leu Thr Asp Thr Asp Gly Ser Glu Arg Leu
        195                 200                 205

Ala Val Thr Leu Asn Gly Leu Pro Glu Gly Ala Val Val Met Asp Ala
    210                 215                 220

Asn Gly Thr Val Val Gly Thr Asn Thr Gly Asn Gly Thr Trp Ser Leu
225                 230                 235                 240

Pro Gly Gly His Ile Asp Gly Leu Thr Leu Gln Val Pro Ala Asp Ser
                245                 250                 255

His Ala Phe Thr Leu Gly Ala Val Ala Thr Ser Thr Glu Ser Asp Pro
            260                 265                 270

Asn Ala Ala Leu Ala Thr Ala Ser Thr Ser Val Ser Val Ala Val Ala
        275                 280                 285

Ala Phe Asp His Ala Pro Val Ala Gly Asp Asp Ser His Ile Asp Asn
    290                 295                 300

Met Ala Gln Gly Pro Ala Leu Ser Val Ala Met Gly Thr Thr Val Asp
305                 310                 315                 320

Asp Val His Thr Thr Thr Thr Thr Thr Thr Val Val Thr Gly Asn Gln
                325                 330                 335

Val Ser Trp Gly Gly Leu Asp Ser Met Ser Asp Pro Thr Thr Ala Thr
            340                 345                 350

Pro Thr Thr Thr Val Ser Asn Asp Leu Asn Thr Ala Asn Asn Gly Thr
        355                 360                 365

Ala Asn Ala Asp Val Ile Ser Val Gly His Asp Asn Asn Ala Ser Ile
    370                 375                 380

Ser Thr Gly Ala Gly Asp Asp Gln Val Thr Ile Gly His Ser Val Asn
385                 390                 395                 400

Ser Lys Ile Asp Leu Gly Ala Gly Thr Asn Ala Leu Asp Val Gly Ala
                405                 410                 415

Asp Val Asn Ala Ser Val Val Gly Gly Ala Gly Asn Asp Thr Val Arg
            420                 425                 430

Val Gly Gly Ala Leu Asn Ser Asn Ile Asp Leu Gly Asn Gly Asp Asn
        435                 440                 445

Arg Leu Gln Val Gly Gly Asp Ala Ser Ala Ser Ile Ser Thr Gly Ser
```

```
    450                 455                 460

Gly Ser Asp Asp Val Lys Ile Val Gly Ser Leu Asn Ser Asn Val Ser
465                 470                 475                 480

Leu Gly Ser Gly Asp Asp Asp Leu Gln Ile Gly Gly Ser Ala Asn Ala
                485                 490                 495

Ser Ile Asp Ala Gly Glu Gly Asn Asp Arg Val Leu Val Gly Arg Asp
            500                 505                 510

Leu Ser Ser Thr Ala Asn Leu Gly Ser Gly Asp Asp Tyr Leu Glu Val
        515                 520                 525

Lys Gly Asn Asp Trp Ala Ser Ile Asn Ala Gly Ala Gly Asn Asp Thr
    530                 535                 540

Val Lys Ile Gly Gly Ala Ile Ser Ala Asn Val Asp Met Gly Ser Gly
545                 550                 555                 560

Asp Asp His Leu Thr Ile Thr Gly Gln Asn Leu Trp Ala Thr Val Ser
                565                 570                 575

Gly Gly Ser Gly Thr Asp Ser Ile Glu Leu Thr Gly Val Thr Lys Ala
            580                 585                 590

Gln Trp Asp Ala Asn Val Asn Gly Ile Lys Gly Tyr Val Lys Asp Phe
        595                 600                 605

Glu Asn Ile Lys Phe Ser Asp Gly Gln Val Ile Gly Asp Ala Thr Ala
    610                 615                 620

Phe Gln Ala Thr Thr Thr Val Thr Thr Thr Thr Thr Thr His Ser Tyr
625                 630                 635                 640

Glu Thr Pro Ile Thr Val Gln Ala Thr Leu Asn Asp Arg Asp Gly Ser
                645                 650                 655

Glu Thr Leu Ser Pro Val Thr Ile Ala Asn Ile Pro Ala Gly Gly His
            660                 665                 670

Leu Glu Leu Asn Gly Gln Ala Leu Thr Pro Asn Ser Asp Gly Ser Tyr
        675                 680                 685

Thr Leu Asn Val Ser Ser Gly Ser Pro Val Thr Val Thr Leu Val Thr
    690                 695                 700

Asp Ala Pro Val Ser Ala Asn Ser Leu Asn Leu Thr Thr Thr Val His
705                 710                 715                 720

Ser Thr Glu Ala His Gly Gly Asp Val Ser Val Thr Thr Leu Val Gly
```

```
                725                 730                 735

Val Gly Ser Asn Ala Gly Glu Thr Val Val Asp Asp Arg Ile Ala Thr
            740                 745                 750

Gly Thr Asp His Lys Val Val Ile Asn Ala Ser Asp Leu Leu Ala Asn
        755                 760                 765

Asp Thr Asp Ala Asp Gly Asp Ala Leu Ser Ile Thr Ala Val Gly Gly
    770                 775                 780

Ala His His Gly Thr Val Ser Met Asp Asn Ala Gly His Val Thr Phe
785                 790                 795                 800

Thr Ala Glu Ala Gly Phe Asn Gly Thr Ala Thr Phe Asp Tyr Thr Val
                805                 810                 815

Ser Asp Gly His Gly Gly Thr Asp Thr Ala Thr Val Ser Val Asn Val
            820                 825                 830

Val Asp Pro Asn His Ala Pro Val Ile Asp Ala Ala His Thr Thr Ala
        835                 840                 845

Thr Leu Asn Ile Asp Asp Ala His Ala Asn Thr Thr Asn Ile Gly Gln
    850                 855                 860

Val Thr Ala Thr Asp Val Asp Gly Asp Thr Leu Ser Tyr Ser Val Leu
865                 870                 875                 880

Ala Gly Gly Thr His His Gly Ser Leu Val Leu Asp Ala Asn Ser Gly
                885                 890                 895

Ser Phe Phe Tyr Asn Ala Asp Asp Thr Ser Trp Ser Gly Thr Asp Thr
            900                 905                 910

Phe Thr Val Gln Val Asn Asp Gly Glu Gly Gly Thr Ala Thr Gln Ser
        915                 920                 925

Val Ser Val His Val Thr Gly Gly Ser Gln Gly Gly Lys Ser Gly Gly
    930                 935                 940

Gly Thr Gly Ser Gly His Ala Val Gly Trp Gly Asp Gly Gly Gly Arg
945                 950                 955                 960

Asp Glu Ser Trp Gly Ala Asn Gly Ser Trp Ser Ile Asp Ala Ile Ser
                965                 970                 975

Gly Gly Gly Ser Asn Gly Gly His Val Val His Ala Ser Asp Asn Gly
            980                 985                 990

Thr Asp Trp Ser Ser Ser Trp Ser  Ala Leu Asp Val Gly  Asn Gly Gly
```

995 1000 1005

His Ala Gly Thr Gly Asp Arg Phe Ser Ile Ala Gly Asp Asn Arg
1010 1015 1020

His Asp Glu Phe Tyr Asn Gly His Ser Gly Asp Thr Leu Ile Gly
1025 1030 1035

Ala Ala Gly Asn Asp Tyr Met Ser Leu Glu Gly Ala Asp Gly Lys
1040 1045 1050

Gln His Ile Ser Gly Tyr Asp His Ile Gln Met Gly Asp Gly Asp
1055 1060 1065

Asn Ala Ile Leu Asp Met Thr Thr Ser His Tyr Asp Tyr Gly Asn
1070 1075 1080

Leu Thr Val Ala Gly Gly Thr Gly His Asp Val Ile Trp Ser Ala
1085 1090 1095

Ser Gly Asp Asp Leu Leu Val Ala Gly Asn Gly Gly Asp Thr Ile
1100 1105 1110

His Gly Gly Ala Gly Asn Asp Thr Ile Val Ala Gly Ala Gly Ser
1115 1120 1125

Asp Asn Leu Met Gly Gln Asp Gly Ser Asp Thr Phe Met Phe Asp
1130 1135 1140

Phe Gly Ala Gly His Asp Ile Val Asn Gly Gly Ala Gly Ala Thr
1145 1150 1155

Trp Thr Asp Thr Ile Asp Leu Ser Thr Asp Met His Asp Gly Ala
1160 1165 1170

Ser Ile Thr Ile Thr Thr Ala Asp Asn His Ser Trp Thr Val Ala
1175 1180 1185

Ser Asp Gly Asp His His Ala Ala Gly Ala Ile Glu Leu Gly Gln
1190 1195 1200

Asp Lys Ala Gly Thr Ile Thr Val His Ser Asn His Gly Asp Thr
1205 1210 1215

Gln Ile Glu Phe Thr Asn Ile Glu Thr Ile Lys Tyr
1220 1225 1230

<210> 21
<211> 210
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 21

Gly Gly Gly Arg Asp Glu Ser Trp Gly Ala Asn Gly Ser Trp Ser Ile
1 5 10 15

Asp Ala Ile Ser Gly Gly Gly Ser Asn Gly Gly His Val Val His Ala
20 25 30

Ser Asp Asn Gly Thr Asp Trp Ser Ser Ser Trp Ser Ala Leu Asp Val
35 40 45

Gly Asn Gly Gly His Ala Gly Thr Gly Asp Arg Phe Ser Ile Ala Gly
50 55 60

Asp Asn Arg His Asp Glu Phe Tyr Asn Gly His Ser Gly Asp Thr Leu
65 70 75 80

Ile Gly Ala Ala Gly Asn Asp Tyr Met Ser Leu Glu Gly Ala Asp Gly
85 90 95

Lys Gln His Ile Ser Gly Tyr Asp His Ile Gln Met Gly Asp Gly Asp
100 105 110

Asn Ala Ile Leu Asp Met Thr Thr Ser His Tyr Asp Tyr Gly Asn Leu
115 120 125

Thr Val Ala Gly Gly Thr Gly His Asp Val Ile Trp Ser Ala Ser Gly
130 135 140

Asp Asp Leu Leu Val Ala Gly Asn Gly Gly Asp Thr Ile His Gly Gly
145 150 155 160

Ala Gly Asn Asp Thr Ile Val Ala Gly Ala Gly Ser Asp Asn Leu Met
165 170 175

Gly Gln Asp Gly Ser Asp Thr Phe Met Phe Asp Phe Gly Ala Gly His
180 185 190

Asp Ile Val Asn Gly Gly Ala Gly Ala Thr Trp Thr Asp Thr Ile Asp
195 200 205

Leu Ser
210

<210> 22
<211> 215
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 22

Val His Ser Thr Glu Ala His Gly Gly Asp Val Ser Val Thr Thr Leu
1 5 10 15

```
Val Gly Val Gly Ser Asn Ala Gly Glu Thr Val Val Asp Asp Arg Ile
            20                  25                  30

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

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

Gly Gly Ala His His Gly Thr Val Ser Met Asp Asn Ala Gly His Val
65                  70                  75                  80

Thr Phe Thr Ala Glu Ala Gly Phe Asn Gly Thr Ala Thr Phe Asp Tyr
                85                  90                  95

Thr Val Ser Asp Gly His Gly Gly Thr Asp Thr Ala Thr Val Ser Val
            100                 105                 110

Asn Val Val Asp Pro Asn His Ala Pro Val Ile Asp Ala Ala His Thr
        115                 120                 125

Thr Ala Thr Leu Asn Ile Asp Asp Ala His Ala Asn Thr Thr Asn Ile
    130                 135                 140

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

Val Leu Ala Gly Gly Thr His His Gly Ser Leu Val Leu Asp Ala Asn
                165                 170                 175

Ser Gly Ser Phe Phe Tyr Asn Ala Asp Asp Thr Ser Trp Ser Gly Thr
            180                 185                 190

Asp Thr Phe Thr Val Gln Val Asn Asp Gly Glu Gly Gly Thr Ala Thr
        195                 200                 205

Gln Ser Val Ser Val His Val
    210                 215


<210>  23
<211>  146
<212>  PRT
<213>  Magnetospirillum magnetotacticum

<400>  23

Gly Thr Val Ser Met Asp Asn Ala Gly His Val Thr Phe Thr Ala Glu
1               5                   10                  15

Ala Gly Phe Asn Gly Thr Ala Thr Phe Asp Tyr Thr Val Ser Asp Gly
            20                  25                  30
```

```
His Gly Gly Thr Asp Thr Ala Thr Val Ser Val Asn Val Val Asp Pro
        35                  40                  45

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

Ile Asp Asp Ala His Ala Asn Thr Thr Asn Ile Gly Gln Val Thr Ala
65                  70                  75                  80

Thr Asp Val Asp Gly Asp Thr Leu Ser Tyr Ser Val Leu Ala Gly Gly
                85                  90                  95

Thr His His Gly Ser Leu Val Leu Asp Ala Asn Ser Gly Ser Phe Phe
            100                 105                 110

Tyr Asn Ala Asp Asp Thr Ser Trp Ser Gly Thr Asp Thr Phe Thr Val
        115                 120                 125

Gln Val Asn Asp Gly Glu Gly Gly Thr Ala Thr Gln Ser Val Ser Val
    130                 135                 140

His Val
145
```

<210> 24
<211> 88
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 24

```
Thr Gly Thr Asp His Lys Val Val Ile Asn Ala Ser Asp Leu Leu Ala
1               5                   10                  15

Asn Asp Thr Asp Ala Asp Gly Asp Ala Leu Ser Ile Thr Ala Val Gly
            20                  25                  30

Gly Ala His His Gly Thr Val Ser Met Asp Asn Ala Gly His Val Thr
        35                  40                  45

Phe Thr Ala Glu Ala Gly Phe Asn Gly Thr Ala Thr Phe Asp Tyr Thr
    50                  55                  60

Val Ser Asp Gly His Gly Gly Thr Asp Thr Ala Thr Val Ser Val Asn
65                  70                  75                  80

Val Val Asp Pro Asn His Ala Pro
                85
```

<210> 25
<211> 1268
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 25

```
Ser Val Ser Ile Asn Pro Ala Thr Gly Glu Tyr Thr Phe Thr Pro Asn
1               5                  10                  15

Ala Asp Ala Gln His Leu Gly Ala Gly Val Val Gln Ala Asp Ser Phe
            20                  25                  30

Gln Val Val Ala Ser Asp Gly Ser Leu Ser Ser Ala Pro Thr Thr Val
        35                  40                  45

Asn Val Ser Ile Thr Gly Asn Asn Asp Ala Ala Thr Ile Thr Gly Ser
    50                  55                  60

Ala Ala Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr Gly His
65                  70                  75                  80

Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His Val Thr Ala Gln
                85                  90                  95

Thr Val Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn
            100                 105                 110

Trp Ser Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly
        115                 120                 125

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

Thr Ala Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser
145                 150                 155                 160

Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser Val Gly Glu Asp Gly Asn
                165                 170                 175

His Ser Ala Thr Gly His Leu Ser Val Ala Asp Val Asp Ser Gly Gln
            180                 185                 190

Ala His Val Thr Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe Ser
        195                 200                 205

Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala
    210                 215                 220

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

Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr Ile
                245                 250                 255

Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser
            260                 265                 270
```

```
Val Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser Val Ala
        275                 280                 285

Asp Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val Glu Thr
    290                 295                 300

Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala
305                 310                 315                 320

Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Glu Ser
                325                 330                 335

Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
            340                 345                 350

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr
        355                 360                 365

Gly Ser Ala Ala Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr
    370                 375                 380

Gly His Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His Val Thr
385                 390                 395                 400

Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp
                405                 410                 415

Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala
            420                 425                 430

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
        435                 440                 445

Asp Gly Thr Ala Thr Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn
    450                 455                 460

Asp Gly Pro Thr Val Ser Gly Ala Val Ala Leu Gly His Thr Ala Glu
465                 470                 475                 480

Asp Asn Ser Val Thr Phe Thr Thr Ala Gln Leu Leu Ala Asn Ala His
                485                 490                 495

Asp Val Asp Thr His Asp Thr Leu Ser Val Ser Asn Leu Thr Ser Thr
            500                 505                 510

His Gly Ser Ile Val Asp Asn Gly Asn Gly Thr Tyr Thr Phe Thr Pro
        515                 520                 525

Thr Glu Asn Tyr Ser Gly His Val Asp Val Ser Tyr Thr Val Ser Asp
    530                 535                 540
```

```
Gly His Gly Gly Thr Ala Ala Gly Ser Ala Ala Leu Asp Val Asp Ala
545                 550                 555                 560

Val Ala Asp Arg Ala Ser Val Ser Val Ser Ile Gly Ala Ala Val Glu
                565                 570                 575

Thr Pro Asn Gly Ser Phe Thr Val Thr Asn Leu Asp Ser Thr Ala Ser
            580                 585                 590

Ala Gly Tyr His Asn Thr Tyr Gly Tyr Tyr Val Met Asp Asp Asn Gly
        595                 600                 605

Asn Pro Thr Ser Gly Gly Val Ile Trp Ser Asp Val His Ala Ser Pro
    610                 615                 620

Asn Ala Ser Val Thr Val Asn Gly Val Asp Pro Asp Arg Val Gly Phe
625                 630                 635                 640

Phe Ile Ile Pro Asp Gly Gly Ser Gln Asn Ser Gly Leu Ala Asn Gly
                645                 650                 655

Ala Ala Leu Thr Phe Ser Lys Asp Ser Ala Gly Asn Trp Gln Ala Ser
            660                 665                 670

Asp Ser Ala Gly His Val Leu Ser Gly Ala Asp Ser Lys Val Leu Phe
        675                 680                 685

Asp Asn Lys Ala Leu Asn Ser Asp His Leu Val His Ala Glu Asp Ser
    690                 695                 700

Ser Ala Val Ser Gly Asn Gln Asn Trp Glu Asp Leu Thr Gly Gly Gly
705                 710                 715                 720

Asp Arg Asp Tyr Asn Asp Val Asn Met Ser Val Ser Trp Gly Asn Ala
                725                 730                 735

Ala Pro Thr Ala Ser His Ala Leu Ser Val Ser Ala Ser Phe Pro Asp
            740                 745                 750

Met Asp Gly Ser Glu Ser His Thr Val Ser Ile Ser Gly Leu Pro Ala
        755                 760                 765

Gly Ala Thr Leu Tyr Gln Asn Gly Val Ala Leu Val Ala Gly Ala Asp
    770                 775                 780

Gly Ser Tyr Ser Leu Asn Pro Ala Gln Leu Gly Gly Leu Ser Val Lys
785                 790                 795                 800

Thr Pro Ala Gly Phe Thr Gly Asp Leu Asn Val Asn Val Thr Ala Val
                805                 810                 815
```

```
Ala Thr Asp Gly Thr Ser Val Ala Ser Ser Ser Ala Ser Ala Ser Val
            820                 825                 830

His Asp Asp Leu Ala Asn His Gly Pro Asp Ala Gly Asp Pro Thr Ser
        835                 840                 845

Val His Gly Ala Ala Gly Ala Thr Ile Thr Ser Ala Val Gly Val Thr
    850                 855                 860

Asp Val Asp Gly Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn Asn
865                 870                 875                 880

Gly Pro Gln His Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe Ser
                885                 890                 895

Tyr Thr Pro Thr Gly Asn Tyr Ser Gly Thr Asp Thr Phe Lys Val Thr
            900                 905                 910

Val Ser Asp Gly His Gly Gly Thr Thr Thr Glu Thr Val Asn Val Thr
        915                 920                 925

Val Glu Asn Gly Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr Ala
    930                 935                 940

Asn Asp His Ser Ala Val Thr Gly His Val Thr Gly Thr Asp Ser Pro
945                 950                 955                 960

Gly Asp Thr Leu Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val
                965                 970                 975

Ser Ser Leu Val Thr Asp His Gly Thr Val Ser Ile Asn Ser Ala Thr
            980                 985                 990

Gly Asp Tyr Thr Phe Thr Pro Lys  Ala Gly Asp Ala Ser  Leu Gly Val
        995                 1000                1005

Gly Ala  Ser Ala Thr Asp Ser  Phe Lys Val Val Ala  Thr Asp Ser
    1010                1015                1020

His Gly  Ala Asp Ser Asn Val  Gly Thr Val Asn Val  Thr Val Thr
    1025                1030                1035

Gly Ser  Asn Asp Gly Pro Thr  Val Ser Ala Ser Asn  Val Thr Thr
    1040                1045                1050

Ala Asn  Asp His Thr Ala Ile  Thr Gly His Ala Ser  Gly Ala Asp
    1055                1060                1065

Val Asp  Thr Gly Asp Thr Val  Ala Tyr His Leu Val  Asp Gly Ser
    1070                1075                1080
```

Gly Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly Thr Val Thr
1085 1090 1095

Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe Thr Pro Thr Gly Asp
1100 1105 1110

Ala Ser Val Gly Val Gly Gln Thr Leu Gly Asp Ser Phe Lys Val
1115 1120 1125

Val Val Val Asp Asn His Gly Ala Ala Ser Ala Pro Ser Thr Val
1130 1135 1140

Ala Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Val
1145 1150 1155

Ala Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile Thr Gly His
1160 1165 1170

Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Arg Tyr His
1175 1180 1185

Leu Met Asp Ala Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala
1190 1195 1200

His Gly Thr Val Thr Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe
1205 1210 1215

Thr Pro Thr Gly Asp Ala Ser Val Gly Val Gly Gln Thr Leu Gly
1220 1225 1230

Asp Ser Phe Lys Val Val Ala Val Asp Asn His Gly Ala Ala Ser
1235 1240 1245

Ala Pro Ser Thr Val Ala Val Thr Ile Thr Gly Ser Asn Asp Gly
1250 1255 1260

Pro Thr Val Ser Val
1265

<210> 26
<211> 437
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 26

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

Thr Val Asn Val Ser Ile Thr Gly Asn Asn Asp Ala Ala Thr Ile Thr
20 25 30

```
Gly Ser Ala Ala Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr
        35                  40                  45

Gly His Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His Val Thr
    50                  55                  60

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

Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala
                85                  90                  95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Thr Val Ala Ser Ala
            100                 105                 110

Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ala Asn
        115                 120                 125

Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser Val Gly Glu Asp
    130                 135                 140

Gly Asn His Ser Ala Thr Gly His Leu Ser Val Ala Asp Val Asp Ser
145                 150                 155                 160

Gly Gln Ala His Val Thr Ala Gln Thr Val Glu Thr Asp Gln Gly Thr
                165                 170                 175

Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala Val Asn Ser Ala
            180                 185                 190

Asn Ala Asp Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala
225                 230                 235                 240

Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser
                245                 250                 255

Val Ala Asp Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val
            260                 265                 270

Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser
        275                 280                 285

Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly
    290                 295                 300
```

```
Glu Ser Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr
                325                 330                 335

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

Ala Thr Gly His Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His
        355                 360                 365

Val Thr Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly
    370                 375                 380

Thr Asp Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala Asp Val
385                 390                 395                 400

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

Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Ser Val Thr Ile Thr Gly
            420                 425                 430

Ser Asn Asp Gly Pro
        435
```

<210> 27
<211> 334
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 27

```
Ala His Val Thr Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe Ser
1               5                   10                  15

Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala
            20                  25                  30

Asp Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr
        35                  40                  45

Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr Ile
    50                  55                  60

Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser
65                  70                  75                  80

Val Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser Val Ala
                85                  90                  95
```

```
Asp Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val Glu Thr
            100                 105                 110

Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala
        115                 120                 125

Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Glu Ser
    130                 135                 140

Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
145                 150                 155                 160

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr
                165                 170                 175

Gly Ser Ala Ala Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr
            180                 185                 190

Gly His Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His Val Thr
        195                 200                 205

Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp
    210                 215                 220

Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala
225                 230                 235                 240

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
                245                 250                 255

Asp Gly Thr Ala Thr Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn
            260                 265                 270

Asp Gly Pro Thr Val Ser Gly Ala Val Ala Leu Gly His Thr Ala Glu
        275                 280                 285

Asp Asn Ser Val Thr Phe Thr Thr Ala Gln Leu Leu Ala Asn Ala His
    290                 295                 300

Asp Val Asp Thr His Asp Thr Leu Ser Val Ser Asn Leu Thr Ser Thr
305                 310                 315                 320

His Gly Ser Ile Val Asp Asn Gly Asn Gly Thr Tyr Thr Phe
                325                 330
```

<210> 28
<211> 697
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 28

```
Lys Val Ser Ser Leu Thr Thr Glu His Gly Thr Val Thr Ile Asp Ala
```

```
1               5                  10                  15

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

Gly Val Ser Gln Ser Ala His Asp Ser Phe Ser Val Met Val Asp Asp
        35                  40                  45

Gly His Gly Gly Thr Ser Thr Ala Asn Ile Gly Val Thr Ile Thr Gly
    50                  55                  60

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

Asp Glu Asp Thr Ser Ile Thr Ile His Ala Ser Asp Leu Leu Lys Asn
                85                  90                  95

Ala His Asp Val Asp Val Gly Asp Thr Leu Ser Val Thr Asn Leu Ser
            100                 105                 110

Ala Thr Asn Gly Thr Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe
        115                 120                 125

Thr Pro Asn His Asp Phe Asn Gly Gln Val Asp Leu Ser Tyr Thr Val
    130                 135                 140

Ser Asp Gly His Gly Gly Asp Thr Pro Ala Lys Ala Ser Phe Asp Val
145                 150                 155                 160

Ala Ala Val Asn Asp Lys Ala Thr Leu Ala Pro Asp Asp Leu Val Thr
                165                 170                 175

Val Asp Asp Asp Thr Lys Ser Glu Gly Phe Ala His Gly Ser Asp Val
            180                 185                 190

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

Val Thr Ser Leu Thr Thr Asp His Gly Thr Val Thr Ile Asp Pro Asp
    210                 215                 220

Thr Gly Lys Tyr Ser Phe Thr Pro Asn Asp Glu Ala Asp Lys Ile Gly
225                 230                 235                 240

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

Gln Val Asp Ser Asp Val Ser Thr Val Asn Val Thr Ile Thr Gly Ser
            260                 265                 270

Asn Asp Gly Pro Thr Val Thr His Ile Asp Ala Val Ala Thr Asp Glu
```

```
        275                 280                 285

Asp His Ala Gly Thr Gly His Val Ala Gly Ala Asp Val Asp Val Gly
    290                 295                 300

Asp Thr Val Arg Tyr His Leu Val Asp Ala Asn Gly Asn Gln Thr Asp
305                 310                 315                 320

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

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

Val Val Gln Ala Asp Ser Phe Gln Val Val Ala Ser Asp Gly Ser Leu
        355                 360                 365

Ser Ser Ala Pro Thr Thr Val Asn Val Ser Ile Thr Gly Asn Asn Asp
    370                 375                 380

Ala Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser Val Gly Glu Asp Gly
385                 390                 395                 400

Asn His Ser Ala Thr Gly His Leu Ser Val Ala Asp Val Asp Ser Gly
                405                 410                 415

Gln Ala His Val Thr Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe
            420                 425                 430

Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn
        435                 440                 445

Ala Asp Val Gln Ala Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe
    450                 455                 460

Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr
465                 470                 475                 480

Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala Gly
                485                 490                 495

Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser Val
            500                 505                 510

Ala Asp Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val Glu
        515                 520                 525

Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe
    530                 535                 540

Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Asn Glu
```

545 550 555 560

Ser Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr
565 570 575

Gln Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile
580 585 590

Thr Gly Ser Ala Ala Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala
595 600 605

Thr Gly His Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His Val
610 615 620

Thr Ala Gln Thr Val Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr
625 630 635 640

Asp Gly Asn Trp Ser Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln
645 650 655

Ala Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Thr Val Ala Ser
660 665 670

Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ala
675 680 685

Asn Asp Ser Ala Thr Ile Thr Gly Ser
690 695

<210> 29
<211> 326
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 29

Val Ala Ala Val Asn His Ala Pro Thr Thr Gln Asp Gly Glu Val Thr
1 5 10 15

Thr Val Asp Asp Asp Thr Ala Val Lys Gly Lys Val Ser Val Asn Asp
20 25 30

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

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

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

Gly Val Ser Gln Ser Ala His Asp Ser Phe Ser Val Met Val Asp Asp
85 90 95

```
Gly His Gly Gly Thr Ser Thr Ala Asn Ile Gly Val Thr Ile Thr Gly
            100                 105                 110

Ser Asn Asp Gly Pro Thr Val Ser Ala Asp Ala Val Leu Thr Gly Gly
        115                 120                 125

Asp Glu Asp Thr Ser Ile Thr Ile His Ala Ser Asp Leu Leu Lys Asn
    130                 135                 140

Ala His Asp Val Asp Val Gly Asp Thr Leu Ser Val Thr Asn Leu Ser
145                 150                 155                 160

Ala Thr Asn Gly Thr Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe
                165                 170                 175

Thr Pro Asn His Asp Phe Asn Gly Gln Val Asp Leu Ser Tyr Thr Val
            180                 185                 190

Ser Asp Gly His Gly Gly Asp Thr Pro Ala Lys Ala Ser Phe Asp Val
        195                 200                 205

Ala Ala Val Asn Asp Lys Ala Thr Leu Ala Pro Asp Asp Leu Val Thr
    210                 215                 220

Val Asp Asp Asp Thr Lys Ser Glu Gly Phe Ala His Gly Ser Asp Val
225                 230                 235                 240

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

Val Thr Ser Leu Thr Thr Asp His Gly Thr Val Thr Ile Asp Pro Asp
            260                 265                 270

Thr Gly Lys Tyr Ser Phe Thr Pro Asn Asp Glu Ala Asp Lys Ile Gly
        275                 280                 285

Leu Gly Gln Ser Ala His Asp Ser Phe Lys Val Val Ala Asn Asp Gly
    290                 295                 300

Gln Val Asp Ser Asp Val Ser Thr Val Asn Val Thr Ile Thr Gly Ser
305                 310                 315                 320

Asn Asp Gly Pro Thr Val
                325
```

<210> 30
<211> 437
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 30

```
Ala Val Asn His Ala Pro Thr Thr Gln Asp Gly Glu Val Thr Thr Val
1               5                  10                  15

Asp Asp Asp Thr Ala Val Lys Gly Lys Val Ser Val Asn Asp Gln Asp
            20                  25                  30

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

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

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

Ser Gln Ser Ala His Asp Ser Phe Ser Val Met Val Asp Asp Gly His
                85                  90                  95

Gly Gly Thr Ser Thr Ala Asn Ile Gly Val Thr Ile Thr Gly Ser Asn
            100                 105                 110

Asp Gly Pro Thr Val Ser Ala Asp Ala Val Leu Thr Gly Gly Asp Glu
        115                 120                 125

Asp Thr Ser Ile Thr Ile His Ala Ser Asp Leu Leu Lys Asn Ala His
    130                 135                 140

Asp Val Asp Val Gly Asp Thr Leu Ser Val Thr Asn Leu Ser Ala Thr
145                 150                 155                 160

Asn Gly Thr Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr Pro
                165                 170                 175

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

Gly His Gly Gly Asp Thr Pro Ala Lys Ala Ser Phe Asp Val Ala Ala
        195                 200                 205

Val Asn Asp Lys Ala Thr Leu Ala Pro Asp Asp Leu Val Thr Val Asp
    210                 215                 220

Asp Asp Thr Lys Ser Glu Gly Phe Ala His Gly Ser Asp Val Asp Gly
225                 230                 235                 240

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

Ser Leu Thr Thr Asp His Gly Thr Val Thr Ile Asp Pro Asp Thr Gly
            260                 265                 270
```

Lys Tyr Ser Phe Thr Pro Asn Asp Glu Ala Asp Lys Ile Gly Leu Gly
275 280 285

Gln Ser Ala His Asp Ser Phe Lys Val Val Ala Asn Asp Gly Gln Val
290 295 300

Asp Ser Asp Val Ser Thr Val Asn Val Thr Ile Thr Gly Ser Asn Asp
305 310 315 320

Gly Pro Thr Val Thr His Ile Asp Ala Val Ala Thr Asp Glu Asp His
325 330 335

Ala Gly Thr Gly His Val Ala Gly Ala Asp Val Asp Val Gly Asp Thr
340 345 350

Val Arg Tyr His Leu Val Asp Ala Asn Gly Asn Gln Thr Asp Thr Leu
355 360 365

Val Thr Glu His Gly Ser Val Ser Ile Asn Pro Ala Thr Gly Glu Tyr
370 375 380

Thr Phe Thr Pro Asn Ala Asp Ala Gln His Leu Gly Ala Gly Val Val
385 390 395 400

Gln Ala Asp Ser Phe Gln Val Val Ala Ser Asp Gly Ser Leu Ser Ser
405 410 415

Ala Pro Thr Thr Val Asn Val Ser Ile Thr Gly Asn Asn Asp Ala Ala
420 425 430

Thr Ile Thr Gly Ser
435

<210> 31
<211> 206
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 31

Ser Gly Asn Asp Asp Leu Phe Gly Thr Asp Gly Asn Asp Leu Leu Leu
1 5 10 15

Gly Gly Lys Gly Gly Tyr Thr Tyr Arg Tyr Ser Gly Gly Ser His Gly
20 25 30

Gly Asn Val Gly Gly Cys Gly Tyr Ser Leu Val Asp Asn Gly Thr Asn
35 40 45

Asp Val Ile Ser Ala Gly Ala Gly Asp Asp Ile Ile Tyr Gly Asp Ala
50 55 60

Lys Met Val Asn Gly Ser Ile Gln Val Thr Gly Ala Gly Asn Asp Ile
65 70 75 80

Leu Asp Gly Gly Ala Gly Asn Asp Gln Ile His Gly Gly Gly Gly Asn
85 90 95

Asp Thr Ile Thr Gly Gly Thr Gly Asp Asp Val Met Phe Gly Asp Gln
100 105 110

Gly Ser Asp Thr Phe Leu Phe Asp Phe Gly Phe Gly His Asp Val Val
115 120 125

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

Asp Asn Gln Ile Ser Ala Val Asn Ile Glu Gly Val Ser Gly Trp Ala
145 150 155 160

Val Ser Val Asp Ala Gln Gly His His Val Ala Gln Ala Thr Asn Gly
165 170 175

Ala His Asp Ala Ser Gly Thr Val Ile Val Thr Asn His Asp Gly Ser
180 185 190

Gln Asp Thr Ile Glu Phe His Asn Val Glu Lys Val Val Trp
195 200 205

<210> 32
<211> 112
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 32

Asn His Ala Pro Thr Thr Gln Asp Gly Glu Val Thr Thr Val Asp Asp
1 5 10 15

Asp Thr Ala Val Lys Gly Lys Val Ser Val Asn Asp Gln Asp Gly Asp
20 25 30

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

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

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

Ser Ala His Asp Ser Phe Ser Val Met Val Asp Asp Gly His Gly Gly
85 90 95

Thr Ser Thr Ala Asn Ile Gly Val Thr Ile Thr Gly Ser Asn Asp Gly

100 105 110

<210> 33
<211> 822
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 33

Cys Arg Pro Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val
1 5 10 15

Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn
20 25 30

Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val
35 40 45

Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val Ala Asp
50 55 60

Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp
65 70 75 80

Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val
85 90 95

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

Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn
115 120 125

Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Gly
130 135 140

Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr Phe Thr
145 150 155 160

Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala His Asp Thr
165 170 175

Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile Val Asp Asn
180 185 190

Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Thr Phe Ser Gly His
195 200 205

Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly Thr Thr Thr
210 215 220

Gly Ser Ala Ala Leu Asp Val Asp Ala Val Ala Asp Arg Ala Thr Val
225 230 235 240

```
Ser Val Ala Ile Gly Ala Pro Val Glu Thr Pro Asn Gly Ser Phe Thr
                245                 250                 255

Val Thr Asn Leu Asp Ser Thr Ala Ser Ala Gly Tyr Asn Asn Thr Tyr
            260                 265                 270

Gly Tyr Tyr Val Met Asp Asp Ser Gly Asn Pro Thr Ser Gly Gly Val
        275                 280                 285

Ile Trp Ser Asn Val His Ala Ser Pro Gly Ala Ser Val Thr Ile Ser
    290                 295                 300

Gly Val Asp Pro Asp Arg Val Gly Phe Phe Leu Ile Pro Asp Gly Gly
305                 310                 315                 320

Ser Gln Asn Ser Gly Leu Ala Asn Gly Ala Ala Leu Thr Phe Ser Lys
                325                 330                 335

Asp Ala Ser Gly Asn Trp Gln Ala Ser Asp Ser Ala Gly His Val Leu
            340                 345                 350

Ser Gly Ala Gly Thr Lys Val Leu Phe Asp Lys Ser Ala Leu Asn Gly
        355                 360                 365

Asp His Met Val His Ser Glu Asp Thr Ser Ala Val Ser Gly Asn Gln
    370                 375                 380

Asn Trp Glu Asp Leu Thr Gly Gly Gly Asp Arg Asp Tyr Asn Asp Val
385                 390                 395                 400

Asn Met Ser Val Thr Trp Gly Asn Ala Ala Pro Thr Ala Thr His Pro
                405                 410                 415

Leu Thr Val Ser Ala Ser Phe Pro Asp Met Asp Gly Ser Glu Gly His
            420                 425                 430

Ala Val Lys Ile Ser Gly Leu Pro Ser Gly Ser Thr Leu Tyr Gln Asn
        435                 440                 445

Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser Leu Asn Pro
    450                 455                 460

Ala Gln Leu Gly Gly Leu Ser Val Lys Thr Pro Ala Gly Phe Asn Gly
465                 470                 475                 480

Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly Thr Ser Val
                485                 490                 495

Ala Ser Ser Thr Ala Ser Ala Thr Val His Asp Asp Leu Ser Asn His
            500                 505                 510
```

```
Gly Pro Asp Ala Gly Asp Ala Thr Ser Val His Gly Ala Met Gly Ala
        515                 520                 525

Thr Ile Thr Gly Ala Ala Gly Val Thr Asp Ser Asp Gly Asp His Leu
    530                 535                 540

Ser Tyr Ala Val Gly Thr Gly Thr Ser Gly Pro Gln His Gly Thr Val
545                 550                 555                 560

Val Val Asn Thr Asp Gly Thr Phe Thr Tyr Thr Pro Ser Gly Asn Tyr
                565                 570                 575

Ser Gly Thr Asp Thr Phe Lys Ile Thr Val Ser Asp Gly His Gly Gly
            580                 585                 590

Thr Ala Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly Ala Pro Thr
        595                 600                 605

Leu Thr Thr Ala Asn Ala Ala Thr Ala Asn Asp His Ser Ala Val Thr
    610                 615                 620

Gly His Val Thr Gly Ser Asp Thr Pro Gly Asp Thr Leu Ser Tyr Ser
625                 630                 635                 640

Leu Val Asp Ala Asn Gly Asn His Val Gly Ser Leu Val Thr Asp His
                645                 650                 655

Gly Thr Val Ser Ile Asn Ala Ala Thr Gly Asp Tyr Thr Phe Thr Pro
            660                 665                 670

Asn Ala Ala Asn Ala Ser Leu Gly Val Gly Ala Ser Val Thr Asp Ser
        675                 680                 685

Phe Lys Val Val Ala Thr Asp Asn His Gly Ala Asp Ser Asn Leu Gly
    690                 695                 700

Thr Val Ala Val Thr Val Thr Gly Ser Asn Asp Gly Pro Val Val Thr
705                 710                 715                 720

Gly Val Thr Gly Gly Thr Gly Asn Glu Ser Ile Thr Ser Ala Arg Ser
                725                 730                 735

Val Val Thr Gly His Ile Ser Ala Gly Asp Val Asp Ala Gly Asp Thr
            740                 745                 750

Leu Ser Tyr Ser Val Thr Asp Asn Ala Ala Ala Gly His His Gly Thr
        755                 760                 765

Leu Ala Val Asn Ala Ser Gly Asp Tyr Thr Phe Thr Ala Ser Asp Ser
    770                 775                 780
```

```
Asn Trp His Gly Thr Asp Ser Phe Thr Val Gln Val Ser Asp Gly His
785                 790                 795                 800


Gly Gly Thr Val Asn Gln Thr Val Ala Ile Thr Val Asn Ala Gln Ala
                805                 810                 815


Asp Ala Ala Thr Ile Asn
            820


<210>  34
<211>  243
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1

<400>  34

Pro Thr Cys Arg Pro Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe
1               5                   10                  15


Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr
            20                  25                  30


Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly
        35                  40                  45


Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val
    50                  55                  60


Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln
65                  70                  75                  80


Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe
                85                  90                  95


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


Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr
        115                 120                 125


Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val
    130                 135                 140


Ser Gly Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr
145                 150                 155                 160


Phe Thr Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala His
                165                 170                 175


Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile Val
            180                 185                 190
```

```
Asp Asn Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Thr Phe Ser
        195                 200                 205

Gly His Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly Thr
    210                 215                 220

Thr Thr Gly Ser Ala Ala Leu Asp Val Asp Ala Val Ala Asp Arg Ala
225                 230                 235                 240

Thr Val Ser
```

<210> 35
<211> 197
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 35

```
Cys Arg Pro Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val
1               5                   10                  15

Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn
            20                  25                  30

Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val
        35                  40                  45

Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val Ala Asp
    50                  55                  60

Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp
65                  70                  75                  80

Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val
                85                  90                  95

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

Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn
        115                 120                 125

Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Gly
    130                 135                 140

Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr Phe Thr
145                 150                 155                 160

Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala His Asp Thr
                165                 170                 175
```

Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile Val Asp Asn
180 185 190

Gly Asn Gly Thr Tyr
195

<210> 36
<211> 201
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 36

Pro Thr Cys Arg Pro Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe
1 5 10 15

Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr
20 25 30

Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly
35 40 45

Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val
50 55 60

Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln
65 70 75 80

Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe
85 90 95

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

Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr
115 120 125

Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val
130 135 140

Ser Gly Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr
145 150 155 160

Phe Thr Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala His
165 170 175

Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile Val
180 185 190

Asp Asn Gly Asn Gly Thr Tyr Thr Phe
195 200

<210> 37

<211> 201
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 37

Pro Thr Cys Arg Pro Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe
1 5 10 15

Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr
20 25 30

Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly
35 40 45

Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val
50 55 60

Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln
65 70 75 80

Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe
85 90 95

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

Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr
115 120 125

Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val
130 135 140

Ser Gly Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr
145 150 155 160

Phe Thr Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala His
165 170 175

Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile Val
180 185 190

Asp Asn Gly Asn Gly Thr Tyr Thr Phe
195 200

<210> 38
<211> 190
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 38

Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
1 5 10 15

```
Asn Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr
        35                  40                  45

Gly Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr
    50                  55                  60

Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn
65                  70                  75                  80

Gly Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala
                85                  90                  95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
            100                 105                 110

Asp Gly Thr Ala Thr Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn
        115                 120                 125

Asp Gly Pro Thr Val Ser Gly Ala Val Gly Leu Gly His Thr Ala Glu
    130                 135                 140

Asp Asn Ser Val Thr Phe Thr Lys Ala Gln Leu Leu Ala Asn Ala His
145                 150                 155                 160

Asp Thr Asp Ala His Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ala
                165                 170                 175

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


<210>  39
<211>  158
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1

<400>  39

Asp Val Ile Ser Ala Gly Ala Gly Asp Asp Val Ile Tyr Gly Asp Ala
1               5                   10                  15

Arg Leu Val Asn Gly Asn Ile Gln Ile Thr Gly Ser Gly Asn Asp Val
            20                  25                  30

Leu Asp Gly Gly Ser Gly Asn Asp Gln Ile His Gly Gly Ala Gly Asn
        35                  40                  45

Asp Thr Ile Ile Gly Gly Thr Gly Asp Asp Val Met Phe Gly Asp Gln
    50                  55                  60
```

Gly Asn Asp Thr Phe Leu Phe Asp Phe Gly Phe Gly His Asp Val Val
65 70 75 80

Asp Gly Gly Arg Gly Ser Asn Trp Thr Asp Thr Leu Asp Leu Thr His
85 90 95

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

Val Ser Val Asp Ala Gln Gly His His Val Ala Gln Ala Thr Asn Gly
115 120 125

Ala His Asp Ala Asn Gly Thr Ile Val Val Thr Asn His Asp Gly Ser
130 135 140

Gln Asp Thr Ile Glu Phe His Asn Val Glu Lys Val Val Trp
145 150 155

<210> 40
<211> 666
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 40

His Arg Pro Val Ala Gly Asp Asp Ser Arg Ile Asp Asp Asp Ala Gln
1 5 10 15

Gly Pro Ala Leu Ser Val Ser Met Gly Thr Thr Thr Val Glu Thr Thr
20 25 30

Thr Thr Gly Thr Ser Ala Asp Val Asp Trp Asn Gly Leu Asp Thr Met
35 40 45

Ser Asp Pro Thr Thr Ala Thr Pro Thr Thr Asn Val Ala Gly Asp Leu
50 55 60

Asn Thr Ala Asn Asn Gly Ser Asn Asn Ala Asp Val Ile Ser Ile Gly
65 70 75 80

Gly Asp Asn Asn Ala Ser Ile Ser Thr Gly Asn Gly Asp Asp Gln Val
85 90 95

Thr Ile Gly Asp Asp Val Asn Ala Lys Ile Asp Leu Gly Asn Gly Thr
100 105 110

Asn Ala Leu Asp Met Ala Asp Asp Val Asn Ala Ser Val Ser Gly Gly
115 120 125

Ser Gly Asn Asp Thr Val Arg Val Gly Asp Asp Leu Asn Gly Asn Ile
130 135 140

Asp Leu Gly Asn Gly Asp Asn Arg Leu Gln Val Gly Gly Asp Ala Asn

145 150 155 160

Ala Ser Ile Ser Thr Gly Ser Gly Ser Asp Asp Val Lys Ile Val Gly
165 170 175

Asp Leu Asn Ser Asn Ile Ser Leu Gly Ser Gly Ala Asp Asp Leu Gln
180 185 190

Thr Gly Gly Asp Ala Asn Ala Ser Ile Asp Val Gly Glu Gly Asn Asp
195 200 205

Arg Val Leu Val Gly Asp Asp Leu Ser Ser Lys Ala Ser Leu Gly Ser
210 215 220

Gly Asp Asp Tyr Leu Glu Val Ala Asp Asp Ser Trp Ala Ser Ile Asp
225 230 235 240

Ala Gly Ser Gly Asn Asp Thr Val Lys Ile Gly Gly Asp Ile Ser Ser
245 250 255

Lys Val Asp Met Gly Ser Gly Asn Asp Arg Val Thr Ile Thr Gly Asp
260 265 270

Asn Leu Trp Ala Thr Val Thr Gly Gly Ser Gly Thr Asp Ser Ile Glu
275 280 285

Leu Thr Gly Val Thr Lys Ala Glu Trp Asp Ala Asn Ala Asn Gly Val
290 295 300

Lys Asn Tyr Val Lys Asp Phe Glu Asn Ile Lys Phe Ala Asp Gly Gln
305 310 315 320

Val Ile Gly Asp Ala Ser Ala Phe Asp Thr Thr Thr Thr Thr Ser Thr
325 330 335

Tyr Lys Thr Pro Leu Thr Ile Glu Ala Thr Leu Asn Asp Thr Asp Gly
340 345 350

Ser Glu Thr Leu Ser Pro Val Thr Ile Gly Asn Ile Pro Ala Gly Ala
355 360 365

Thr Leu Glu Leu Asp Gly Glu Val Leu Thr Pro Asn Ala Asp Gly Thr
370 375 380

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

Thr Asp Thr Pro Val Thr Ala Asn Ser Leu Asn Leu Thr Thr Thr Val
405 410 415

Ser Ser Thr Glu Ala His Gly Gly Asp Val Ser Val Thr Thr Gln Val

420 425 430

Gly Val Gly Ser Asn Ala Gly Glu Thr Val Ala Asp Asp Arg Ile Ala
435 440 445

Thr Asp Thr Asn Arg Thr Val Ser Ile Asp Ser Ala Asp Leu Leu Ala
450 455 460

Asn Asp Thr Asp Ala Asp Gly Asp Ala Leu Ser Ile Ile Ser Val Gly
465 470 475 480

Asn Ala Gln His Gly Thr Val Ser Leu Gly Ala Asp Gly Gln Val Val
485 490 495

Phe Thr Ala Asp Arg Gly Phe Glu Gly Thr Thr Thr Phe Glu Tyr Thr
500 505 510

Val Ser Asp Gly His Gly Gly Thr Asp Val Ala Thr Val Ser Val Tyr
515 520 525

Val Asp Asp Pro Asn Asp Ala Pro Val Ile Asn Ala Ala Gln Thr Thr
530 535 540

Glu Thr Leu Ser Val Asp Tyr Ser Glu Pro Asn Ser Ser Asn Ile Gly
545 550 555 560

Arg Val Ser Ala Thr Asp Val Asn Gly Asp Thr Leu Thr Tyr Ser Val
565 570 575

Leu Asp Ser Gly Asn Gln His Gly Asn Leu Val Ile Asp Ser Asp Ser
580 585 590

Gly Ser Phe Phe Tyr Asn Ala Asp Asp Thr Ser Trp Ser Gly Thr Asp
595 600 605

Thr Phe Thr Val Gln Val Asp Asp Gly Asn Gly Gly Leu Ala Thr Gln
610 615 620

Thr Ile Ser Val Gln Val Thr Gly Gly Ser Gly Gly Gly Asn Gly Ser
625 630 635 640

Gly Gly Gly His Ala Ile Gly Trp Gly Asn Gly Gly Gly Arg Asp Glu
645 650 655

Ser Trp Gly Ala Asn Gly Ser Trp Ser Val
660 665

<210> 41
<211> 547
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 41

```
Ser Glu Asp Gly Ser Gly Ser Gly Ser Ala Val Ala Ser Asp Val Asp
1               5                   10                  15

Gly Asp Thr Leu Arg Tyr His Leu Val Asp Thr Asp Gly Asn Gln Val
            20                  25                  30

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

Gly Glu Tyr Thr Phe Thr Pro Asn Ala Glu Ala Gln Ala Leu Gly Val
    50                  55                  60

Gly Ala Val Gln Ser Asp Thr Phe Lys Val Val Ala Thr Asp Gly Thr
65                  70                  75                  80

Thr Thr Ser Glu Pro Thr Thr Val Gly Val Thr Ile Thr Gly Ser Asn
                85                  90                  95

Asp Gly Pro Ile Val Ser Gly Ala Val Asp Leu Gly Asp Thr Ala Glu
            100                 105                 110

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

Asp Val Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Thr Ser Ala Asn
    130                 135                 140

Gly Thr Ile Thr Glu Asn Ser Asp Gly Thr Tyr Thr Phe Thr Pro Ala
145                 150                 155                 160

Glu Asn Phe Ser Gly Ser Val Asp Val Ser Tyr Thr Val Ser Asp Gly
                165                 170                 175

Gln Gly Gly Thr Thr Ala Gly Ser Ala Ser Leu Asp Val Ser Ala Val
            180                 185                 190

Ala Asp Gln Ala Ser Val Ser Leu Ser Ile Gly Glu Gly Ala Val Asp
        195                 200                 205

Thr Asn Gly Ser Phe Thr Val Thr Asn His Asp Gly Ser Ala Gly Tyr
    210                 215                 220

His Asn Thr Tyr Gly Tyr Tyr Val Met Asp Glu Asn Gly Asn Pro Thr
225                 230                 235                 240

Ser Gly Glu Ile Ile Trp Lys Asp Val His Asp Thr Asn Gly Gln Ser
                245                 250                 255

Val Thr Ile Glu Gly Val Asp Pro Asp Gln Val Gly Phe Phe Ile Ile
            260                 265                 270
```

```
Pro Asn Gly Asp Gln Asn Ser Ser Ile Arg Asp Gly Ser Asp Val Thr
        275                 280                 285

Phe Thr Lys Asp Ser Ala Gly Asn Trp Gln Val Val Asp Ser Asn Gly
    290                 295                 300

Ala Val Leu Ser Gly Thr Gly Thr Lys Val Leu Phe Asp Asn Lys Asp
305                 310                 315                 320

Leu Asn Ser Asp Asp Leu Val His Met Gln Asp Thr Ser Arg Asp Gly
                325                 330                 335

Gly Asn Gln Asn Trp Glu Asp Leu Asn Gly Gly Gly Asp Arg Asp Tyr
            340                 345                 350

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

Thr His Glu Val Asn Ile Ala Ala Ser Phe Pro Asp Met Asp Gly Ser
    370                 375                 380

Glu Gly His Thr Val Val Leu Asn Gly Leu Pro Glu Gly Ala Thr Leu
385                 390                 395                 400

Tyr Gln Asp Gly Val Ala Leu Val Pro Gly Ala Asp Gly Ser Tyr Thr
                405                 410                 415

Leu Asp Ala Ser Asp Leu Asp Gly Leu Thr Leu Thr Thr Ala Pro Gly
            420                 425                 430

Phe Ser Gly Glu Ile Glu Leu Ser Val Thr Ala Thr Ser Ala Asp Gly
        435                 440                 445

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

Gly Asn Thr Gly Pro Asp Ala Gly Glu Ala Glu Ser Val Ser Thr Ala
465                 470                 475                 480

Val Asn Asn Ala Val Thr Gly Gln Val Glu Ala Thr Asp Ala Asp Gly
                485                 490                 495

Asn Asp Leu Asn Phe Ser Leu Ala Thr Gly Asn Asp Gly Pro Gln His
            500                 505                 510

Gly Ser Val Ala Leu Asn Pro Asp Gly Thr Phe Thr Tyr Thr Pro Thr
        515                 520                 525

Gly Asn Phe Ser Gly Thr Asp Thr Phe Lys Val Val Ile Asp Asp Gly
    530                 535                 540
```

His Gly Gly
545

<210> 42
<211> 443
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 42

Glu Asp Gly Ser Gly Ser Gly Ser Ala Val Ala Ser Asp Val Asp Gly
1 5 10 15

Asp Thr Leu Arg Tyr His Leu Val Asp Thr Asp Gly Asn Gln Val Ser
20 25 30

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

Glu Tyr Thr Phe Thr Pro Asn Ala Glu Ala Gln Ala Leu Gly Val Gly
50 55 60

Ala Val Gln Ser Asp Thr Phe Lys Val Val Ala Thr Asp Gly Thr Thr
65 70 75 80

Thr Ser Glu Pro Thr Thr Val Gly Val Thr Ile Thr Gly Ser Asn Asp
85 90 95

Gly Pro Ile Val Ser Gly Ala Val Asp Leu Gly Asp Thr Ala Glu Asp
100 105 110

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

Val Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Thr Ser Ala Asn Gly
130 135 140

Thr Ile Thr Glu Asn Ser Asp Gly Thr Tyr Thr Phe Thr Pro Ala Glu
145 150 155 160

Asn Phe Ser Gly Ser Val Asp Val Ser Tyr Thr Val Ser Asp Gly Gln
165 170 175

Gly Gly Thr Thr Ala Gly Ser Ala Ser Leu Asp Val Ser Ala Val Ala
180 185 190

Asp Gln Ala Ser Val Ser Leu Ser Ile Gly Glu Gly Ala Val Asp Thr
195 200 205

Asn Gly Ser Phe Thr Val Thr Asn His Asp Gly Ser Ala Gly Tyr His
210 215 220

```
Asn Thr Tyr Gly Tyr Tyr Val Met Asp Glu Asn Gly Asn Pro Thr Ser
225                 230                 235                 240

Gly Glu Ile Ile Trp Lys Asp Val His Asp Thr Asn Gly Gln Ser Val
                245                 250                 255

Thr Ile Glu Gly Val Asp Pro Asp Gln Val Gly Phe Phe Ile Ile Pro
            260                 265                 270

Asn Gly Asp Gln Asn Ser Ser Ile Arg Asp Gly Ser Asp Val Thr Phe
        275                 280                 285

Thr Lys Asp Ser Ala Gly Asn Trp Gln Val Val Asp Ser Asn Gly Ala
    290                 295                 300

Val Leu Ser Gly Thr Gly Thr Lys Val Leu Phe Asp Asn Lys Asp Leu
305                 310                 315                 320

Asn Ser Asp Asp Leu Val His Met Gln Asp Thr Ser Arg Asp Gly Gly
                325                 330                 335

Asn Gln Asn Trp Glu Asp Leu Asn Gly Gly Gly Asp Arg Asp Tyr Asn
            340                 345                 350

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

His Glu Val Asn Ile Ala Ala Ser Phe Pro Asp Met Asp Gly Ser Glu
    370                 375                 380

Gly His Thr Val Val Leu Asn Gly Leu Pro Glu Gly Ala Thr Leu Tyr
385                 390                 395                 400

Gln Asp Gly Val Ala Leu Val Pro Gly Ala Asp Gly Ser Tyr Thr Leu
                405                 410                 415

Asp Ala Ser Asp Leu Asp Gly Leu Thr Leu Thr Thr Ala Pro Gly Phe
            420                 425                 430

Ser Gly Glu Ile Glu Leu Ser Val Thr Ala Thr
        435                 440


<210>  43
<211>  166
<212>  PRT
<213>  Magnetospirillum sp. SO-1

<400>  43

Val Val Ser Ala Ser Asp Val Leu Thr Ser Glu Asp Gly Ser Gly Ser
1               5                   10                  15
```

Gly Ser Ala Val Ala Ser Asp Val Asp Gly Asp Thr Leu Arg Tyr His
20 25 30

Leu Val Asp Thr Asp Gly Asn Gln Val Ser Ser Leu Ser Thr Asp His
35 40 45

Gly Thr Val Thr Ile Asp Ser Ala Thr Gly Glu Tyr Thr Phe Thr Pro
50 55 60

Asn Ala Glu Ala Gln Ala Leu Gly Val Gly Ala Val Gln Ser Asp Thr
65 70 75 80

Phe Lys Val Val Ala Thr Asp Gly Thr Thr Thr Ser Glu Pro Thr Thr
85 90 95

Val Gly Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Ile Val Ser Gly
100 105 110

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

Lys Ala Gln Leu Leu Ala Asn Ala Ser Asp Val Asp Gly Asp Ser Leu
130 135 140

Ser Val Ser Asn Leu Thr Ser Ala Asn Gly Thr Ile Thr Glu Asn Ser
145 150 155 160

Asp Gly Thr Tyr Thr Phe
165

<210> 44
<211> 153
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 44

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

His Leu Val Asp Thr Asp Gly Asn Gln Val Ser Ser Leu Ser Thr Asp
20 25 30

His Gly Thr Val Thr Ile Asp Ser Ala Thr Gly Glu Tyr Thr Phe Thr
35 40 45

Pro Asn Ala Glu Ala Gln Ala Leu Gly Val Gly Ala Val Gln Ser Asp
50 55 60

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

Thr Val Gly Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Ile Val Ser

85 90 95

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

Thr Lys Ala Gln Leu Leu Ala Asn Ala Ser Asp Val Asp Gly Asp Ser
115 120 125

Leu Ser Val Ser Asn Leu Thr Ser Ala Asn Gly Thr Ile Thr Glu Asn
130 135 140

Ser Asp Gly Thr Tyr Thr Phe Thr Pro
145 150

<210> 45
<211> 292
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 45

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

Leu Ser Pro Val Thr Ile Gly Asn Ile Pro Ala Gly Ala Thr Leu Glu
20 25 30

Leu Asp Gly Glu Val Leu Thr Pro Asn Ala Asp Gly Thr Tyr Thr Leu
35 40 45

Asn Val Met Ser Gly Ser Pro Val Glu Val Thr Leu Val Thr Asp Thr
50 55 60

Pro Val Thr Ala Asn Ser Leu Asn Leu Thr Thr Thr Val Ser Ser Thr
65 70 75 80

Glu Ala His Gly Gly Asp Val Ser Val Thr Thr Gln Val Gly Val Gly
85 90 95

Ser Asn Ala Gly Glu Thr Val Ala Asp Asp Arg Ile Ala Thr Asp Thr
100 105 110

Asn Arg Thr Val Ser Ile Asp Ser Ala Asp Leu Leu Ala Asn Asp Thr
115 120 125

Asp Ala Asp Gly Asp Ala Leu Ser Ile Ile Ser Val Gly Asn Ala Gln
130 135 140

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

Asp Arg Gly Phe Glu Gly Thr Thr Thr Phe Glu Tyr Thr Val Ser Asp
165 170 175

Gly His Gly Gly Thr Asp Val Ala Thr Val Ser Val Tyr Val Asp Asp
180 185 190

Pro Asn Asp Ala Pro Val Ile Asn Ala Ala Gln Thr Thr Glu Thr Leu
195 200 205

Ser Val Asp Tyr Ser Glu Pro Asn Ser Ser Asn Ile Gly Arg Val Ser
210 215 220

Ala Thr Asp Val Asn Gly Asp Thr Leu Thr Tyr Ser Val Leu Asp Ser
225 230 235 240

Gly Asn Gln His Gly Asn Leu Val Ile Asp Ser Asp Ser Gly Ser Phe
245 250 255

Phe Tyr Asn Ala Asp Asp Thr Ser Trp Ser Gly Thr Asp Thr Phe Thr
260 265 270

Val Gln Val Asp Asp Gly Asn Gly Gly Leu Ala Thr Gln Thr Ile Ser
275 280 285

Val Gln Val Thr
290

<210> 46
<211> 199
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 46

Thr Ser Thr His Glu Val Asn Ile Ala Ala Ser Phe Pro Asp Met Asp
1 5 10 15

Gly Ser Glu Gly His Thr Val Val Leu Asn Gly Leu Pro Glu Gly Ala
20 25 30

Thr Leu Tyr Gln Asp Gly Val Ala Leu Val Pro Gly Ala Asp Gly Ser
35 40 45

Tyr Thr Leu Asp Ala Ser Asp Leu Asp Gly Leu Thr Leu Thr Thr Ala
50 55 60

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

Asp Gly Ala Ser Thr Ala Ser Ala Ser Ala Gln Ala Glu Val Asn Ile
85 90 95

Asp Leu Gly Asn Thr Gly Pro Asp Ala Gly Glu Ala Glu Ser Val Ser
100 105 110

```
Thr Ala Val Asn Asn Ala Val Thr Gly Gln Val Glu Ala Thr Asp Ala
        115                 120                 125


Asp Gly Asn Asp Leu Asn Phe Ser Leu Ala Thr Gly Asn Asp Gly Pro
    130                 135                 140


Gln His Gly Ser Val Ala Leu Asn Pro Asp Gly Thr Phe Thr Tyr Thr
145                 150                 155                 160


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


Asp Gly His Gly Gly Thr Thr Thr Glu Thr Val Ser Val Thr Val Glu
            180                 185                 190


Asn Pro Asn His Arg Pro Val
        195


<210>  47
<211>  107
<212>  PRT
<213>  Magnetospirillum sp. SO-1

<400>  47

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


Pro Ile Val Ser Gly Ala Val Asp Leu Gly Asp Thr Ala Glu Asp Asn
            20                  25                  30


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


Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Thr Ser Ala Asn Gly Thr
    50                  55                  60


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


Phe Ser Gly Ser Val Asp Val Ser Tyr Thr Val Ser Asp Gly Gln Gly
                85                  90                  95


Gly Thr Thr Ala Gly Ser Ala Ser Leu Asp Val
            100                 105


<210>  48
<211>  156
<212>  PRT
<213>  Magnetospirillum sp. SO-1

<400>  48

Glu Asp Gly Ser Gly Ser Gly Ser Ala Val Ala Ser Asp Val Asp Gly
```

1 5 10 15

Asp Thr Leu Arg Tyr His Leu Val Asp Thr Asp Gly Asn Gln Val Ser
20 25 30

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

Glu Tyr Thr Phe Thr Pro Asn Ala Glu Ala Gln Ala Leu Gly Val Gly
50 55 60

Ala Val Gln Ser Asp Thr Phe Lys Val Val Ala Thr Asp Gly Thr Thr
65 70 75 80

Thr Ser Glu Pro Thr Thr Val Gly Val Thr Ile Thr Gly Ser Asn Asp
85 90 95

Gly Pro Ile Val Ser Gly Ala Val Asp Leu Gly Asp Thr Ala Glu Asp
100 105 110

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

Val Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Thr Ser Ala Asn Gly
130 135 140

Thr Ile Thr Glu Asn Ser Asp Gly Thr Tyr Thr Phe
145 150 155

<210> 49
<211> 156
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 49

Glu Asp Gly Ser Gly Ser Gly Ser Ala Val Ala Ser Asp Val Asp Gly
1 5 10 15

Asp Thr Leu Arg Tyr His Leu Val Asp Thr Asp Gly Asn Gln Val Ser
20 25 30

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

Glu Tyr Thr Phe Thr Pro Asn Ala Glu Ala Gln Ala Leu Gly Val Gly
50 55 60

Ala Val Gln Ser Asp Thr Phe Lys Val Val Ala Thr Asp Gly Thr Thr
65 70 75 80

Thr Ser Glu Pro Thr Thr Val Gly Val Thr Ile Thr Gly Ser Asn Asp
85 90 95

Gly Pro Ile Val Ser Gly Ala Val Asp Leu Gly Asp Thr Ala Glu Asp
100 105 110

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

Val Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Thr Ser Ala Asn Gly
130 135 140

Thr Ile Thr Glu Asn Ser Asp Gly Thr Tyr Thr Phe
145 150 155

<210> 50
<211> 429
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (123)..(123)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (392)..(392)
<223> Xaa can be any naturally occurring amino acid

<400> 50

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala Ala Thr
35 40 45

Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
85 90 95

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Thr Leu Glu Ile
100 105 110

Pro Gly Thr Glu Leu Glu Phe Val Ile Met Xaa Leu Gln Val Thr Ala
115 120 125

```
Arg Arg His Val His Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
    130                 135                 140

Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp
145                 150                 155                 160

Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Thr
                165                 170                 175

Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr
            180                 185                 190

Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
        195                 200                 205

Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr
    210                 215                 220

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

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
                245                 250                 255

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
            260                 265                 270

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
        275                 280                 285

Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser
    290                 295                 300

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn
305                 310                 315                 320

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
                325                 330                 335

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

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr
        355                 360                 365

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Thr Leu Glu Asp Pro Arg
    370                 375                 380

Tyr Arg Ala Arg Leu Tyr His Xaa Val Asp Gly Asp Arg His Phe Leu
385                 390                 395                 400
```

Gly Val Gly Ala Phe Gly Thr Gly Asp Arg Glu Val Leu Gly His Gly
405 410 415

Ile Pro Ala Pro Arg Ala Trp Pro Ala Gly Phe Ser Leu
420 425

<210> 51
<211> 387
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (132)..(132)
<223> Xaa can be any naturally occurring amino acid

<400> 51

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

Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val
35 40 45

Gly Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp
50 55 60

Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp
65 70 75 80

Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu
85 90 95

Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met
100 105 110

Thr Lys Thr Phe Thr Thr Leu Glu Ile Pro Gly Thr Glu Leu Glu Phe
115 120 125

Val Ile Met Xaa Leu Gln Val Thr Ala Arg Arg His Val His Gln Glu
130 135 140

Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly
145 150 155 160

Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly
165 170 175

Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala
180 185 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
195 200 205

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

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

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
245 250 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
260 265 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly
275 280 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
290 295 300

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305 310 315 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
325 330 335

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
340 345 350

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
355 360 365

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
370 375 380

Ser Asp Val
385

<210> 52
<211> 438
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (132)..(132)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (401)..(401)
<223> Xaa can be any naturally occurring amino acid

<400> 52

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

Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val
35 40 45

Gly Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp
50 55 60

Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp
65 70 75 80

Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu
85 90 95

Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met
100 105 110

Thr Lys Thr Phe Thr Thr Leu Glu Ile Pro Gly Thr Glu Leu Glu Phe
115 120 125

Val Ile Met Xaa Leu Gln Val Thr Ala Arg Arg His Val His Gln Glu
130 135 140

Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly
145 150 155 160

Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly
165 170 175

Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala
180 185 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
195 200 205

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

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

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
245 250 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly

260 265 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly
275 280 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
290 295 300

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305 310 315 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
325 330 335

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
340 345 350

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
355 360 365

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
370 375 380

Ser Asp Val Thr Leu Glu Asp Pro Arg Tyr Arg Ala Arg Leu Tyr His
385 390 395 400

Xaa Val Asp Gly Asp Arg His Phe Leu Gly Val Gly Ala Phe Gly Thr
405 410 415

Gly Asp Arg Glu Val Leu Gly His Gly Ile Pro Ala Pro Arg Ala Trp
420 425 430

Pro Ala Gly Phe Ser Leu
435

<210> 53
<211> 366
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (132)..(132)
<223> Xaa can be any naturally occurring amino acid

<400> 53

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

Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

```
Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val
        35                  40                  45

Gly Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp
    50                  55                  60

Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp
65                  70                  75                  80

Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu
                85                  90                  95

Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met
            100                 105                 110

Thr Lys Thr Phe Thr Thr Leu Glu Ile Pro Gly Thr Glu Leu Glu Phe
        115                 120                 125

Val Ile Met Xaa Leu Gln Val Thr Ala Arg Arg His Val His Gln Glu
    130                 135                 140

Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly
145                 150                 155                 160

Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly
                165                 170                 175

Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala
            180                 185                 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
        195                 200                 205

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

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

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
                245                 250                 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
            260                 265                 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly
        275                 280                 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
    290                 295                 300
```

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305 310 315 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
325 330 335

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
340 345 350

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile
355 360 365

<210> 54
<211> 365
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (131)..(131)
<223> Xaa can be any naturally occurring amino acid

<400> 54

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

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly
20 25 30

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
35 40 45

Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp Val
50 55 60

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
65 70 75 80

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
85 90 95

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
100 105 110

Lys Thr Phe Thr Thr Leu Glu Ile Pro Gly Thr Glu Leu Glu Phe Val
115 120 125

Ile Met Xaa Leu Gln Val Thr Ala Arg Arg His Val His Gln Glu Val
130 135 140

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
145 150 155 160

```
Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
                165                 170                 175

Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala Thr
            180                 185                 190

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
        195                 200                 205

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

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

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
                245                 250                 255

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
            260                 265                 270

Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu
        275                 280                 285

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
    290                 295                 300

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
305                 310                 315                 320

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
                325                 330                 335

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
            340                 345                 350

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile
        355                 360                 365


<210>  55
<211>  315
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1


<220>
<221>  misc_feature
<222>  (60)..(60)
<223>  Xaa can be any naturally occurring amino acid

<400>  55

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
1               5                   10                  15
```

```
Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln
            20                  25                  30

Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Thr Leu Glu
        35                  40                  45

Ile Pro Gly Thr Glu Leu Glu Phe Val Ile Met Xaa Leu Gln Val Thr
    50                  55                  60

Ala Arg Arg His Val His Gln Glu Val Thr Val Thr Ile His Gly Ser
65                  70                  75                  80

Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu
                85                  90                  95

Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val Ser Asp Val Asp
            100                 105                 110

Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly
        115                 120                 125

Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn
    130                 135                 140

Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys
145                 150                 155                 160

Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr
                165                 170                 175

Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile
            180                 185                 190

Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu
        195                 200                 205

Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser
    210                 215                 220

Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp
225                 230                 235                 240

Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala
                245                 250                 255

Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr
            260                 265                 270

Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala
        275                 280                 285
```

Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly
290 295 300

Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
305 310 315

<210> 56
<211> 314
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (132)..(132)
<223> Xaa can be any naturally occurring amino acid

<400> 56

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

Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val
35 40 45

Gly Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp
50 55 60

Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp
65 70 75 80

Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu
85 90 95

Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met
100 105 110

Thr Lys Thr Phe Thr Thr Leu Glu Ile Pro Gly Thr Glu Leu Glu Phe
115 120 125

Val Ile Met Xaa Leu Gln Val Thr Ala Arg Arg His Val His Gln Glu
130 135 140

Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly
145 150 155 160

Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly
165 170 175

Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala

180 185 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
195 200 205

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

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

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
245 250 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
260 265 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly
275 280 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
290 295 300

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
305 310

<210> 57
<211> 386
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (132)..(132)
<223> Xaa can be any naturally occurring amino acid

<400> 57

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

Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val
35 40 45

Gly Glu Asp Gly Thr Gln Ala Ala Thr Gly Thr Leu Asn Val Ala Asp
50 55 60

Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp
65 70 75 80

```
Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu
                85                  90                  95

Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met
            100                 105                 110

Thr Lys Thr Phe Thr Thr Leu Glu Ile Pro Gly Thr Glu Leu Glu Phe
        115                 120                 125

Val Ile Met Xaa Leu Gln Val Thr Ala Arg Arg His Val His Gln Glu
    130                 135                 140

Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly
145                 150                 155                 160

Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly
                165                 170                 175

Thr Leu His Val Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala
            180                 185                 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
        195                 200                 205

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

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

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
                245                 250                 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
            260                 265                 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly
        275                 280                 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
    290                 295                 300

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305                 310                 315                 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
                325                 330                 335

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
            340                 345                 350
```

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
355 360 365

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
370 375 380

Ser Asp
385

<210> 58
<211> 411
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 58

Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala Val
1 5 10 15

Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala Thr
20 25 30

Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr Ala Asp Asp
35 40 45

Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser Phe Ala Met
50 55 60

Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu Thr Arg Thr
65 70 75 80

Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val Thr Val Thr
85 90 95

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

Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr Ala Thr Gly Thr
115 120 125

Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
130 135 140

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
145 150 155 160

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

Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
180 185 190

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser

195 200 205

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
210 215 220

Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu
225 230 235 240

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

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
260 265 270

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
275 280 285

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
290 295 300

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
305 310 315 320

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

Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
340 345 350

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
355 360 365

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
370 375 380

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
385 390 395 400

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp
405 410

<210> 59
<211> 470
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 59

Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr
1 5 10 15

Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile Asn Ala Thr Tyr
20 25 30

```
Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly Ser Ala Ser Leu
        35                  40                  45

His Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala
    50                  55                  60

Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala
65                  70                  75                  80

Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr Ala Asp
                85                  90                  95

Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser Phe Ala
            100                 105                 110

Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu Thr Arg
        115                 120                 125

Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val Thr Val
    130                 135                 140

Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly Asp Ala Lys
145                 150                 155                 160

Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr Ala Thr Gly
                165                 170                 175

Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala
            180                 185                 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
        195                 200                 205

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

Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp
225                 230                 235                 240

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
                245                 250                 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
            260                 265                 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly
        275                 280                 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
    290                 295                 300
```

```
Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305                 310                 315                 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
                325                 330                 335

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
            340                 345                 350

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
        355                 360                 365

Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val
    370                 375                 380

Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
385                 390                 395                 400

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
                405                 410                 415

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu
            420                 425                 430

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
        435                 440                 445

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

Ser Gly Asp Ile Ala Gly
465                 470


<210>  60
<211>  468
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1

<400>  60

Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr
1               5                   10                  15

Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile Asn Ala Thr Tyr
            20                  25                  30

Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly Ser Ala Ser Leu
        35                  40                  45

His Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala
    50                  55                  60
```

```
Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala
65                  70                  75                  80

Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr Ala Asp
                85                  90                  95

Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser Phe Ala
            100                 105                 110

Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu Thr Arg
        115                 120                 125

Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val Thr Val
    130                 135                 140

Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly Asp Ala Lys
145                 150                 155                 160

Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr Ala Thr Gly
                165                 170                 175

Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala
            180                 185                 190

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
        195                 200                 205

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

Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp
225                 230                 235                 240

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp
                245                 250                 255

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
            260                 265                 270

Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly
        275                 280                 285

Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe
    290                 295                 300

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
305                 310                 315                 320

Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
                325                 330                 335
```

```
Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
            340                 345                 350

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
        355                 360                 365

Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val
    370                 375                 380

Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
385                 390                 395                 400

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
                405                 410                 415

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu
            420                 425                 430

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
        435                 440                 445

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

Ser Gly Asp Ile
465
```

<210> 61
<211> 345
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 61

```
Leu Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr
1               5                   10                  15

Val Thr Val Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly
            20                  25                  30

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

Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His
    50                  55                  60

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

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val
                85                  90                  95
```

```
Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr
            100                 105                 110

Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly
        115                 120                 125

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
    130                 135                 140

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
145                 150                 155                 160

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
                165                 170                 175

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
            180                 185                 190

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
        195                 200                 205

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
    210                 215                 220

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
225                 230                 235                 240

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

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
            260                 265                 270

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

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
    290                 295                 300

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
305                 310                 315                 320

Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser
                325                 330                 335

Ala Thr Ile Ser Gly Asp Ile Ala Gly
            340                 345
```

<210> 62
<211> 371
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 62

```
Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser Phe Ala Met
1               5                  10                  15

Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu Thr Arg Thr
            20                  25                  30

Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val Thr Val Thr
        35                  40                  45

Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly Asp Ala Lys Asp
    50                  55                  60

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

Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr
                85                  90                  95

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
            100                 105                 110

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
        115                 120                 125

Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
    130                 135                 140

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
145                 150                 155                 160

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
                165                 170                 175

Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu
            180                 185                 190

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
        195                 200                 205

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
    210                 215                 220

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
225                 230                 235                 240

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
                245                 250                 255

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
```

260 265 270

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ala
275 280 285

Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
290 295 300

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

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
325 330 335

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
340 345 350

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
355 360 365

Gly Asp Ile
370

<210> 63
<211> 419
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 63

Leu Asp Asp Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp
1 5 10 15

Gly Thr Tyr Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile Asn
20 25 30

Ala Thr Tyr Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly Ser
35 40 45

Ala Ser Leu His Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly
50 55 60

Asp Thr Ala Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn
65 70 75 80

Leu Asp Ala Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr
85 90 95

Thr Ala Asp Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp
100 105 110

Ser Phe Ala Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His
115 120 125

```
Leu Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr
    130                 135                 140

Val Thr Val Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly
145                 150                 155                 160

Asp Ala Lys Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr
                165                 170                 175

Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His
            180                 185                 190

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
        195                 200                 205

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

Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr
225                 230                 235                 240

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

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
            260                 265                 270

Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val
        275                 280                 285

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
    290                 295                 300

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
305                 310                 315                 320

Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr
                325                 330                 335

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
            340                 345                 350

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
        355                 360                 365

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
    370                 375                 380

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
385                 390                 395                 400
```

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
405 410 415

Trp Ser Phe

<210> 64
<211> 280
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 64

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
1 5 10 15

Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln
20 25 30

Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser
35 40 45

Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser
50 55 60

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

Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp
85 90 95

Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly
100 105 110

Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn
115 120 125

Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys
130 135 140

Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr
145 150 155 160

Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile
165 170 175

Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu
180 185 190

Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser
195 200 205

Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp
210 215 220

Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala
225 230 235 240

Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr
245 250 255

Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala
260 265 270

Thr Ile Ser Gly Asp Ile Ala Gly
275 280

<210> 65
<211> 172
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 65

Asp Ile Gln Ala Val Ala Val Asn His Ala Pro Ile Val Ala Gly Val
1 5 10 15

Ala Asp Ile Gly Thr Ile Asp Glu Asp His Pro Leu Thr Met Thr Ala
20 25 30

Ala Glu Trp Gln Ala Lys Leu Leu Ala Asn Ala Thr Asp Ser Asp Gly
35 40 45

Asp Thr Leu Ser Ile Leu Ser Leu Asp Asp Ile Arg Ile Asp His Gly
50 55 60

Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr Thr Phe Thr Pro Asp Ala
65 70 75 80

Asn Phe Asn Gly Glu Ile Asn Ala Thr Tyr Thr Ile Ser Asp Gly His
85 90 95

Gly Gly Leu Ala Thr Gly Ser Ala Ser Leu His Val Asn Ala Val Asn
100 105 110

Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala Val Val Val Gly Glu Asp
115 120 125

Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala Thr Asp Ile Asp Ser Pro
130 135 140

Ala Thr Phe Val Ala Ala Thr Thr Ala Asp Asp Tyr Gly Thr Phe Ser
145 150 155 160

Val Asp Glu Ser Gly Gln Trp Ser Phe Ala Met Asn
165 170

<210> 66
<211> 387
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 66

Ala Asn Ala Thr Asp Ser Asp Gly Asp Thr Leu Ser Ile Leu Ser Leu
1 5 10 15

Asp Asp Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp Gly
20 25 30

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

Thr Tyr Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly Ser Ala
50 55 60

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

Thr Ala Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu
85 90 95

Asp Ala Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr
100 105 110

Ala Asp Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser
115 120 125

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

Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val
145 150 155 160

Thr Val Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly Asp
165 170 175

Ala Lys Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr Ala
180 185 190

Thr Gly Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His Val
195 200 205

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
210 215 220

Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln

225 230 235 240

Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser
245 250 255

Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser
260 265 270

Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu
275 280 285

Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp
290 295 300

Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly
305 310 315 320

Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn
325 330 335

Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys
340 345 350

Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr
355 360 365

Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile
370 375 380

Ala Gly Gly
385

<210> 67
<211> 182
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 67

Asp His Pro Leu Thr Met Thr Ala Ala Glu Trp Gln Ala Lys Leu Leu
1 5 10 15

Ala Asn Ala Thr Asp Ser Asp Gly Asp Thr Leu Ser Ile Leu Ser Leu
20 25 30

Asp Asp Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp Gly
35 40 45

Thr Tyr Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile Asn Ala
50 55 60

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

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

Thr Ala Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn Leu
            100                 105                 110

Asp Ala Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr Thr
        115                 120                 125

Ala Asp Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp Ser
    130                 135                 140

Phe Ala Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His Leu
145                 150                 155                 160

Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr Val
                165                 170                 175

Thr Val Thr Ile Asp Gly
            180
```

<210> 68
<211> 93
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 68

```
Gly Asp Thr Leu Ser Ile Leu Ser Leu Asp Asp Ile Arg Ile Asp His
1               5                   10                  15

Gly Ser Phe Ala Arg Asn Ala Asp Gly Thr Tyr Thr Phe Thr Pro Asp
            20                  25                  30

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

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

Asn Asp Ala Ala Glu Ile Thr Gly Asp Thr Ala Val Val Val Gly Glu
65                  70                  75                  80

Asp Thr Ala Arg Ala Ala Gly Asn Leu Asp Ala Thr Asp
                85                  90
```

<210> 69
<211> 411
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 69

```
Met Asn Ser Asp His Leu Val His Ala Glu Asp Ser Ser Ala Val Ser
1               5                  10                  15

Gly Asn Gln Asn Trp Glu Asp Leu Asn Gly Gly Gly Asp Arg Asp Tyr
            20                  25                  30

Asn Asp Val Asn Met Ser Val Ser Trp Gly Asn Ala Ala Pro Thr Ala
        35                  40                  45

Ser His Ala Leu Ser Val Ser Ala Ser Phe Pro Asp Met Asp Gly Ser
    50                  55                  60

Glu Ser His Thr Val Ser Ile Ser Gly Leu Pro Ala Gly Ala Thr Leu
65                  70                  75                  80

Tyr Gln Asn Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser
                85                  90                  95

Leu Asn Pro Ala Gln Leu Gly Gly Leu Ser Val Lys Thr Pro Ala Gly
            100                 105                 110

Phe Thr Gly Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly
        115                 120                 125

Thr Ser Val Ala Ser Ser Ser Ala Ser Ala Ser Val His Asp Asp Leu
    130                 135                 140

Ala Asn His Gly Pro Asp Ala Gly Asp Pro Thr Ser Val His Gly Ala
145                 150                 155                 160

Ala Gly Ala Thr Ile Thr Ser Ala Val Gly Val Thr Asp Val Asp Gly
                165                 170                 175

Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn Asn Gly Pro Gln His
            180                 185                 190

Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe Ser Tyr Thr Pro Thr
        195                 200                 205

Gly Asn Tyr Ser Gly Thr Asp Thr Phe Lys Val Thr Val Ser Asp Gly
    210                 215                 220

His Gly Gly Thr Thr Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly
225                 230                 235                 240

Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr Ala Asn Asp His Ser
                245                 250                 255

Ala Val Thr Gly His Val Thr Gly Thr Asp Ser Pro Gly Asp Thr Leu
            260                 265                 270
```

Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val Ser Ser Leu Val
275 280 285

Thr Asp His Gly Thr Val Ser Ile Asn Ser Ala Thr Gly Asp Tyr Thr
290 295 300

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

Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp Ser
325 330 335

Asn Val Gly Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly Pro
340 345 350

Thr Val Ser Ala Ser Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile
355 360 365

Thr Gly His Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Ala
370 375 380

Tyr His Leu Val Asp Gly Ser Gly Asn Gln Val Asp Ser Leu Thr Thr
385 390 395 400

Ala His Gly Thr Val Thr Ile Asn Ser Ala Thr
405 410

<210> 70
<211> 240
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 70

Thr Asp Val Asp Gly Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn
1 5 10 15

Asn Gly Pro Gln His Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe
20 25 30

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

Thr Val Ser Asp Gly His Gly Gly Thr Thr Thr Glu Thr Val Asn Val
50 55 60

Thr Val Glu Asn Gly Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr
65 70 75 80

Ala Asn Asp His Ser Ala Val Thr Gly His Val Thr Gly Thr Asp Ser
85 90 95

Pro Gly Asp Thr Leu Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His

100 105 110

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

Thr Gly Asp Tyr Thr Phe Thr Pro Lys Ala Gly Asp Ala Ser Leu Gly
130 135 140

Val Gly Ala Ser Ala Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser
145 150 155 160

His Gly Ala Asp Ser Asn Val Gly Thr Val Asn Val Thr Val Thr Gly
165 170 175

Ser Asn Asp Gly Pro Thr Val Ser Ala Ser Asn Val Thr Thr Ala Asn
180 185 190

Asp His Thr Ala Ile Thr Gly His Ala Ser Gly Ala Asp Val Asp Thr
195 200 205

Gly Asp Thr Val Ala Tyr His Leu Val Asp Gly Ser Gly Asn Gln Val
210 215 220

Asp Ser Leu Thr Thr Ala His Gly Thr Val Thr Ile Asn Ser Ala Thr
225 230 235 240

<210> 71
<211> 127
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 71

Asp His Ser Ala Val Thr Gly His Val Thr Gly Thr Asp Ser Pro Gly
1 5 10 15

Asp Thr Leu Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val Ser
20 25 30

Ser Leu Val Thr Asp His Gly Thr Val Ser Ile Asn Ser Ala Thr Gly
35 40 45

Asp Tyr Thr Phe Thr Pro Lys Ala Gly Asp Ala Ser Leu Gly Val Gly
50 55 60

Ala Ser Ala Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser His Gly
65 70 75 80

Ala Asp Ser Asn Val Gly Thr Val Asn Val Thr Val Thr Gly Ser Asn
85 90 95

Asp Gly Pro Thr Val Ser Ala Ser Asn Val Thr Thr Ala Asn Asp His
100 105 110

Thr Ala Ile Thr Gly His Ala Ser Gly Ala Asp Val Asp Thr Gly
115 120 125

<210> 72
<211> 183
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 72

Thr Asp Val Asp Gly Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn
1 5 10 15

Asn Gly Pro Gln His Gly Thr Val Val Asn Thr Asp Gly Thr Phe
20 25 30

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

Thr Val Ser Asp Gly His Gly Gly Thr Thr Thr Glu Thr Val Asn Val
50 55 60

Thr Val Glu Asn Gly Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr
65 70 75 80

Ala Asn Asp His Ser Ala Val Thr Gly His Val Thr Gly Thr Asp Ser
85 90 95

Pro Gly Asp Thr Leu Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His
100 105 110

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

Thr Gly Asp Tyr Thr Phe Thr Pro Lys Ala Gly Asp Ala Ser Leu Gly
130 135 140

Val Gly Ala Ser Ala Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser
145 150 155 160

His Gly Ala Asp Ser Asn Val Gly Thr Val Asn Val Thr Val Thr Gly
165 170 175

Ser Asn Asp Gly Pro Thr Val
180

<210> 73
<211> 300
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 73

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

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

Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser Leu Asn Pro
        35                  40                  45

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

Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly Thr Ser Val
65                  70                  75                  80

Ala Ser Ser Ser Ala Ser Ala Ser Val His Asp Asp Leu Ala Asn His
                85                  90                  95

Gly Pro Asp Ala Gly Asp Pro Thr Ser Val His Gly Ala Ala Gly Ala
            100                 105                 110

Thr Ile Thr Ser Ala Val Gly Val Thr Asp Val Asp Gly Asp His Leu
        115                 120                 125

Ser Tyr Ala Val Gly Thr Gly Asn Asn Gly Pro Gln His Gly Thr Val
    130                 135                 140

Val Val Asn Thr Asp Gly Thr Phe Ser Tyr Thr Pro Thr Gly Asn Tyr
145                 150                 155                 160

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

Thr Thr Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly Ala Pro Thr
            180                 185                 190

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

Gly His Val Thr Gly Thr Asp Ser Pro Gly Asp Thr Leu Ser Tyr Ser
    210                 215                 220

Leu Val Asp Ala Asn Gly Asn His Val Ser Ser Leu Val Thr Asp His
225                 230                 235                 240

Gly Thr Val Ser Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe Thr Pro
                245                 250                 255

Lys Ala Gly Asp Ala Ser Leu Gly Val Gly Ala Ser Ala Thr Asp Ser
            260                 265                 270
```

Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp Ser Asn Val Gly
275 280 285

Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly
290 295 300

<210> 74
<211> 88
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 74

Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp Ser Asn Val Gly
1 5 10 15

Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly Pro Thr Val Ser
20 25 30

Ala Ser Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile Thr Gly His
35 40 45

Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Ala Tyr His Leu
50 55 60

Val Asp Gly Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly
65 70 75 80

Thr Val Thr Ile Asn Ser Ala Thr
85

<210> 75
<211> 89
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 75

Val Ser Trp Gly Asn Ala Ala Pro Thr Ala Ser His Ala Leu Ser Val
1 5 10 15

Ser Ala Ser Phe Pro Asp Met Asp Gly Ser Glu Ser His Thr Val Ser
20 25 30

Ile Ser Gly Leu Pro Ala Gly Ala Thr Leu Tyr Gln Asn Gly Val Ala
35 40 45

Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser Leu Asn Pro Ala Gln Leu
50 55 60

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

Val Asn Val Thr Ala Val Ala Thr Asp
85

<210> 76
<211> 86
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 76

Gly Gly Gly Asp Arg Asp Tyr Asn Asp Val Asn Met Ser Val Ser Trp
1 5 10 15

Gly Asn Ala Ala Pro Thr Ala Ser His Ala Leu Ser Val Ser Ala Ser
20 25 30

Phe Pro Asp Met Asp Gly Ser Glu Ser His Thr Val Ser Ile Ser Gly
35 40 45

Leu Pro Ala Gly Ala Thr Leu Tyr Gln Asn Gly Val Ala Leu Val Ala
50 55 60

Gly Ala Asp Gly Ser Tyr Ser Leu Asn Pro Ala Gln Leu Gly Gly Leu
65 70 75 80

Ser Val Lys Thr Pro Ala
85

<210> 77
<211> 189
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 77

Thr Asp Val Asp Gly Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn
1 5 10 15

Asn Gly Pro Gln His Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe
20 25 30

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

Thr Val Ser Asp Gly His Gly Gly Thr Thr Thr Glu Thr Val Asn Val
50 55 60

Thr Val Glu Asn Gly Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr
65 70 75 80

Ala Asn Asp His Ser Ala Val Thr Gly His Val Thr Gly Thr Asp Ser
85 90 95

Pro Gly Asp Thr Leu Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His
100 105 110

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

Thr Gly Asp Tyr Thr Phe Thr Pro Lys Ala Gly Asp Ala Ser Leu Gly
130 135 140

Val Gly Ala Ser Ala Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser
145 150 155 160

His Gly Ala Asp Ser Asn Val Gly Thr Val Asn Val Thr Val Thr Gly
165 170 175

Ser Asn Asp Gly Pro Thr Val Ser Ala Ser Asn Val Thr
180 185

<210> 78
<211> 166
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 78

His Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe Ser Tyr Thr Pro
1 5 10 15

Thr Gly Asn Tyr Ser Gly Thr Asp Thr Phe Lys Val Thr Val Ser Asp
20 25 30

Gly His Gly Gly Thr Thr Thr Glu Thr Val Asn Val Thr Val Glu Asn
35 40 45

Gly Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr Ala Asn Asp His
50 55 60

Ser Ala Val Thr Gly His Val Thr Gly Thr Asp Ser Pro Gly Asp Thr
65 70 75 80

Leu Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val Ser Ser Leu
85 90 95

Val Thr Asp His Gly Thr Val Ser Ile Asn Ser Ala Thr Gly Asp Tyr
100 105 110

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

Ala Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp
130 135 140

Ser Asn Val Gly Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly
145 150 155 160

Pro Thr Val Ser Ala Ser

165

<210> 79
<211> 405
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 79

Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr
35 40 45

Gly Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr
50 55 60

Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn
65 70 75 80

Gly Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala
85 90 95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
100 105 110

Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp
130 135 140

Gly Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His
145 150 155 160

Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr
165 170 175

Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly
180 185 190

Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr
195 200 205

Phe Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val
210 215 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225 230 235 240

```
Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala
                405


<210>  80
<211>  405
<212>  PRT
<213>  Magnetospirillum magnetotacticum

<400>  80

Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
1               5                   10                  15

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr
        35                  40                  45

Gly Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr
    50                  55                  60
```

```
Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn
65                  70                  75                  80

Gly Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala
                85                  90                  95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
            100                 105                 110

Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn
        115                 120                 125

Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp
    130                 135                 140

Gly Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His
145                 150                 155                 160

Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr
                165                 170                 175

Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly
            180                 185                 190

Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr
                325                 330                 335
```

```
Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala
            340                 345                 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
        355                 360                 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
    370                 375                 380

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

Gln Ala Leu Gly Ala
                405
```

<210> 81
<211> 343
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 81

```
Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu
1               5                   10                  15

Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly
            20                  25                  30

Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly
        35                  40                  45

Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala
    50                  55                  60

Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly
65                  70                  75                  80

Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu
                85                  90                  95

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

Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn Asp
        115                 120                 125

Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly
    130                 135                 140

Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His Gly
145                 150                 155                 160
```

```
Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe
                165                 170                 175

Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly Asn
            180                 185                 190

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

Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val Thr
    210                 215                 220

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
225                 230                 235                 240

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
                245                 250                 255

Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
            260                 265                 270

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

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly Asp
    290                 295                 300

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
305                 310                 315                 320

Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile
                325                 330                 335

Ser Gly Asp Ile Ala Gly Gly
            340
```

<210> 82
<211> 396
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 82

```
Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
1               5                   10                  15

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr
        35                  40                  45

Gly Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr
```

```
    50                  55                  60

Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn
65                  70                  75                  80

Gly Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala
                85                  90                  95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
            100                 105                 110

Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn
        115                 120                 125

Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp
    130                 135                 140

Gly Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His
145                 150                 155                 160

Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr
                165                 170                 175

Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly
            180                 185                 190

Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
    290                 295                 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305                 310                 315                 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr
```

325 330 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala
340 345 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
355 360 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
370 375 380

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
385 390 395

<210> 83
<211> 289
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 83

Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr
35 40 45

Gly Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr
50 55 60

Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn
65 70 75 80

Gly Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala
85 90 95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
100 105 110

Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn
115 120 125

Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp
130 135 140

Gly Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His
145 150 155 160

Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr
165 170 175

```
Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly
            180                 185                 190

Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270

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

Phe
```

<210> 84
<211> 342
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 84

```
Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln
1               5                   10                  15

Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly
            20                  25                  30

Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly
        35                  40                  45

Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser
    50                  55                  60

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

Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His Gly Gln
                85                  90                  95

Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser
            100                 105                 110
```

```
Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly Asn Ala
        115                 120                 125

Asp Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe Thr
    130                 135                 140

Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val Thr Ile
145                 150                 155                 160

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
                165                 170                 175

Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ala
            180                 185                 190

Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
        195                 200                 205

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
    210                 215                 220

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly Asp Ser
225                 230                 235                 240

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
                245                 250                 255

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
            260                 265                 270

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala Ala Thr
        275                 280                 285

Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val Gln
    290                 295                 300

Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
305                 310                 315                 320

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
                325                 330                 335

Leu Gly Ala Ser Tyr Ser
            340
```

<210> 85
<211> 396
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 85

```
Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln
1               5                   10                  15

Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser
            20                  25                  30

Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr
        35                  40                  45

Gly Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr
    50                  55                  60

Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn
65                  70                  75                  80

Gly Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala
                85                  90                  95

Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala
            100                 105                 110

Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn
        115                 120                 125

Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp
    130                 135                 140

Gly Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His
145                 150                 155                 160

Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr
                165                 170                 175

Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly
            180                 185                 190

Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr
        195                 200                 205

Phe Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val
    210                 215                 220

Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala
225                 230                 235                 240

Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn
                245                 250                 255

Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val
            260                 265                 270
```

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

Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly
290 295 300

Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp
305 310 315 320

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr
325 330 335

Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala
340 345 350

Ala Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His
355 360 365

Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly
370 375 380

Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp
385 390 395

<210> 86
<211> 343
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 86

Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu
1 5 10 15

Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly
20 25 30

Ser Thr Thr Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly
35 40 45

Thr Leu Ser Val Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala
50 55 60

Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly
65 70 75 80

Gln Trp Thr Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu
85 90 95

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

Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn Gly Ala Asn Asp

115 120 125

Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val Ala Glu Asp Gly
130 135 140

Asn Gly Arg Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp His Gly
145 150 155 160

Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe
165 170 175

Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val Asn Ser Gly Asn
180 185 190

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

Thr Val Thr Ser Ala Asp Cys Thr Asp Thr Gln Glu Val Thr Val Thr
210 215 220

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
225 230 235 240

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
245 250 255

Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
260 265 270

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

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly Asp
290 295 300

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
305 310 315 320

Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile
325 330 335

Ser Gly Asp Ile Ala Gly Gly
340

<210> 87
<211> 1103
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 87

Met Gln Ala Leu Gly Ala Asn Asp His Leu Thr Lys Thr Phe Glu Val
1 5 10 15

```
Gln Thr Ala Asp Gly Thr Thr Gln Thr Val Thr Val Thr Val Asp Gly
            20                  25                  30

Ala Asn Asp Ala Ala Val Ile Thr Gly Asp Thr Arg Gly Gly Val Gly
        35                  40                  45

Glu Asp Gly Val Leu Lys Thr Ser Gly Asp Leu Asn Ala Thr Asp Val
    50                  55                  60

Asp Ser Ala Ala Thr Phe Gln Glu Ser Ser Val Thr Asp Ala His Gly
65                  70                  75                  80

Thr Phe Thr Val Gly Thr Asp Gly Ala Trp Ser Tyr Thr Leu Asn Asn
                85                  90                  95

Asp Ser Pro Ala Val Gln Ala Leu Gly Ala Asn Asp His Leu Thr Lys
            100                 105                 110

Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Thr Gln Thr Val Thr Val
        115                 120                 125

Thr Val Asp Gly Ala Asn Asp Ala Ala Val Ile Thr Gly Asp Thr Arg
    130                 135                 140

Gly Gly Val Gly Glu Asp Gly Val Leu Asn Thr Ser Gly Asp Leu Asn
145                 150                 155                 160

Ala Thr Asp Val Asp Ser Ala Thr Ser Phe Gln Glu Ser Ser Val Thr
                165                 170                 175

Asp Ala His Gly Thr Phe Thr Val Gly Thr Asp Gly Ala Trp Ser Tyr
            180                 185                 190

Thr Leu Asn Asn Asp Ser Pro Ala Val Gln Ala Leu Gly Ala Asn Asp
        195                 200                 205

His Leu Thr Lys Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Thr Gln
    210                 215                 220

Thr Val Thr Val Thr Val Asp Gly Ala Asn Asp Ala Ala Val Ile Thr
225                 230                 235                 240

Gly Asp Thr Arg Gly Gly Val Gly Glu Asp Gly Val Leu Lys Thr Ser
                245                 250                 255

Gly Asp Leu Asn Ala Thr Asp Val Asp Ser Ala Ala Thr Phe Gln Glu
            260                 265                 270

Ser Ser Val Thr Asp Ala His Gly Thr Phe Thr Val Gly Thr Asp Gly
        275                 280                 285
```

```
Ala Trp Ser Tyr Thr Leu Asn Asn Asp Ser Pro Ala Val Gln Ala Leu
    290                 295                 300

Gly Ala Asn Asp His Leu Thr Lys Thr Phe Glu Val Gln Thr Ala Asp
305                 310                 315                 320

Gly Thr Thr Gln Thr Val Thr Val Thr Val Asp Gly Ala Asn Asp Ala
                325                 330                 335

Ala Val Ile Thr Gly Asp Thr Arg Gly Gly Val Gly Glu Asp Gly Val
            340                 345                 350

Leu Asn Thr Ser Gly Asp Leu Asn Ala Thr Asp Val Asp Ser Ala Thr
        355                 360                 365

Ser Phe Gln Glu Ser Ser Val Thr Asp Ala His Gly Thr Phe Thr Val
    370                 375                 380

Gly Thr Asp Gly Ala Trp Ser Tyr Thr Leu Asn Asn Asp Ser Pro Ala
385                 390                 395                 400

Val Gln Ala Leu Gly Ala Asn Asp His Leu Thr Lys Thr Phe Glu Val
                405                 410                 415

Gln Thr Ala Asp Gly Thr Thr Gln Thr Val Thr Val Thr Val Asp Gly
            420                 425                 430

Ala Asn Asp Gly Pro Thr Thr Gly Ala Val Thr Leu Ala Ala Gly Thr
        435                 440                 445

Glu Asp Asn Ser Val Thr Ile Arg Ala Ser Asp Leu Leu Ser Gln Ala
    450                 455                 460

His Asp Ile Glu Gly Asp Thr Leu Ser Val Thr Asn Leu His Ala Asn
465                 470                 475                 480

Asn Gly Ser Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr Pro
                485                 490                 495

Asn His Asp Phe Asn Gly Gln Val Asp Leu Ser Tyr Thr Ile Ser Asp
            500                 505                 510

Gly His Gly Gly Asn Thr Glu Gly Ser Ala Lys Phe Asp Val Thr Ala
        515                 520                 525

Val Asn Asp Gly Pro Val Val Ser Gly Asp Val Thr Leu Thr Ser Gly
    530                 535                 540

Thr Glu Asp Arg Ser Val Thr Ile Lys Ala Gly Asp Leu Leu Gly His
545                 550                 555                 560
```

```
Ala Ser Asp Val Asp Gly Asp Thr Leu Ser Val Ser Asn Leu Ser Ala
                565                 570                 575

Ser Asn Gly Thr Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr
            580                 585                 590

Pro Asn Gln Asp Phe Asn Gly His Val Asp Leu Thr Tyr Thr Val Ala
        595                 600                 605

Asp Gly His Gly Gly Glu Ala Pro Gly Lys Ala Gly Phe Glu Val Ser
    610                 615                 620

Ala Val Ala Asp Asp Ala Arg Ile Val Ala Pro Asp Val Ser Ile Thr
625                 630                 635                 640

Tyr Gly Ser Ala Asn Thr Ser Gln Thr Leu Ala Gly Thr Ala Gly Ala
                645                 650                 655

Asp Thr Leu Val Gly Gly Gly Gly Asn Asp Thr Leu Thr Gly Gly Ala
            660                 665                 670

Gly Asn Asp Val Leu Tyr Gly Asp Ala Gly Pro Asn Ser Gly Gly Pro
        675                 680                 685

Phe Asn Val Ala Leu Asn Ile Asp Ala Ser Ala Thr Val Asn Gly Glu
    690                 695                 700

His Val Gly Thr Ile Thr Leu Thr Gly Leu Pro Asp Gly Ala Asn Leu
705                 710                 715                 720

Ser Ala Gly Val His Asn Ala Asp Gly Ser Trp Thr Leu Ser Ala Gly
                725                 730                 735

Asp Leu His Gly Leu Thr Ala Asn Val Ala Asp Ala Thr Pro Phe Asn
            740                 745                 750

Val Gly Ile Ala Val Gln Thr Val Asp Gly Thr Ser Thr His Val Thr
        755                 760                 765

Thr Ser Ser Met Ser Val Asp Phe His Ser Thr Thr Val Asp Gly Asn
    770                 775                 780

Asp Thr Ile Ser Gly Gly Ala Gly Ser Asp Thr Met Tyr Gly Gly Gly
785                 790                 795                 800

Gly Asn Asp Thr Phe Leu Ile Ser Asp Asn Asp Gly Ser Thr Asp Thr
                805                 810                 815

Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp Ser Tyr
            820                 825                 830
```

```
Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly Ile Glu
        835                 840                 845

Val Ile Asp Gly Gly Asp Gly Thr Pro Ala Tyr Asn Thr Ile Gln Ala
    850                 855                 860

Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val Lys Ser
865                 870                 875                 880

Phe Val Ile Asp Gly Gly Ala Gly Asn Asp Thr Ile Thr Gly Thr Ser
                885                 890                 895

Gly Asn Asp Thr Ile Ser Gly Gly Ala Gly Ser Asp Thr Met Ser Gly
            900                 905                 910

Gly Ala Gly Asn Asp Thr Phe Leu Ile Ser Asn Asn Asp Gly Ser Thr
        915                 920                 925

Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp
    930                 935                 940

Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly
945                 950                 955                 960

Ile Glu Val Ile Asp Gly Gly Asp Gly Thr Pro Ala Tyr Asn Thr Ile
                965                 970                 975

Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val
            980                 985                 990

Lys Ser Phe Val Ile Asp Gly Gly  Ala Gly Asn Asp Thr  Ile Thr Gly
        995                 1000                1005

Thr Ser  Gly Asn Asp Thr Ile  Ser Gly Gly Ala Gly  Ser Asp Thr
    1010                1015                1020

Met Ser  Gly Gly Ala Gly Asn  Asp Thr Phe Leu Ile  Ser Asn Asn
    1025                1030                1035

Asp Gly  Ser Thr Asp Thr Phe  Ile Gly Gly Asp Gly  Thr Asp Thr
    1040                1045                1050

Ile Met  Gly Asn Trp Ser Tyr  Asp Thr Leu Lys Val  Asp Asn His
    1055                1060                1065

Leu Ala  Asn Leu Gln Gly Ile  Glu Val Ile Asp Gly  Gly Asp Gly
    1070                1075                1080

Thr Pro  Ala Tyr Asn Thr Ile  Gln Gly Gly Ser Gly  Asn Asp Glu
    1085                1090                1095
```

Leu Asp Phe Ser Gly
1100

<210> 88
<211> 587
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 88

Leu Thr Lys Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Thr Gln Thr
1   5   10   15

Val Thr Val Thr Val Asp Gly Ala Asn Asp Ala Ala Val Ile Thr Gly
            20   25   30

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

Asp Leu Asn Ala Thr Asp Val Asp Ser Ala Ala Thr Phe Gln Glu Ser
    50   55   60

Ser Val Thr Asp Ala His Gly Thr Phe Thr Val Gly Thr Asp Gly Ala
65   70   75   80

Trp Ser Tyr Thr Leu Asn Asn Asp Ser Pro Ala Val Gln Ala Leu Gly
                85   90   95

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

Thr Thr Gln Thr Val Thr Val Thr Val Asp Gly Ala Asn Asp Ala Ala
        115   120   125

Val Ile Thr Gly Asp Thr Arg Gly Gly Val Gly Glu Asp Gly Val Leu
    130   135   140

Asn Thr Ser Gly Asp Leu Asn Ala Thr Asp Val Asp Ser Ala Thr Ser
145   150   155   160

Phe Gln Glu Ser Ser Val Thr Asp Ala His Gly Thr Phe Thr Val Gly
                165   170   175

Thr Asp Gly Ala Trp Ser Tyr Thr Leu Asn Asn Asp Ser Pro Ala Val
            180   185   190

Gln Ala Leu Gly Ala Asn Asp His Leu Thr Lys Thr Phe Glu Val Gln
        195   200   205

Thr Ala Asp Gly Thr Thr Gln Thr Val Thr Val Thr Val Asp Gly Ala
    210   215   220

```
Asn Asp Ala Ala Val Ile Thr Gly Asp Thr Arg Gly Gly Val Gly Glu
225                 230                 235                 240

Asp Gly Val Leu Lys Thr Ser Gly Asp Leu Asn Ala Thr Asp Val Asp
                245                 250                 255

Ser Ala Ala Thr Phe Gln Glu Ser Ser Val Thr Asp Ala His Gly Thr
            260                 265                 270

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

Ser Pro Ala Val Gln Ala Leu Gly Ala Asn Asp His Leu Thr Lys Thr
    290                 295                 300

Phe Glu Val Gln Thr Ala Asp Gly Thr Thr Gln Thr Val Thr Val Thr
305                 310                 315                 320

Val Asp Gly Ala Asn Asp Ala Ala Val Ile Thr Gly Asp Thr Arg Gly
                325                 330                 335

Gly Val Gly Glu Asp Gly Val Leu Asn Thr Ser Gly Asp Leu Asn Ala
            340                 345                 350

Thr Asp Val Asp Ser Ala Thr Ser Phe Gln Glu Ser Ser Val Thr Asp
        355                 360                 365

Ala His Gly Thr Phe Thr Val Gly Thr Asp Gly Ala Trp Ser Tyr Thr
    370                 375                 380

Leu Asn Asn Asp Ser Pro Ala Val Gln Ala Leu Gly Ala Asn Asp His
385                 390                 395                 400

Leu Thr Lys Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Thr Gln Thr
                405                 410                 415

Val Thr Val Thr Val Asp Gly Ala Asn Asp Gly Pro Thr Thr Gly Ala
            420                 425                 430

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

Ser Asp Leu Leu Ser Gln Ala His Asp Ile Glu Gly Asp Thr Leu Ser
    450                 455                 460

Val Thr Asn Leu His Ala Asn Asn Gly Ser Ile Thr Asp Asn His Asp
465                 470                 475                 480

Gly Thr Tyr Thr Phe Thr Pro Asn His Asp Phe Asn Gly Gln Val Asp
                485                 490                 495
```

```
Leu Ser Tyr Thr Ile Ser Asp Gly His Gly Gly Asn Thr Glu Gly Ser
            500                 505                 510

Ala Lys Phe Asp Val Thr Ala Val Asn Asp Gly Pro Val Val Ser Gly
        515                 520                 525

Asp Val Thr Leu Thr Ser Gly Thr Glu Asp Arg Ser Val Thr Ile Lys
    530                 535                 540

Ala Gly Asp Leu Leu Gly His Ala Ser Asp Val Asp Gly Asp Thr Leu
545                 550                 555                 560

Ser Val Ser Asn Leu Ser Ala Ser Asn Gly Thr Ile Thr Asp Asn His
                565                 570                 575

Asp Gly Thr Tyr Thr Phe Thr Pro Asn Gln Asp
            580                 585
```

<210> 89
<211> 255
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 89

```
Gln Thr Phe Thr Phe Asn Thr Leu Gly Gly Leu Lys Val Asp Asn Phe
1               5                   10                  15

Glu Ala Leu Lys Val Asn Leu Asn Gly His Asp Ile Ser Leu Glu Asn
            20                  25                  30

Pro Pro Glu Val Thr Ala Ala Thr Ala Val Thr Thr Asp Glu Asp His
        35                  40                  45

Ser Ser Thr Gly His Val Thr Ala Thr Asp Gln Asp Val Gly Asp Ser
    50                  55                  60

Val Arg Tyr His Leu Met Asp Ala Asn Gly Asn Gln Val Asp Ser Leu
65                  70                  75                  80

Thr Thr Ala His Gly Thr Val Thr Ile Asn Ser Ala Thr Gly Asp Tyr
                85                  90                  95

Thr Phe Thr Pro Asn Ala Asp Ala Gln Ala Leu Arg Ala Gly Asp Val
            100                 105                 110

Gln Thr Asp Ser Phe Lys Val Val Ala Thr Asp Gly Thr Met Thr Ser
        115                 120                 125

Ala Pro Ser Thr Val Gly Val Thr Ile Asn Gly Ala Asn Asp Ser Ala
    130                 135                 140
```

Thr Ile Thr Gly Thr Ala Ala Gly Ala Val Gly Glu Asp Gly Asn Gly
145 150 155 160

Arg Ala Thr Gly Thr Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala
165 170 175

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

Gly Glu Asn Gly Gln Trp Ser Phe Gln Val Asn Ser Ser Asn Ala Asp
195 200 205

Val Gln Ala Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val
210 215 220

Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Ser Val Thr Ile Thr
225 230 235 240

Gly Ser Asn Asp Gly Pro Thr Val Ser Gly Ala Val Ala Leu Gly
245 250 255

<210> 90
<211> 325
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 90

Asp Ile Ser Leu Glu Asn Pro Pro Glu Val Thr Ala Ala Thr Ala Val
1 5 10 15

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

Gln Asp Val Gly Asp Ser Val Arg Tyr His Leu Met Asp Ala Asn Gly
35 40 45

Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly Thr Val Thr Ile Asn
50 55 60

Ser Ala Thr Gly Asp Tyr Thr Phe Thr Pro Asn Ala Asp Ala Gln Ala
65 70 75 80

Leu Arg Ala Gly Asp Val Gln Thr Asp Ser Phe Lys Val Val Ala Thr
85 90 95

Asp Gly Thr Met Thr Ser Ala Pro Ser Thr Val Gly Val Thr Ile Asn
100 105 110

Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Thr Ala Ala Gly Ala Val
115 120 125

Gly Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val Ala Asp

130 135 140

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

Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Ser Phe Gln Val
165 170 175

Asn Ser Ser Asn Ala Asp Val Gln Ala Leu Gly Ala Gly Glu Ser Met
180 185 190

Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn
195 200 205

Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Gly
210 215 220

Ala Val Ala Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr Phe Thr
225 230 235 240

Lys Ala Gln Leu Leu Ala Asn Ala His Asp Val Asp Thr His Asp Thr
245 250 255

Leu Ser Val Ser Asn Leu Thr Ser Thr His Gly Ser Ile Val Asp Asn
260 265 270

Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Asn Tyr Ser Gly His
275 280 285

Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly Thr Ala Ala
290 295 300

Gly Ser Ala Ala Leu Asp Val Asp Ala Val Ala Asp Arg Ala Ser Val
305 310 315 320

Ser Val Ser Ile Gly
325

<210> 91
<211> 294
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 91

Thr Phe Thr Phe Asn Thr Leu Gly Gly Leu Lys Val Asp Asn Phe Glu
1 5 10 15

Ala Leu Lys Val Asn Leu Asn Gly His Asp Ile Ser Leu Glu Asn Pro
20 25 30

Pro Glu Val Thr Ala Ala Thr Ala Val Thr Thr Asp Glu Asp His Ser
35 40 45

```
Ser Thr Gly His Val Thr Ala Thr Asp Gln Asp Val Gly Asp Ser Val
    50                  55                  60

Arg Tyr His Leu Met Asp Ala Asn Gly Asn Gln Val Asp Ser Leu Thr
65                  70                  75                  80

Thr Ala His Gly Thr Val Thr Ile Asn Ser Ala Thr Gly Asp Tyr Thr
                85                  90                  95

Phe Thr Pro Asn Ala Asp Ala Gln Ala Leu Arg Ala Gly Asp Val Gln
            100                 105                 110

Thr Asp Ser Phe Lys Val Val Ala Thr Asp Gly Thr Met Thr Ser Ala
        115                 120                 125

Pro Ser Thr Val Gly Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr
    130                 135                 140

Ile Thr Gly Thr Ala Ala Gly Ala Val Gly Glu Asp Gly Asn Gly Arg
145                 150                 155                 160

Ala Thr Gly Thr Leu Ser Val Ala Asp Val Asp Ser Gly Gln Ala His
                165                 170                 175

Val Thr Ala Gln Thr Val Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly
            180                 185                 190

Glu Asn Gly Gln Trp Ser Phe Gln Val Asn Ser Ser Asn Ala Asp Val
        195                 200                 205

Gln Ala Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Ala Val Ala
    210                 215                 220

Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Ser Val Thr Ile Thr Gly
225                 230                 235                 240

Ser Asn Asp Gly Pro Thr Val Ser Gly Ala Val Ala Leu Gly His Thr
                245                 250                 255

Ala Glu Asp Asn Ser Val Thr Phe Thr Lys Ala Gln Leu Leu Ala Asn
            260                 265                 270

Ala His Asp Val Asp Thr His Asp Thr Leu Ser Val Ser Asn Leu Thr
        275                 280                 285

Ser Thr His Gly Ser Ile
    290
```

<210> 92
<211> 180

<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 92

```
Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp
1               5                   10                  15

Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly
            20                  25                  30

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

Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val
    50                  55                  60

Lys Ser Phe Val Ile Asp Gly Gly Ala Gly Asn Asp Thr Ile Thr Gly
65                  70                  75                  80

Thr Ser Gly Asn Asp Thr Ile Ser Gly Gly Ala Gly Ser Asp Thr Met
                85                  90                  95

Ser Gly Gly Ala Gly Asn Asp Thr Phe Leu Ile Ser Asn Asn Asp Gly
            100                 105                 110

Ser Thr Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly
        115                 120                 125

Asn Trp Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu
    130                 135                 140

Gln Gly Ile Glu Val Ile Asp Gly Gly Asp Gly Thr Pro Ala Tyr Asn
145                 150                 155                 160

Thr Ile Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met
                165                 170                 175

Thr Val Lys Ser
            180
```

<210> 93
<211> 180
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 93

```
Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp
1               5                   10                  15

Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly
            20                  25                  30
```

```
Ile Glu Val Ile Asp Gly Gly Asp Gly Thr Pro Ala Tyr Asn Thr Ile
        35                  40                  45

Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val
    50                  55                  60

Lys Ser Phe Val Ile Asp Gly Gly Ala Gly Asn Asp Thr Ile Thr Gly
65                  70                  75                  80

Thr Ser Gly Asn Asp Thr Ile Ser Gly Gly Ala Gly Ser Asp Thr Met
                85                  90                  95

Ser Gly Gly Ala Gly Asn Asp Thr Phe Leu Ile Ser Asn Asn Asp Gly
            100                 105                 110

Ser Thr Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly
        115                 120                 125

Asn Trp Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu
    130                 135                 140

Gln Gly Ile Glu Val Ile Asp Gly Gly Asp Gly Thr Pro Ala Tyr Asn
145                 150                 155                 160

Thr Ile Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met
                165                 170                 175

Thr Val Lys Ser
            180
```

<210> 94
<211> 137
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 94

```
Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp
1               5                   10                  15

Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly
            20                  25                  30

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

Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val
    50                  55                  60

Lys Ser Phe Val Ile Asp Gly Gly Ala Gly Asn Asp Thr Ile Thr Gly
65                  70                  75                  80

Thr Ser Gly Asn Asp Thr Ile Ser Gly Gly Ala Gly Ser Asp Thr Met
```

85 90 95

Ser Gly Gly Ala Gly Asn Asp Thr Phe Leu Ile Ser Asn Asn Asp Gly
100 105 110

Ser Thr Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly
115 120 125

Asn Trp Ser Tyr Asp Thr Leu Lys Val
130 135

<210> 95
<211> 180
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 95

Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp
1 5 10 15

Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly
20 25 30

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

Gln Ala Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val
50 55 60

Lys Ser Phe Val Ile Asp Gly Gly Ala Gly Asn Asp Thr Ile Thr Gly
65 70 75 80

Thr Ser Gly Asn Asp Thr Ile Ser Gly Gly Ala Gly Ser Asp Thr Met
85 90 95

Ser Gly Gly Ala Gly Asn Asp Thr Phe Leu Ile Ser Asn Asn Asp Gly
100 105 110

Ser Thr Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly
115 120 125

Asn Trp Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu
130 135 140

Gln Gly Ile Glu Val Ile Asp Gly Gly Asp Gly Thr Pro Ala Tyr Asn
145 150 155 160

Thr Ile Gln Gly Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met
165 170 175

Thr Val Lys Ser
180

<210> 96
<211> 115
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 96

Asp Thr Phe Ile Gly Gly Asp Gly Thr Asp Thr Ile Met Gly Asn Trp
1 5 10 15

Ser Tyr Asp Thr Leu Lys Val Asp Asn His Leu Ala Asn Leu Gln Gly
20 25 30

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

Gln Ala Gly Ser Gly Asn Asp Glu Leu Asp Phe Ser Gly Met Thr Val
50 55 60

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

Thr Ala Gly Ala Asp Thr Ile Gln Ala Gly Thr Gly Asn Asp Thr Val
85 90 95

Ile Ala Asn Gln Gly Ser Val Gly Ser Asp Val Tyr His Gly Gly Ala
100 105 110

Gly Thr Asp
115

<210> 97
<211> 104
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 97

Asn Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser
1 5 10 15

Gly Ala Val Ala Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr Phe
20 25 30

Thr Lys Ala Gln Leu Leu Ala Asn Ala His Asp Val Asp Thr His Asp
35 40 45

Thr Leu Ser Val Ser Asn Leu Thr Ser Thr His Gly Ser Ile Val Asp
50 55 60

Asn Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Asn Tyr Ser Gly
65 70 75 80

His Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly Thr Ala
85 90 95

Ala Gly Ser Ala Ala Leu Asp Val
100

<210> 98
<211> 909
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 98

Asp Ile Ala Leu Gly Asp Ser Leu Thr Tyr Gly Leu Thr Phe Leu Asp
1 5 10 15

Ala Asp Gly Asn Val Ile Pro Thr Pro Asp Trp Val Glu Phe Asp Ala
20 25 30

Ala Thr Gly Gln Leu Ser Gly Thr Pro Asp Asn Ser Asp Val Gly Ala
35 40 45

Phe Gln Ile Gln Val Thr Ala Thr Asp Glu Ser Gly Ala Thr Ala Thr
50 55 60

Thr Glu Pro Phe Thr Val Ser Val Ala Asp Val Asp Asn Ala Ala Glu
65 70 75 80

Ile Ser Val Thr Gly Gly Glu Gly Asp Glu Ser Thr Thr Asn Ala Ala
85 90 95

Thr Val Val Thr Gly Gln Ile Glu Ala Ser Asp Ala Asp Gly Gly Ile
100 105 110

Val Ser Phe Ala Val Val Ala Gly Gly Asp His His Gly Ser Leu Thr
115 120 125

Val Asn Ala Asp Gly Ser Phe Ser Phe Thr Ala Glu Asp Ala Asn Trp
130 135 140

Asn Gly Thr Asp Ser Phe Gln Val Gln Leu Thr Asp Gly Glu Gly Asn
145 150 155 160

Val Tyr Thr Gln Ser Leu Thr Ile Thr Val Asp Pro Thr Asn Asp Ala
165 170 175

Pro Val Val Thr Met Gly Val Asp Leu Gly Thr Gly Thr Glu Asp Gln
180 185 190

Arg Ile Ile Ile Ser Lys Ser Asp Leu Val Glu Asn Ala Ser Asp Val
195 200 205

Asp Gly Asp Ala Leu Ala Ala Ala Asn Ile Ser Ala Asp His Gly Thr

210 215 220

Ile Ile Asp Asn Gly Asn Gly Thr Ile Thr Phe Val Pro Asp Ala Asn
225 230 235 240

Tyr Asn Gly Asp Val Thr Phe Ser Tyr Thr Val Ser Asp Gly Gln Gly
245 250 255

Gly Thr Ala Ser Gly Thr Ala Thr Leu Asp Val Thr Ala Val Asn Asp
260 265 270

Gly Pro Val Val Ser Gly Thr Val Asp Leu Gly Asp Ser Leu Glu Asp
275 280 285

Gln Ala Val Ile Ile Ser Lys Glu Asp Leu Leu Gly Asn Ala Ser Asp
290 295 300

Val Asp Gly Asp Thr Leu Ser Ala Ala Asn Ile Ser Ala Asp His Gly
305 310 315 320

Thr Ile Val Asp Asn Gly Asp Gly Thr Ile Thr Phe Thr Pro Ala Ala
325 330 335

Asp Tyr His Gly Asp Val Thr Phe Thr Tyr Thr Val Ser Asp Gly Gln
340 345 350

Gly Gly Thr Thr Ser Gly Thr Ala Thr Leu Asp Leu Ala Asp Val Ser
355 360 365

Asp Asn Gln Gly Pro Val Ala Gly Asp Asp Gly Asp Asn Ile Asp Met
370 375 380

Ser Ala Gln Gly Pro Ala Leu Arg Leu Asn Ile Gly Asp Ala Thr Val
385 390 395 400

Ile Glu Gly Glu Asn Pro Met Ala Gly Leu Ala Asp Met Glu Asp Pro
405 410 415

Thr Ser Arg Ala Thr Thr Thr Asn Tyr Gly Ser Asp Leu Asn Ser Ser
420 425 430

Leu Thr Asn Asn Gly Asn Val Asp Asp Leu Val Ser Val Gly Arg Asp
435 440 445

Val Asn Ala Ser Ile Asn Ile Gly Asn Gly Asp Asp Gln Leu Ser Val
450 455 460

Gly Arg Asp Val Asn Ala Asn Val Asp Leu Gly Asn Gly Thr Asn Ala
465 470 475 480

Leu Asp Val Gly Gly Asp Val Asn Ala Ser Val Thr Thr Gly Ser Gly

485 490 495

Asn Asp Thr Val Arg Ile Gly Asp Glu Leu Asn Gly Arg Ile Asp Leu
500 505 510

Gly Asn Gly Asp Asn Arg Leu Glu Ile Gly Gly Ala Ala Asn Ala Ser
515 520 525

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

Asn Ser Gln Ala Thr Leu Gly Ser Gly Asp Asp Thr Leu Asp Ile Asp
545 550 555 560

Gly Ser Ala Tyr Ala Thr Ile Asp Ala Gly Ser Gly Asn Asp Ile Val
565 570 575

Thr Ile Gly Asn Asp Val Ser Ser Asn Ile Thr Leu Gly Ala Gly Asp
580 585 590

Asp Ile Leu Gln Val Thr Asp Asp Val Trp Ala Thr Ile Asp Ala Gly
595 600 605

Ser Gly Asp Asp Thr Val Ser Leu Gly Gly Asp Ile Ser Gly Lys Val
610 615 620

Asp Met Gly Ser Gly Asn Asp His Leu Thr Ile Thr Gly Gln Asn Leu
625 630 635 640

Trp Ser Thr Val Thr Gly Gly Ser Gly Thr Asp Ser Ile Glu Leu Thr
645 650 655

Gly Val Thr Lys Ala Gln Trp Asp Ala Asn Thr Asn Asn Ile Gln Gly
660 665 670

Tyr Val Lys Asp Phe Glu Asn Ile Lys Phe Ser Asp Gly Arg Val Ile
675 680 685

Gly Asp Ala Ser Ala Phe Glu Gly Asn Gly Gly Gly Glu Ser Asp Thr
690 695 700

Tyr Glu Tyr Pro Ile Glu Val Thr Ala Thr Leu Thr Asp Thr Asp Gly
705 710 715 720

Ser Glu Ser Leu Ser Ala Val Thr Leu Thr Asn Ile Pro Ala Gly Ala
725 730 735

Thr Val Met Leu Gly Asp Gln Val Leu Thr Ala Gly Asn Asp Gly Ser
740 745 750

Tyr Ser Val Asn Val Thr Ser Gly Ser Thr Val Thr Leu Thr Val Val

755 760 765

Ser Asp Gly Pro Leu Asp Leu Ser Gly Val Thr Ala Ser Val Thr Ser
770 775 780

Thr Glu Ala Asn Gly Gly Asp Thr Ala Thr Thr Thr Leu Val Gly Glu
785 790 795 800

Gly Ser Asn Ala Gly Glu Ala Ala Gln Glu Gly Ile His Val Ala Glu
805 810 815

Asp Gly Ser Ile Val Ile Asn Gly Ser Asn Leu Leu Ala Asn Asp Ser
820 825 830

Asp Ala Asp Gly Asp Thr Leu Thr Ile Val Ser Val Gly Asp Ala Glu
835 840 845

His Gly Ser Val Thr Leu Asn Pro Asp Gly Thr Ile Ser Phe Val Pro
850 855 860

Asp Ala Asn Tyr Gln Gly Glu Thr Ser Phe Thr Tyr Thr Val Ser Asp
865 870 875 880

Gly Gln Gly Gly Thr Ser Thr Ala Thr Val Asn Leu Thr Val Asp Ser
885 890 895

Asp Gly Ile Asn Glu Asn Val Ser Tyr Thr Ile Asp Ala
900 905

<210> 99
<211> 306
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 99

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

Gly Gly Asn Asp Lys Leu Tyr Gly Asp Gly Ala Thr Glu Gly Ser Gly
20 25 30

Gly Tyr Leu Tyr Ala Asp Leu Asp Ile Ser Gly Gly Ala Ser Asp Gly
35 40 45

Ser Ser Val Thr Tyr Thr Ile Ala Gly Leu Glu Ala Gly Val Gln Leu
50 55 60

Val Gln Asp Gly Val Val Leu Ser Ala Asp Ala Asn Gly Val Tyr Thr
65 70 75 80

Leu Asp Asp Val Ala Gly Leu Glu Leu Lys Ile Pro Asp Asn Gly Ser
85 90 95

```
Leu Thr Asp Ile Asp Phe Thr Val Gly Leu Leu Asp Ala Asn Gly Gln
            100                 105                 110

Gln Val Ala Ser Asp Thr Val Thr Met Asp Val Ser Asp Phe Ala Gly
        115                 120                 125

Leu Gly Ser Gly Asp Gly Asn Asp Thr Leu Ser Gly Gly Ser Gly Thr
    130                 135                 140

Asp Thr Leu Phe Gly Gly Gly Gly Asp Asp Val Leu Val Tyr Ser Ala
145                 150                 155                 160

Asp Gln Val Ser Asp Arg Asn Asp Ala Asp Tyr Gln Asp Gln Gly Gly
                165                 170                 175

Ala Ala Arg Asp Gly Thr Asp His Thr Val Asp Ser Asn Gly Leu Asn
            180                 185                 190

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

Met Ser Asp Gly Asn Asp Ala Ile Trp Ile Gly Asn Val Gln Gly Val
    210                 215                 220

Glu Val Ile Gln Ala Gly Ala Gly Asn Asp Val Val Asp Met Asn Tyr
225                 230                 235                 240

Ser Asp Gly Thr Ser Tyr Gly Asp Leu Thr Val Asp Gly Gly Ser Gly
                245                 250                 255

Asn Asp Ala Ile Phe Thr Asn Asp Gly Asp Asp Val Leu Ile Gly Gly
            260                 265                 270

Ser Gly Thr Asn Tyr Leu Ser Gly Asn Ala Gly Asn Asp Thr Phe Ile
        275                 280                 285

Gly Gly Ser Gly Ser Asp Ala Met His Gly Gly Ala Gly Ala Asp Thr
    290                 295                 300

Val Asp
305
```

<210> 100
<211> 123
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 100

```
Thr Val Asp Gly Gly Ala Gly Asn Asp Thr Ile Trp Thr Gly Asn Gly
1               5                   10                  15
```

Asp Asp Thr Leu Ile Gly Gly Ala Gly Asp Asp Gln Leu Tyr Gly Glu
20 25 30

Ala Gly Ser Asp Thr Phe Leu Phe Asp Phe Gly Ser Gly His Asp Thr
35 40 45

Val Asn Gly Gly Gly Gly Ser Trp Thr Asp Thr Leu Asp Phe Ser Asp
50 55 60

Ala Val Gly Gln Thr Phe Val Ile Thr Thr Asp Ser Gly Glu Ser Trp
65 70 75 80

Thr Ile Gln Val Asp Gly Glu Asn His Gly Thr Leu Asp Ile Gly Asp
85 90 95

Asn Ala Ser Gly Glu Val His Leu Asn Thr Ala Asn Gly Glu Thr Val
100 105 110

Val Asp Phe Asp Asn Ile Glu Gln Ile Lys Trp
115 120

<210> 101
<211> 745
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 101

Ser Asp Thr Val Thr Tyr Thr Val Thr Ser Ala Asp Gly Ser Thr Leu
1 5 10 15

Thr Asn Thr Met Asn Leu Asn Val Ala Asn Val Asp Asp Ala Pro Gln
20 25 30

Val Thr Leu Ala Gly Gly Ser Gly Asp Glu Asp Thr Val Ile Thr Gly
35 40 45

Ser Ile Gly Val Ala Asp Val Asp Asn Gln Gly Ala Ala Ser Thr Leu
50 55 60

Glu Leu Val Gly Asp Ala Gln His Gly Thr Val Thr Leu Asn Ser Asn
65 70 75 80

Gly Thr Tyr Ser Phe Val Ala Ser Asp Ala Asn Trp Asn Gly Thr Asp
85 90 95

Thr Phe Thr Val Arg Ile Thr Asp Ala Gln Gly Ala Val Thr Glu Gln
100 105 110

Val Val Glu Val Asn Val Gly Ala Val Asp Asp Ala Thr Met Val Ser
115 120 125

```
Ala Pro Val Asp Leu Gly Ala Val Thr Glu Asp Ser Gly Thr Ile Thr
    130                 135                 140

Ile Ala Ala Ser Asp Leu Leu Ala Asn Ala Ser Asp Val Asp Asn Ala
145                 150                 155                 160

Leu Ser Val Asp Asn Val Lys Ile Asn Gly Val Glu Leu Val Asp Asn
                165                 170                 175

Gly Asp Gly Thr Tyr Ser Tyr Thr Pro Pro Ala Asp Phe Asn Gly Gln
            180                 185                 190

Ile Asp Val Thr Tyr Asp Val Val Thr Asp Thr Gly Ile Ala Thr Pro
        195                 200                 205

Ala Thr Ala Ser Ile Asp Val Thr Ala Val Asp Asp Ala Thr Val Val
    210                 215                 220

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

Thr Ile Ala Ala Ser Asp Leu Leu Ala Asn Ala Ser Asp Val Asp Asn
                245                 250                 255

Ala Leu Ser Val Asp Asn Val Lys Ile Asn Gly Val Glu Leu Val Asp
            260                 265                 270

Asn Gly Asp Gly Thr Tyr Ser Tyr Thr Pro Pro Ala Asn Phe Asn Gly
        275                 280                 285

Gln Ile Asp Val Thr Tyr Asp Val Val Thr Asp Thr Gly Ile Ala Thr
    290                 295                 300

Pro Ala Thr Ala Ser Ile Asp Val Thr Ala Val Asp Asp Ala Thr Met
305                 310                 315                 320

Val Ser Ala Pro Val Asp Leu Gly Ala Val Asp Glu Asp Ser Gly Val
                325                 330                 335

Ile Thr Ile Ala Ala Ser Asp Leu Leu Ala Asn Ala Ser Asp Val Asp
            340                 345                 350

Asn Ala Leu Ser Val Asp Asn Val Lys Ile Asn Gly Val Glu Leu Val
        355                 360                 365

Asp Asn Gly Asp Gly Thr Tyr Ser Tyr Thr Pro Pro Ala Asp Phe Asn
    370                 375                 380

Gly Thr Ile Asp Val Thr Tyr Asp Val Val Thr Asp Thr Gly Ile Ala
385                 390                 395                 400
```

```
Thr Pro Ala Thr Ala Ser Ile Asp Val Asn Ala Val Glu Asp Ala Ala
                405                 410                 415

Gln Leu Asp Ser Pro Ser Glu Val Asp Leu Thr Val Gly Gln Asp Gly
            420                 425                 430

Ile Gly Thr Gly Asp Leu Asp Ala Ser Asp Ala Asp Gly Asp Thr Leu
        435                 440                 445

Thr Tyr Gly Ile Val Asp Pro Ala Thr Gly Glu Leu Val Gly Gln Leu
    450                 455                 460

Glu Thr Asp Tyr Gly Thr Val Val Val Asp Pro Ala Thr Gly Glu Tyr
465                 470                 475                 480

Thr Phe Thr Pro Asn Asp Asn Ala Ala Thr Leu Asp Asp Asn Gln Ser
                485                 490                 495

Ala Ser Asp Ala Phe Gln Val Ala Ala Ser Asp Gly Thr Ser Ile Ser
            500                 505                 510

Glu Pro Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro
        515                 520                 525

Val Val Glu Thr Thr Thr Ser Ser Leu Thr Met Ser Glu Asp Gly Ser
    530                 535                 540

Ala Glu Gly Ala Ile Ala Gly Ser Asp Val Asp Ala Gly Asp Thr Val
545                 550                 555                 560

Ser Tyr Tyr Leu Val Asp Glu Asn Gly Asp Arg Val Thr Thr Leu Val
                565                 570                 575

Thr Asp Asn Gly Ser Val Thr Ile Asp Ser Glu Thr Gly Gln Tyr Thr
            580                 585                 590

Phe Thr Ala Ala Asp Gly Leu Asn Ser Leu Asn Asp Gly Asp Ser Val
        595                 600                 605

Thr Asp Ser Phe Gln Val Val Ala Trp Asp Gly Thr Ala Ala Ser Ala
    610                 615                 620

Pro Gln Asp Val Ser Val Thr Ile Asn Gly Ser Asp Asp Ala Thr Val
625                 630                 635                 640

Val Thr Gly Ser Val Asp Leu Gly Asp Val Thr Glu Asp Thr Gly Val
                645                 650                 655

Ile Thr Ile Ser Ala Glu Asp Leu Leu Ala Asn Ala Ser Asp Val Asp
            660                 665                 670
```

Asn Ala Leu Ser Val Asp Asn Val Lys Ile Asn Gly Val Glu Leu Val
675 680 685

Asp Asn Gly Asp Gly Thr Tyr Ser Tyr Thr Pro Pro Ala Asp Phe Asn
690 695 700

Gly Thr Ile Asp Val Thr Tyr Asp Val Val Thr Asp Thr Gly Ile Ala
705 710 715 720

Thr Pro Ala Thr Ala Ser Ile Asp Val Thr Ala Val Asp Asp Ala Thr
725 730 735

Val Val Ser Ala Pro Val Asp Leu Gly
740 745

<210> 102
<211> 387
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 102

Thr Asp Ser Phe Thr Val Phe Val Thr Asp Asp Glu Gly Asn Thr Val
1 5 10 15

Ser Gln Val Val Glu Leu Asn Ile Ala Asn Val Asp Asp Ala Ala Val
20 25 30

Val Ser Val Thr Gly Gly Val Gly Asp Glu Ser Thr Thr Gly Asp Ala
35 40 45

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

Ile Gly Tyr Glu Val Val Ala Gly Asp His Pro Gly Ser Leu Thr Val
65 70 75 80

Asn Ala Asp Gly Thr Phe Thr Phe Val Ala Asp Asn Pro Asn Trp Asn
85 90 95

Gly Ser Glu Thr Phe Thr Val Lys Val Tyr Asp Asp Gln Gly Gly Ala
100 105 110

Thr Glu Val Pro Val Thr Ile Thr Val Asn Ala Thr Asp Asp Ala Val
115 120 125

Val Asp Asn Gly Ile Leu Ile Asp Leu Pro Gly Asp Asn Asp Pro Thr
130 135 140

Leu Val Ala Val Pro Asn Pro Val Glu Met Gln Glu Asp Ser Ser Leu
145 150 155 160

Arg Phe Ala Ile Asp Ala Thr Asp Pro Asp Gly Ser Pro Val Thr Ile

165 170 175

Ser Phe Glu Gln Pro Ala His Gly Ser Val Ile Asp Asn Gly Asp Gly
180 185 190

Thr Phe Thr Tyr Gln Pro Ser Asp Asn Tyr Phe Gly Ser Asp Thr Val
195 200 205

Thr Tyr Thr Val Thr Ser Ala Asp Gly Ser Thr Leu Thr Asn Thr Met
210 215 220

Asn Leu Asn Val Ala Asn Val Asp Asp Ala Pro Gln Val Thr Leu Ala
225 230 235 240

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

Ala Asp Val Asp Asn Gln Gly Ala Ala Ser Thr Leu Glu Leu Val Gly
260 265 270

Asp Ala Gln His Gly Thr Val Thr Leu Asn Ser Asn Gly Thr Tyr Ser
275 280 285

Phe Val Ala Ser Asp Ala Asn Trp Asn Gly Thr Asp Thr Phe Thr Val
290 295 300

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

Asn Val Gly Ala Val Asp Asp Ala Thr Met Val Ser Ala Pro Val Asp
325 330 335

Leu Gly Ala Val Thr Glu Asp Ser Gly Thr Ile Thr Ile Ala Ala Ser
340 345 350

Asp Leu Leu Ala Asn Ala Ser Asp Val Asp Asn Ala Leu Ser Val Asp
355 360 365

Asn Val Lys Ile Asn Gly Val Glu Leu Val Asp Asn Gly Asp Gly Thr
370 375 380

Tyr Ser Tyr
385

<210> 103
<211> 54
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 103

Thr Phe Asp Asn Thr Glu Val Ser Ser Val Val Lys Ser Asp Thr Val
1 5 10 15

Asp Gly Gly Ala Gly Asn Asp Thr Ile Trp Thr Gly Asn Gly Asp Asp
20 25 30

Thr Leu Ile Gly Gly Ala Gly Asp Asp Gln Leu Tyr Gly Glu Ala Gly
35 40 45

Ser Asp Thr Phe Leu Phe
50

<210> 104
<211> 1857
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 104

Met Pro Thr Cys Arg Pro Leu Gly Ala Gly Glu Ser Met Thr Lys Thr
1 5 10 15

Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val
20 25 30

Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr
35 40 45

Gly Ala Val Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser
50 55 60

Val Ala Asp Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val
65 70 75 80

Gln Thr Asp Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr
85 90 95

Phe Gln Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly
100 105 110

Glu Ser Met Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala
115 120 125

Thr Gln Asn Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr
130 135 140

Val Ser Gly Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val
145 150 155 160

Thr Phe Thr Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala
165 170 175

His Asp Thr Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile
180 185 190

```
Val Asp Asn Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Thr Phe
        195                 200                 205

Ser Gly His Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly
    210                 215                 220

Thr Thr Thr Gly Ser Ala Ala Leu Asp Val Asp Ala Val Ala Asp Arg
225                 230                 235                 240

Ala Thr Val Ser Val Ala Ile Gly Ala Pro Val Glu Thr Pro Asn Gly
                245                 250                 255

Ser Phe Thr Val Thr Asn Leu Asp Ser Thr Ala Ser Ala Gly Tyr Asn
            260                 265                 270

Asn Thr Tyr Gly Tyr Tyr Val Met Asp Asp Ser Gly Asn Pro Thr Ser
        275                 280                 285

Gly Gly Val Ile Trp Ser Asn Val His Ala Ser Pro Gly Ala Ser Val
    290                 295                 300

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

Asp Gly Gly Ser Gln Asn Ser Gly Leu Ala Asn Gly Ala Ala Leu Thr
                325                 330                 335

Phe Ser Lys Asp Ala Ser Gly Asn Trp Gln Ala Ser Asp Ser Ala Gly
            340                 345                 350

His Val Leu Ser Gly Ala Gly Thr Lys Val Leu Phe Asp Lys Ser Ala
        355                 360                 365

Leu Asn Gly Asp His Met Val His Ser Glu Asp Thr Ser Ala Val Ser
    370                 375                 380

Gly Asn Gln Asn Trp Glu Asp Leu Thr Gly Gly Gly Asp Arg Asp Tyr
385                 390                 395                 400

Asn Asp Val Asn Met Ser Val Thr Trp Gly Asn Ala Ala Pro Thr Ala
                405                 410                 415

Thr His Pro Leu Thr Val Ser Ala Ser Phe Pro Asp Met Asp Gly Ser
            420                 425                 430

Glu Gly His Ala Val Lys Ile Ser Gly Leu Pro Ser Gly Ser Thr Leu
        435                 440                 445

Tyr Gln Asn Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser
    450                 455                 460
```

```
Leu Asn Pro Ala Gln Leu Gly Gly Leu Ser Val Lys Thr Pro Ala Gly
465                 470                 475                 480

Phe Asn Gly Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly
                485                 490                 495

Thr Ser Val Ala Ser Ser Thr Ala Ser Ala Thr Val His Asp Asp Leu
            500                 505                 510

Ser Asn His Gly Pro Asp Ala Gly Asp Ala Thr Ser Val His Gly Ala
        515                 520                 525

Met Gly Ala Thr Ile Thr Gly Ala Ala Gly Val Thr Asp Ser Asp Gly
    530                 535                 540

Asp His Leu Ser Tyr Ala Val Gly Thr Gly Thr Ser Gly Pro Gln His
545                 550                 555                 560

Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe Thr Tyr Thr Pro Ser
                565                 570                 575

Gly Asn Tyr Ser Gly Thr Asp Thr Phe Lys Ile Thr Val Ser Asp Gly
            580                 585                 590

His Gly Gly Thr Ala Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly
        595                 600                 605

Ala Pro Thr Leu Thr Thr Ala Asn Ala Ala Thr Ala Asn Asp His Ser
    610                 615                 620

Ala Val Thr Gly His Val Thr Gly Ser Asp Thr Pro Gly Asp Thr Leu
625                 630                 635                 640

Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val Gly Ser Leu Val
                645                 650                 655

Thr Asp His Gly Thr Val Ser Ile Asn Ala Ala Thr Gly Asp Tyr Thr
            660                 665                 670

Phe Thr Pro Asn Ala Ala Asn Ala Ser Leu Gly Val Gly Ala Ser Val
        675                 680                 685

Thr Asp Ser Phe Lys Val Val Ala Thr Asp Asn His Gly Ala Asp Ser
    690                 695                 700

Asn Leu Gly Thr Val Ala Val Thr Val Thr Gly Ser Asn Asp Gly Pro
705                 710                 715                 720

Val Val Thr Gly Val Thr Gly Gly Thr Gly Asn Glu Ser Ile Thr Ser
                725                 730                 735
```

```
Ala Arg Ser Val Val Thr Gly His Ile Ser Ala Gly Asp Val Asp Ala
            740                 745                 750

Gly Asp Thr Leu Ser Tyr Ser Val Thr Asp Asn Ala Ala Ala Gly His
        755                 760                 765

His Gly Thr Leu Ala Val Asn Ala Ser Gly Asp Tyr Thr Phe Thr Ala
    770                 775                 780

Ser Asp Ser Asn Trp His Gly Thr Asp Ser Phe Thr Val Gln Val Ser
785                 790                 795                 800

Asp Gly His Gly Gly Thr Val Asn Gln Thr Val Ala Ile Thr Val Asn
                805                 810                 815

Ala Gln Ala Asp Ala Ala Thr Ile Asn Ala Gln Asp Ala Ser Met Ala
            820                 825                 830

Ala Gln Ser Gly Ala Thr Phe Thr Ala Ser Gly Gly Tyr Ala Glu Gly
        835                 840                 845

Gly Ser Gly Ser Asp Ile Ile Asn Gly Ser Ser Ala Asn Asp Ile Leu
    850                 855                 860

Tyr Gly Asp Asp Pro Ser Gly Asp Thr Glu Val Thr Val Ala Leu Asn
865                 870                 875                 880

Ile Ser Ala Ala Ala Ile Ser Gly Glu Ser Val Ser Ser Ile Thr Leu
                885                 890                 895

Ser Asn Leu Pro Gly Gly Ala Val Leu Asn His Gly His Asp Asn Gly
            900                 905                 910

Asp Gly Thr Trp Thr Leu Ala Pro Gly Asp Leu Thr Gly Leu Thr Leu
        915                 920                 925

Thr Ser Asn Asn Gly Ile Gly Gly Thr Val Asp Val Ala Val Thr Thr
    930                 935                 940

Leu Asp Gly Thr Ser Thr Ala Val Thr Asn Ser Ser Phe Asn Val Ser
945                 950                 955                 960

Phe Ser Gly Gly Phe Asn Asp Thr Ile Thr Gly Gly Val Gly Ala Asp
                965                 970                 975

Thr Met Tyr Gly Gly Ala Gly Asn Asp Thr Phe Lys Val Ser Gly Ala
            980                 985                 990

Ser Glu Ser Thr Gly Asp Ile Tyr  Asp Gly Gly Ser Gly  Thr Asp Thr
        995                 1000                1005
```

```
Val Leu  Gly Ser Ser Gly Asn  Asp Val Ile Ser Val  Thr Ser Asn
    1010                 1015                 1020

Leu Gly  Asn Met Arg Ser Ile  Glu Val Ile Asp Gly  Gly Ala Gly
    1025                 1030                 1035

Thr Asp  Thr Leu Leu Ala Gly  Ser Gly Asn Asp Tyr  Leu Asp Phe
    1040                 1045                 1050

Ser Gly  Thr Thr Ile Arg Gly  Val Glu Val Ile Asp  Thr Gly Ala
    1055                 1060                 1065

Gly Asn  Asp Val Ile Thr Gly  Ser Ala Gly Ala Asp  Thr Ile Leu
    1070                 1075                 1080

Thr Gly  Thr Gly Asp Asp Thr  Val Val Ala Ile Gly  Gly Gln Thr
    1085                 1090                 1095

Ala Gly  Asp Val Tyr Asp Gly  Gly Ala Gly Thr Asp  Thr Leu Asn
    1100                 1105                 1110

Val Asp  Leu Thr Pro Ala Gln  Tyr Thr Thr Ala Val  Arg Leu Glu
    1115                 1120                 1125

Leu Met  Ser Phe Ala Ser Phe  Val Asp Asn Pro Ala  Asn Ala Gly
    1130                 1135                 1140

Lys Ser  Phe Thr Phe Gln Ser  Leu Gly Gly Leu Lys  Ala Thr Asn
    1145                 1150                 1155

Phe Glu  Asp Leu Arg Val Thr  Val Asp Gly Asn Asp  Val Asp Leu
    1160                 1165                 1170

Asn His  Pro Pro Gln Val Thr  Ser Val Glu Ser Asn  Tyr Thr Ala
    1175                 1180                 1185

Gly His  Ala Asp Gly Val Val  His Ala Thr Asp Ser  Asp Gly Asp
    1190                 1195                 1200

Thr Met  Ser Tyr Ser Phe Gly  Thr Asn Thr Asn Gly  Thr Pro Ile
    1205                 1210                 1215

Thr Ser  Met Ala Thr Ala His  Gly Thr Val Thr Ile  Asp Ser Ser
    1220                 1225                 1230

Thr Gly  Glu Tyr His Phe Thr  Ala Ser Asp Ala Asn  Phe Lys Gly
    1235                 1240                 1245

Thr Asp  Thr Phe Ser Val Thr  Val Lys Asp Gly Met  Gly Gly Thr
    1250                 1255                 1260
```

```
Thr Thr  Gln Lys Val Asn Leu  Asp Phe Asn Pro Gly  Asp Asp Ala
    1265                1270                1275

Thr Val  Val Thr Gly Pro Thr  Ser Leu Gly Gly Ser  Asp Glu Asp
    1280                1285                1290

Thr Gln  Thr Phe Ile Arg Thr  Asp Gln Leu Leu Ala  Asn Ala Thr
    1295                1300                1305

Asp Val  Asp Asn Thr Leu His  Val Ala Asn Leu Ser  Ala Val Asp
    1310                1315                1320

Ser His  Gly Ala Val Val Gly  Ser Phe Val His Ala  Val Asp Ala
    1325                1330                1335

Asp Gly  His Asp Gly Tyr Ala  Phe Thr Pro Asn Ala  Asn Phe Ala
    1340                1345                1350

Gly Asp  Val Thr Val Asn Tyr  Asp Val Val Thr Asp  Thr Gly Ile
    1355                1360                1365

Ala Thr  His Thr Ser Gly Ser  Leu His Val Asp Ala  Val Ala Asp
    1370                1375                1380

Ala Ala  Thr Phe Asp Ala Thr  Ile Gly Ser Asn Gly  Val Ser Val
    1385                1390                1395

Ala His  Leu Gly Asn Asp Ser  Lys Val Val Asn Leu  Phe Val Asn
    1400                1405                1410

Asp Thr  Ser Ser Gly Thr Ala  Gly Phe Asp Ile Tyr  Leu Gly Gly
    1415                1420                1425

Thr Asn  Ile Gly His Tyr Thr  Val Gly Arg Ser Tyr  Ser Ser Asp
    1430                1435                1440

Lys Ser  Val Ser Leu Thr Leu  Thr Asp Ala Gln His  Thr Gln Leu
    1445                1450                1455

Leu Asn  Gly Ala Asp Ile Lys  Ile Val Asp Asn Asp  Gly Tyr Asn
    1460                1465                1470

Thr Arg  Asp Val Leu Val Asp  Arg Ile Gln Val Asp  Gly Leu Thr
    1475                1480                1485

Phe Gln  Ala Glu Asn Gly Ile  Leu Ser Gly Ala Ser  Thr Thr Ser
    1490                1495                1500

Gly Tyr  Tyr Gly Val Ser Ser  Glu Thr Tyr Ala Arg  Leu Asn Asn
    1505                1510                1515
```

```
Val Gly  Ser Ser Val Thr Phe  Asp Phe Asp Ser Ser  Val Ser His
    1520                 1525                 1530

Thr Ser  Ser Gly Tyr His Val  Asp Leu Ala Gly His  Leu Asn Asp
    1535                 1540                 1545

Thr Asp  Gly Ser Glu Thr Leu  Ser Tyr His Ile Asp  Ala Met Thr
    1550                 1555                 1560

Thr Gly  Ala Ser Leu Ser Tyr  Thr Gly Asn Glu Gly  Thr Leu Val
    1565                 1570                 1575

His Asn  Thr Asp Gly Ser Trp  Asp Phe Asn Val Asp  Ala Ser His
    1580                 1585                 1590

Tyr Asp  Gly Ala Val Ser Leu  Asn Leu Asn Val Ala  Asn Gly Thr
    1595                 1600                 1605

Ala Gly  Phe Asp Val His Val  Thr Ala Asn Ala Thr  Glu Thr Ser
    1610                 1615                 1620

Asn Leu  Asp Val Ala Gly Val  Gly Asp Thr Val His  Cys Asp Gly
    1625                 1630                 1635

Ala Ile  Gly Gly Ala Gly Ala  Ile Pro Gly Ile Thr  Leu Val Gly
    1640                 1645                 1650

Asn Ala  Gly Asn Asp Asp Ile  Ile Gly Thr Asn Gly  Asn Asp Leu
    1655                 1660                 1665

Leu Leu  Gly Gly Lys Gly Gly  Ala Thr Tyr Arg Phe  Ser Gly Gly
    1670                 1675                 1680

Gly Cys  Gly Ser Gly Gly Gly  Trp Ser Ile Val Gln  Ser Asp Thr
    1685                 1690                 1695

Asn Asp  Val Ile Ser Ala Gly  Ala Gly Asp Asp Val  Ile Tyr Gly
    1700                 1705                 1710

Asp Ala  Arg Leu Val Asn Gly  Asn Ile Gln Ile Thr  Gly Ser Gly
    1715                 1720                 1725

Asn Asp  Val Leu Asp Gly Gly  Ser Gly Asn Asp Gln  Ile His Gly
    1730                 1735                 1740

Gly Ala  Gly Asn Asp Thr Ile  Ile Gly Gly Thr Gly  Asp Asp Val
    1745                 1750                 1755

Met Phe  Gly Asp Gln Gly Asn  Asp Thr Phe Leu Phe  Asp Phe Gly
    1760                 1765                 1770
```

Phe Gly His Asp Val Val Asp Gly Gly Arg Gly Ser Asn Trp Thr
1775 1780 1785

Asp Thr Leu Asp Leu Thr His Asp Asn Gln Ile Ser Ser Val Asn
1790 1795 1800

Ile Glu Gly Val Ser Gly Trp Ala Val Ser Val Asp Ala Gln Gly
1805 1810 1815

His His Val Ala Gln Ala Thr Asn Gly Ala His Asp Ala Asn Gly
1820 1825 1830

Thr Ile Val Val Thr Asn His Asp Gly Ser Gln Asp Thr Ile Glu
1835 1840 1845

Phe His Asn Val Glu Lys Val Val Trp
1850 1855

<210> 105
<211> 1439
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 105

His Leu Val Asp Gly Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala
1 5 10 15

His Gly Thr Val Ser Ile Asn Thr Ala Thr Gly Asp Tyr Thr Phe Thr
20 25 30

Pro Thr Gly Asp Ser Ser Leu Gly Val Gly Gln Thr Leu Gly Asp Ser
35 40 45

Phe Lys Val Val Ala Val Asp Asn His Gly Ala Ala Ser Ala Pro Ser
50 55 60

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

Val Ala Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile Thr Gly His
85 90 95

Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Ala Tyr His Leu
100 105 110

Val Asp Gly Asn Gly Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly
115 120 125

Thr Val Thr Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe Thr Pro Thr
130 135 140

```
Gly Asp Ala Ser Val Gly Val Gly Gln Thr Leu Gly Asp Ser Phe Lys
145                 150                 155                 160

Val Val Ala Val Asp Asn His Gly Ala Ala Ser Ala Pro Ser Thr Val
                165                 170                 175

Ala Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Val Ala
            180                 185                 190

Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile Thr Gly His Ala Thr
        195                 200                 205

Gly Ala Asp Val Asp Thr Gly Asp Thr Val Arg Tyr His Leu Met Asp
    210                 215                 220

Ala Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly Thr Val
225                 230                 235                 240

Thr Ile Asn Ala Ala Thr Gly Asp Tyr Thr Phe Thr Pro Thr Gly Asp
                245                 250                 255

Ser Ser Leu Gly Val Gly Gln Thr Leu Gly Asp Ser Phe Lys Val Val
            260                 265                 270

Ala Val Asp Asn His Gly Ser Ala Ser Ala Ala Ser Thr Val Asn Val
        275                 280                 285

Thr Ile Thr Gly Ser Asn Asp Gly Pro Val Val Ser Ser Val Thr Gly
    290                 295                 300

Gly Thr Gly Asn Glu Ser Thr Thr Ser Ala Asn Ser Val Val Thr Gly
305                 310                 315                 320

His Ile Thr Ala Ser Asp Val Asp Ala Thr Asp Thr Leu Ser Tyr Ser
                325                 330                 335

Val Thr Asp Asn Ala Ala Ala Gly His His Gly Thr Leu Ala Val Asn
            340                 345                 350

Ala Ser Gly Asp Phe Thr Phe Thr Ala Ser Asp Ser Asn Trp His Gly
        355                 360                 365

Thr Asp Ser Phe Thr Val Gln Val Ser Asp Gly His Gly Gly Thr Val
    370                 375                 380

Asn Gln Ser Val Gly Ile Thr Val Asn Ala Gln Ala Asp Ala Ala Thr
385                 390                 395                 400

Ile Asn Ala Gln Asp Ala Ser Met Ser Ala Gln Ser Gly Ala Thr Tyr
                405                 410                 415
```

```
Thr Ala Ser Asp Gly Tyr Ala Gln Gly Gly Ser Gly Ser Asp Ile Ile
            420                 425                 430

Asn Gly Ser Thr Ala Asn Asp Thr Leu Tyr Gly Asp Asp Pro Thr Gly
        435                 440                 445

Asp Thr Ser Val Thr Val Asn Leu Asn Ile Ser Ala Ser Ala Ile Thr
    450                 455                 460

Gly Glu Ser Val Gly Ser Ile Thr Leu Ser Asn Ile Pro Gly Gly Ala
465                 470                 475                 480

Thr Leu Asn His Gly Val Asp Asn Gly Asp Gly Thr Trp Thr Leu Ala
                485                 490                 495

Pro Ala Asp Leu Thr Gly Leu Gln Leu Thr Ser Pro Thr Gly Met Gly
            500                 505                 510

Gly Ser Ile Asn Val Ala Val Thr Thr Leu Asp Gly Thr Ser Thr Ala
        515                 520                 525

Val Thr Asn Ser Ser Phe Asn Val Ser Phe Ser Gly Gly Phe Asn Asp
    530                 535                 540

Thr Ile Thr Gly Gly Ala Gly Ala Asp Thr Met Tyr Gly Gly Ala Gly
545                 550                 555                 560

Asn Asp Thr Phe Lys Val Ser Gly Ala Thr Glu Ser Val Gly Asp Ile
                565                 570                 575

Tyr Asp Gly Gly Ser Gly Val Asp Thr Ile Leu Gly Ser Ser Gly Ala
            580                 585                 590

Asp Val Ile Ser Val Thr Ser Asn Leu Gly Asn Met His Ser Ile Glu
        595                 600                 605

Val Ile Asp Gly Gly Ala Gly Thr Asp Thr Leu Leu Ala Gly Ser Gly
    610                 615                 620

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

Ile Asp Thr Gly Ala Gly Asn Asp Val Ile Thr Gly Ser Ala Gly Ala
                645                 650                 655

Asp Thr Ile Leu Thr Gly Thr Gly Asp Asp Thr Val Val Ala Ile Gly
            660                 665                 670

Gly Gln Thr Thr Gly Asp Val Tyr Asp Gly Gly Ala Gly Phe Asp Thr
        675                 680                 685
```

```
Leu Asn Val Asp Leu Thr Pro Ala Gln Tyr Thr His Ala Val Arg Leu
    690                 695                 700

Glu Leu Met Asn Phe Ala Ser Phe Val Asp Asp Pro Ala Asn Ala Gly
705                 710                 715                 720

Lys Ser Phe Thr Phe Gln Ser Leu Gly Gly Leu Lys Ala Thr Asn Phe
                725                 730                 735

Glu Asp Leu Arg Val Thr Val Asp Gly Asn Asp Val Asp Leu Asn His
            740                 745                 750

Pro Pro Gln Val Thr Ser Val Glu Ser Asn Tyr Thr Thr Gly His Ala
        755                 760                 765

Asp Gly Ala Val His Val Thr Asp Ser Asp Gly Asp Thr Leu Ser Tyr
    770                 775                 780

Ser Leu Gly Thr Asn Ala Asn Gly Ser Pro Ile Thr Ser Met Ala Thr
785                 790                 795                 800

Ala His Gly Thr Val Ser Ile Asp Ala Ala Thr Gly Glu Tyr His Phe
                805                 810                 815

Thr Ser Ser Asp Pro Asn Phe Lys Gly Thr Asp Ser Phe Asn Val Thr
            820                 825                 830

Val Asn Asp Gly Met Gly Gly Thr Thr Thr Gln Lys Val Asn Leu Asp
        835                 840                 845

Phe Asn Pro Gly Asp Asp Ala Thr Val Val Thr Gly Pro Thr Ala Leu
    850                 855                 860

Gly Thr Ser Thr Glu Asp Ala Gln Thr Phe Ile Arg Thr Asp Gln Leu
865                 870                 875                 880

Leu Ala Asn Ser Thr Asp Val Asp Asn Thr Leu His Val Ala Asn Leu
                885                 890                 895

Ser Ala Val Asp Thr Asn Gly Asn Val Val Gly Ser Phe Val His Ala
            900                 905                 910

Val Asp Ala Asp Gly His Asp Gly Tyr Ala Phe Thr Pro Asn Ala Asn
        915                 920                 925

Trp Ser Gly Asp Val Thr Val Asn Tyr Asp Val Val Thr Asp Thr Gly
    930                 935                 940

Ile Ala Thr His Thr Ser Gly Ala Leu His Val Asp Ala Val Ala Asp
945                 950                 955                 960
```

```
Ala Ala Thr Phe Asp Ala Asn Ile Gly Ser Asn Gly Val Ser Val Ala
               965                 970                 975

His Leu Gly Asn Asp Ser Lys Ala Ile Asn Leu Tyr Val Asn Asp Ser
           980                 985                 990

Ser Ser Asn Ser Thr Ala Ala Gly  Phe Asp Val Tyr Leu  Gly Gly Thr
       995                 1000                1005

Asn Leu  Gly His Tyr Thr Val  Asn Arg Ser Thr Thr  Ser Asp Lys
   1010                1015                1020

Thr Val  Ser Leu Thr Leu Thr  Asp Ala Gln His Asp  Gln Leu Leu
   1025                1030                1035

Asn Gly  Ala Asp Ile Lys Ile  Val Asp Asn Asp Gly  Ser Asn Ser
   1040                1045                1050

Arg Asp  Val Leu Val Asp Arg  Ile Gln Val Asp Gly  Leu Thr Phe
   1055                1060                1065

Gln Ala  Glu Asn Gly Ile Met  Val Gly Ala Val Ser  Ser His Gly
   1070                1075                1080

Thr Ser  Gly Val Thr Ser Glu  Thr Tyr Ala Arg Leu  Asn Ser Ile
   1085                1090                1095

Gly Ser  Ser Val Thr Phe Asp  Leu Asp Thr Ser Val  Thr His Thr
   1100                1105                1110

Ala Ser  Gly Tyr His Val Asp  Leu Gly Gly His Leu  Asn Asp Thr
   1115                1120                1125

Asp Gly  Ser Glu Thr Leu Ser  Tyr His Ile Asp Ala  Leu Ala Thr
   1130                1135                1140

Gly Ala  Ser Leu Ser Tyr Thr  Gly Asn Glu Gly Thr  Leu Val His
   1145                1150                1155

Asn Thr  Asp Gly Ser Trp Asp  Phe Asn Val Asp Ser  Ser His Tyr
   1160                1165                1170

Asp Gly  Ala Ala Ser Leu Asn  Leu Asn Val Ala Gln  Gly Thr Thr
   1175                1180                1185

Gly Phe  Asp Val His Ile Thr  Ala Asn Ala Thr Glu  Thr Ser Asn
   1190                1195                1200

Leu Asp  Val Ala Gly Val Gly  Asp Val Val His Cys  Asp Gly Ala
   1205                1210                1215
```

Ile Gly Gly Gly Ser Ala Ile Pro Gly Ile Thr Leu Val Gly Asn
1220 1225 1230

Ser Gly Asn Asp Asp Leu Phe Gly Thr Asp Gly Asn Asp Leu Leu
1235 1240 1245

Leu Gly Gly Lys Gly Gly Tyr Thr Tyr Arg Tyr Ser Gly Gly Ser
1250 1255 1260

His Gly Gly Asn Val Gly Gly Cys Gly Tyr Ser Leu Val Asp Asn
1265 1270 1275

Gly Thr Asn Asp Val Ile Ser Ala Gly Ala Gly Asp Asp Ile Ile
1280 1285 1290

Tyr Gly Asp Ala Lys Met Val Asn Gly Ser Ile Gln Val Thr Gly
1295 1300 1305

Ala Gly Asn Asp Ile Leu Asp Gly Gly Ala Gly Asn Asp Gln Ile
1310 1315 1320

His Gly Gly Gly Gly Asn Asp Thr Ile Thr Gly Gly Thr Gly Asp
1325 1330 1335

Asp Val Met Phe Gly Asp Gln Gly Ser Asp Thr Phe Leu Phe Asp
1340 1345 1350

Phe Gly Phe Gly His Asp Val Val Asp Gly Gly Arg Gly Ser Asn
1355 1360 1365

Trp Thr Asp Thr Leu Asp Leu Thr His Asp Asn Gln Ile Ser Ala
1370 1375 1380

Val Asn Ile Glu Gly Val Ser Gly Trp Ala Val Ser Val Asp Ala
1385 1390 1395

Gln Gly His His Val Ala Gln Ala Thr Asn Gly Ala His Asp Ala
1400 1405 1410

Ser Gly Thr Val Ile Val Thr Asn His Asp Gly Ser Gln Asp Thr
1415 1420 1425

Ile Glu Phe His Asn Val Glu Lys Val Val Trp
1430 1435

<210> 106
<211> 837
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 106

Val Gln Ala Leu Gly Ala Gly Glu Ser Met Thr Lys Thr Phe Thr Val

1 5 10 15

Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser Val
35 40 45

Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser Val Ala Asp
50 55 60

Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val Glu Thr Asp
65 70 75 80

Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala Val
85 90 95

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

Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn
115 120 125

Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Gly
130 135 140

Ala Val Ala Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr Phe Thr
145 150 155 160

Thr Ala Gln Leu Leu Ala Asn Ala His Asp Val Asp Thr His Asp Thr
165 170 175

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

Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Asn Tyr Ser Gly His
195 200 205

Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly Thr Ala Ala
210 215 220

Gly Ser Ala Ala Leu Asp Val Asp Ala Val Ala Asp Arg Ala Ser Val
225 230 235 240

Ser Val Ser Ile Gly Ala Ala Val Glu Thr Pro Asn Gly Ser Phe Thr
245 250 255

Val Thr Asn Leu Asp Ser Thr Ala Ser Ala Gly Tyr His Asn Thr Tyr
260 265 270

Gly Tyr Tyr Val Met Asp Asp Asn Gly Asn Pro Thr Ser Gly Gly Val

275 280 285

Ile Trp Ser Asp Val His Ala Ser Pro Asn Ala Ser Val Thr Val Asn
290 295 300

Gly Val Asp Pro Asp Arg Val Gly Phe Phe Ile Ile Pro Asp Gly Gly
305 310 315 320

Ser Gln Asn Ser Gly Leu Ala Asn Gly Ala Ala Leu Thr Phe Ser Lys
325 330 335

Asp Ser Ala Gly Asn Trp Gln Ala Ser Asp Ser Ala Gly His Val Leu
340 345 350

Ser Gly Ala Asp Ser Lys Val Leu Phe Asp Asn Lys Ala Leu Asn Ser
355 360 365

Asp His Leu Val His Ala Glu Asp Ser Ser Ala Val Ser Gly Asn Gln
370 375 380

Asn Trp Glu Asp Leu Thr Gly Gly Gly Asp Arg Asp Tyr Asn Asp Val
385 390 395 400

Asn Met Ser Val Ser Trp Gly Asn Ala Ala Pro Thr Ala Ser His Ala
405 410 415

Leu Ser Val Ser Ala Ser Phe Pro Asp Met Asp Gly Ser Glu Ser His
420 425 430

Thr Val Ser Ile Ser Gly Leu Pro Ala Gly Ala Thr Leu Tyr Gln Asn
435 440 445

Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser Leu Asn Pro
450 455 460

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

Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly Thr Ser Val
485 490 495

Ala Ser Ser Ser Ala Ser Ala Ser Val His Asp Asp Leu Ala Asn His
500 505 510

Gly Pro Asp Ala Gly Asp Pro Thr Ser Val His Gly Ala Ala Gly Ala
515 520 525

Thr Ile Thr Ser Ala Val Gly Val Thr Asp Val Asp Gly Asp His Leu
530 535 540

Ser Tyr Ala Val Gly Thr Gly Asn Asn Gly Pro Gln His Gly Thr Val

545 550 555 560

Val Val Asn Thr Asp Gly Thr Phe Ser Tyr Thr Pro Thr Gly Asn Tyr
565 570 575

Ser Gly Thr Asp Thr Phe Lys Val Thr Val Ser Asp Gly His Gly Gly
580 585 590

Thr Thr Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly Ala Pro Thr
595 600 605

Leu Thr Thr Ala Asn Ala Thr Thr Ala Asn Asp His Ser Ala Val Thr
610 615 620

Gly His Val Thr Gly Thr Asp Ser Pro Gly Asp Thr Leu Ser Tyr Ser
625 630 635 640

Leu Val Asp Ala Asn Gly Asn His Val Ser Ser Leu Val Thr Asp His
645 650 655

Gly Thr Val Ser Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe Thr Pro
660 665 670

Lys Ala Gly Asp Ala Ser Leu Gly Val Gly Ala Ser Ala Thr Asp Ser
675 680 685

Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp Ser Asn Val Gly
690 695 700

Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly Pro Thr Val Ser
705 710 715 720

Ala Ser Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile Thr Gly His
725 730 735

Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Ala Tyr His Leu
740 745 750

Val Asp Gly Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly
755 760 765

Thr Val Thr Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe Thr Pro Thr
770 775 780

Gly Asp Ala Ser Val Gly Val Gly Gln Thr Leu Gly Asp Ser Phe Lys
785 790 795 800

Val Val Val Val Asp Asn His Gly Ala Ala Ser Ala Pro Ser Thr Val
805 810 815

Ala Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Val Ala

820 825 830

Asn Val Thr Thr Ala
835

<210> 107
<211> 145
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 107

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

Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu Val Thr Val Thr Ile Asn
20 25 30

Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly Ser Ala Ala Gly Ser Val
35 40 45

Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser Val Ala Asp
50 55 60

Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val Glu Thr Asp
65 70 75 80

Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser Phe Ala Val
85 90 95

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

Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Glu
115 120 125

Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr Ile Thr Gly
130 135 140

Ser
145

<210> 108
<211> 148
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 108

Ala Gln His Leu Gly Ala Gly Val Val Gln Ala Asp Ser Phe Gln Val
1 5 10 15

Val Ala Ser Asp Gly Ser Leu Ser Ser Ala Pro Thr Thr Val Asn Val
20 25 30

```
Ser Ile Thr Gly Asn Asn Asp Ala Ala Thr Ile Thr Gly Ser Ala Ala
        35                  40                  45

Gly Ser Val Gly Glu Asp Gly Asn His Ser Ala Thr Gly His Leu Ser
    50                  55                  60

Val Ala Asp Val Asp Ser Gly Gln Ala His Val Thr Ala Gln Thr Val
65                  70                  75                  80

Glu Thr Asp Gln Gly Thr Phe Ser Ile Gly Thr Asp Gly Asn Trp Ser
                85                  90                  95

Phe Ala Val Asn Ser Ala Asn Ala Asp Val Gln Ala Leu Gly Ala Gly
            100                 105                 110

Glu Ser Met Thr Lys Thr Phe Thr Val Ala Ser Ala Asp Gly Thr Ala
        115                 120                 125

Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ala Asn Asp Ser Ala Thr
    130                 135                 140

Ile Thr Gly Ser
145
```

<210> 109
<211> 167
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 109

```
Ser Leu Thr Thr Glu His Gly Thr Val Thr Ile Asp Ala Lys Thr Gly
1               5                   10                  15

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

Gln Ser Ala His Asp Ser Phe Ser Val Met Val Asp Asp Gly His Gly
        35                  40                  45

Gly Thr Ser Thr Ala Asn Ile Gly Val Thr Ile Thr Gly Ser Asn Asp
    50                  55                  60

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

Thr Ser Ile Thr Ile His Ala Ser Asp Leu Leu Lys Asn Ala His Asp
                85                  90                  95

Val Asp Val Gly Asp Thr Leu Ser Val Thr Asn Leu Ser Ala Thr Asn
            100                 105                 110
```

Gly Thr Ile Thr Asp Asn His Asp Gly Thr Tyr Thr Phe Thr Pro Asn
115 120 125

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

His Gly Gly Asp Thr Pro Ala Lys Ala Ser Phe Asp Val Ala Ala Val
145 150 155 160

Asn Asp Lys Ala Thr Leu Ala
165

<210> 110
<211> 830
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 110

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

Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn Val Thr Val Thr Ile Asn
20 25 30

Gly Ala Asn Asp Ser Ala Thr Ile Ser Gly Ser Thr Thr Gly Ala Val
35 40 45

Ala Glu Asp Gly Asn Gly Arg Ala Thr Gly Thr Leu Ser Val Ala Asp
50 55 60

Val Asp His Gly Gln Ala His Val Thr Ala Gln Thr Val Gln Thr Asp
65 70 75 80

Gln Gly Thr Phe Ser Ile Gly Glu Asn Gly Gln Trp Thr Phe Gln Val
85 90 95

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

Thr Lys Thr Phe Ala Val Ala Ser Ala Asp Gly Thr Ala Thr Gln Asn
115 120 125

Val Ser Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Thr Val Ser Gly
130 135 140

Ala Val Gly Leu Gly His Thr Ala Glu Asp Asn Ser Val Thr Phe Thr
145 150 155 160

Lys Ala Gln Leu Leu Ala Asn Ala His Asp Thr Asp Ala His Asp Thr
165 170 175

Leu Ser Val Ser Asn Leu Ser Ala Ala His Gly Ser Ile Val Asp Asn

```
            180                 185                 190

Gly Asn Gly Thr Tyr Thr Phe Thr Pro Thr Glu Thr Phe Ser Gly His
        195                 200                 205

Val Asp Val Ser Tyr Thr Val Ser Asp Gly His Gly Gly Thr Thr Thr
    210                 215                 220

Gly Ser Ala Ala Leu Asp Val Asp Ala Val Ala Asp Arg Ala Thr Val
225                 230                 235                 240

Ser Val Ala Ile Gly Ala Pro Val Glu Thr Pro Asn Gly Ser Phe Thr
                245                 250                 255

Val Thr Asn Leu Asp Ser Thr Ala Ser Ala Gly Tyr Asn Asn Thr Tyr
            260                 265                 270

Gly Tyr Tyr Val Met Asp Asp Ser Gly Asn Pro Thr Ser Gly Gly Val
        275                 280                 285

Ile Trp Ser Asn Val His Ala Ser Pro Gly Ala Ser Val Thr Ile Ser
    290                 295                 300

Gly Val Asp Pro Asp Arg Val Gly Phe Phe Leu Ile Pro Asp Gly Gly
305                 310                 315                 320

Ser Gln Asn Ser Gly Leu Ala Asn Gly Ala Ala Leu Thr Phe Ser Lys
                325                 330                 335

Asp Ala Ser Gly Asn Trp Gln Ala Ser Asp Ser Ala Gly His Val Leu
            340                 345                 350

Ser Gly Ala Gly Thr Lys Val Leu Phe Asp Lys Ser Ala Leu Asn Gly
        355                 360                 365

Asp His Met Val His Ser Glu Asp Thr Ser Ala Val Ser Gly Asn Gln
    370                 375                 380

Asn Trp Glu Asp Leu Thr Gly Gly Gly Asp Arg Asp Tyr Asn Asp Val
385                 390                 395                 400

Asn Met Ser Val Thr Trp Gly Asn Ala Ala Pro Thr Ala Thr His Pro
                405                 410                 415

Leu Thr Val Ser Ala Ser Phe Pro Asp Met Asp Gly Ser Glu Gly His
            420                 425                 430

Ala Val Lys Ile Ser Gly Leu Pro Ser Gly Ser Thr Leu Tyr Gln Asn
        435                 440                 445

Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser Leu Asn Pro
```

```
    450                 455                 460

Ala Gln Leu Gly Gly Leu Ser Val Lys Thr Pro Ala Gly Phe Asn Gly
465                 470                 475                 480

Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly Thr Ser Val
                485                 490                 495

Ala Ser Ser Thr Ala Ser Ala Thr Val His Asp Asp Leu Ser Asn His
            500                 505                 510

Gly Pro Asp Ala Gly Asp Ala Thr Ser Val His Gly Ala Met Gly Ala
        515                 520                 525

Thr Ile Thr Gly Ala Ala Gly Val Thr Asp Ser Asp Gly Asp His Leu
    530                 535                 540

Ser Tyr Ala Val Gly Thr Gly Thr Ser Gly Pro Gln His Gly Thr Val
545                 550                 555                 560

Val Val Asn Thr Asp Gly Thr Phe Thr Tyr Thr Pro Ser Gly Asn Tyr
                565                 570                 575

Ser Gly Thr Asp Thr Phe Lys Ile Thr Val Ser Asp Gly His Gly Gly
            580                 585                 590

Thr Ala Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly Ala Pro Thr
        595                 600                 605

Leu Thr Thr Ala Asn Ala Ala Thr Ala Asn Asp His Ser Ala Val Thr
    610                 615                 620

Gly His Val Thr Gly Ser Asp Thr Pro Gly Asp Thr Leu Ser Tyr Ser
625                 630                 635                 640

Leu Val Asp Ala Asn Gly Asn His Val Gly Ser Leu Val Thr Asp His
                645                 650                 655

Gly Thr Val Ser Ile Asn Ala Ala Thr Gly Asp Tyr Thr Phe Thr Pro
            660                 665                 670

Asn Ala Ala Asn Ala Ser Leu Gly Val Gly Ala Ser Val Thr Asp Ser
        675                 680                 685

Phe Lys Val Val Ala Thr Asp Asn His Gly Ala Asp Ser Asn Leu Gly
    690                 695                 700

Thr Val Ala Val Thr Val Thr Gly Ser Asn Asp Gly Pro Val Val Asn
705                 710                 715                 720

Thr Ala Asn Val Thr Thr Ala Asn Asp His Thr Ala Val Ser Gly His
```

725 730 735

Ala Ala Gly Thr Asp Val Asp Ala Gly Asp Ser Val Arg Tyr His Leu
740 745 750

Val Asp Ala Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala His Gly
755 760 765

Thr Val Ser Ile Asn Ala Ala Thr Gly Asp Tyr Thr Phe Thr Pro Thr
770 775 780

Gly Asp Ser Ser Leu Gly Val Gly Gln Thr Leu Gly Asp Ser Phe Lys
785 790 795 800

Val Val Ala Val Asp Asn His Gly Ala Ala Ser Ala Pro Ser Thr Val
805 810 815

Ala Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Val Val Asp
820 825 830

<210> 111
<211> 242
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 111

Pro Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe
1 5 10 15

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

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
35 40 45

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
50 55 60

Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
65 70 75 80

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
85 90 95

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

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
115 120 125

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

```
Ser Gly Pro Val Asp Leu Gly Ala Thr Ala Glu Asp His Ser Ile Thr
145                 150                 155                 160

Phe Thr Ala Gln Gln Leu Leu Gly His Ala Ser Asp Ile Asp Gly Asp
                165                 170                 175

Ser Leu Ser Val Ser Asn Leu Ser Ala Gly Asn Gly Thr Ile Ser Gln
            180                 185                 190

Asn Ala Asp Gly Ser Tyr Thr Phe Thr Pro Asn Ala Asp Phe Asn Gly
        195                 200                 205

Glu Val Asn Val Thr Tyr Thr Val Ser Asp Gly His Gly Gly Thr Thr
    210                 215                 220

Ser Gly Ser Ala Ser Phe Asp Val Thr Ser Val Asn Asp Gly Pro Thr
225                 230                 235                 240

Thr Ser
```

<210> 112
<211> 198
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 112

```
Pro Ala Val Gln Ala Leu Gly Ala Gly Asp Ser Met Thr Lys Thr Phe
1               5                   10                  15

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

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
        35                  40                  45

Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val
    50                  55                  60

Ser Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
65                  70                  75                  80

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
                85                  90                  95

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp
            100                 105                 110

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
        115                 120                 125
```

```
Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile
    130                 135                 140

Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala
145                 150                 155                 160

Ser Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val
                165                 170                 175

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
            180                 185                 190

Asp Gly Lys Trp Ser Phe
        195
```

<210> 113
<211> 198
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 113

```
Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe
1               5                   10                  15

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

Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
        35                  40                  45

Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu His Val
    50                  55                  60

Ser Asp Val Asp Thr Gly Glu Ala His Val Gln Ala Thr Ser Val Glu
65                  70                  75                  80

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
                85                  90                  95

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Gly Asp
            100                 105                 110

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
        115                 120                 125

Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile
    130                 135                 140

Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala
145                 150                 155                 160
```

Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val
165 170 175

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
180 185 190

Asp Gly Lys Trp Ser Phe
195

<210> 114
<211> 200
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 114

Ser Gly Gly Asp Thr Leu Ile Gly Ala Ala Gly Asn Asp Tyr Met Ser
1 5 10 15

Leu Glu Gly Gly Asp His Ala Gln Lys Ile Ser Gly Ile Asp His Ile
20 25 30

Gln Leu Gly Asp Gly Asp Asn Val Ile Leu Asp Met Thr Thr Thr Arg
35 40 45

Tyr Asp Tyr Gly Asp Leu Thr Val Ala Gly Gly Ser Gly His Asp Val
50 55 60

Ile Trp Ser Ala Ser Gly Asp Asp Leu Leu Val Ala Gly Asn Gly Gly
65 70 75 80

Asn Thr Ile His Gly Gly Ala Gly Asn Asp Thr Ile Val Ala Gly Ala
85 90 95

Gly Ser Asp Glu Leu Met Gly Gln Glu Gly Asn Asp Thr Phe Leu Phe
100 105 110

Asp Phe Gly Ser Gly His Asp Thr Val Asn Gly Gly Ala Gly Thr Asn
115 120 125

Trp Thr Asp Thr Ile Asp Leu Ser Thr Asp Met His Ala Gly Ala Asn
130 135 140

Ile Thr Ile Thr Thr Ala Asp Asn His Ser Trp Thr Val Ala Ser Asp
145 150 155 160

Gly Asp His Asn Ala Thr Gly Asn Ile Glu Leu Gly Gln Asp Lys Ser
165 170 175

Gly Thr Ile Thr Val His Ser Gln Asp Gly Asp Gln Thr Ile Glu Phe
180 185 190

Thr Asn Ile Glu Ser Ile Lys Tyr

195 200

<210> 115
<211> 85
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 115

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
1 5 10 15

Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser
20 25 30

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gln Ala Ala Thr
35 40 45

Gly Thr Leu Asn Val Ala Asp Val Asp Ser Gly Glu Ala His Val Gln
50 55 60

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

Gly Lys Trp Ser Phe
85

<210> 116
<211> 547
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 116

Ser Glu Asp Gly Ser Gly Ser Gly Ser Ala Val Ala Ser Asp Val Asp
1 5 10 15

Gly Asp Thr Leu Arg Tyr His Leu Val Asp Thr Asp Gly Asn Gln Val
20 25 30

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

Gly Glu Tyr Thr Phe Thr Pro Asn Ala Glu Ala Gln Ala Leu Gly Val
50 55 60

Gly Ala Val Gln Ser Asp Thr Phe Lys Val Val Ala Thr Asp Gly Thr
65 70 75 80

Thr Thr Ser Glu Pro Thr Thr Val Gly Val Thr Ile Thr Gly Ser Asn
85 90 95

Asp Gly Pro Ile Val Ser Gly Ala Val Asp Leu Gly Asp Thr Ala Glu
100 105 110

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

Asp Val Asp Gly Asp Ser Leu Ser Val Ser Asn Leu Thr Ser Ala Asn
    130                 135                 140

Gly Thr Ile Thr Glu Asn Ser Asp Gly Thr Tyr Thr Phe Thr Pro Ala
145                 150                 155                 160

Glu Asn Phe Ser Gly Ser Val Asp Val Ser Tyr Thr Val Ser Asp Gly
                165                 170                 175

Gln Gly Gly Thr Thr Ala Gly Ser Ala Ser Leu Asp Val Ser Ala Val
            180                 185                 190

Ala Asp Gln Ala Ser Val Ser Leu Ser Ile Gly Glu Gly Ala Val Asp
        195                 200                 205

Thr Asn Gly Ser Phe Thr Val Thr Asn His Asp Gly Ser Ala Gly Tyr
    210                 215                 220

His Asn Thr Tyr Gly Tyr Tyr Val Met Asp Glu Asn Gly Asn Pro Thr
225                 230                 235                 240

Ser Gly Glu Ile Ile Trp Lys Asp Val His Asp Thr Asn Gly Gln Ser
                245                 250                 255

Val Thr Ile Glu Gly Val Asp Pro Asp Gln Val Gly Phe Phe Ile Ile
            260                 265                 270

Pro Asn Gly Asp Gln Asn Ser Ser Ile Arg Asp Gly Ser Asp Val Thr
        275                 280                 285

Phe Thr Lys Asp Ser Ala Gly Asn Trp Gln Val Val Asp Ser Asn Gly
    290                 295                 300

Ala Val Leu Ser Gly Thr Gly Thr Lys Val Leu Phe Asp Asn Lys Asp
305                 310                 315                 320

Leu Asn Ser Asp Asp Leu Val His Met Gln Asp Thr Ser Arg Asp Gly
                325                 330                 335

Gly Asn Gln Asn Trp Glu Asp Leu Asn Gly Gly Gly Asp Arg Asp Tyr
            340                 345                 350

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

Thr His Glu Val Asn Ile Ala Ala Ser Phe Pro Asp Met Asp Gly Ser
    370                 375                 380
```

```
Glu Gly His Thr Val Val Leu Asn Gly Leu Pro Glu Gly Ala Thr Leu
385                 390                 395                 400

Tyr Gln Asp Gly Val Ala Leu Val Pro Gly Ala Asp Gly Ser Tyr Thr
                405                 410                 415

Leu Asp Ala Ser Asp Leu Asp Gly Leu Thr Leu Thr Thr Ala Pro Gly
            420                 425                 430

Phe Ser Gly Glu Ile Glu Leu Ser Val Thr Ala Thr Ser Ala Asp Gly
        435                 440                 445

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

Gly Asn Thr Gly Pro Asp Ala Gly Glu Ala Glu Ser Val Ser Thr Ala
465                 470                 475                 480

Val Asn Asn Ala Val Thr Gly Gln Val Glu Ala Thr Asp Ala Asp Gly
                485                 490                 495

Asn Asp Leu Asn Phe Ser Leu Ala Thr Gly Asn Asp Gly Pro Gln His
            500                 505                 510

Gly Ser Val Ala Leu Asn Pro Asp Gly Thr Phe Thr Tyr Thr Pro Thr
        515                 520                 525

Gly Asn Phe Ser Gly Thr Asp Thr Phe Lys Val Val Ile Asp Asp Gly
    530                 535                 540

His Gly Gly
545
```

<210> 117
<211> 210
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 117

```
Ser Gly Ser Ala Val Ala Ser Asp Val Asp Gly Asp Thr Leu Arg Tyr
1               5                   10                  15

His Leu Val Asp Thr Asp Gly Asn Gln Val Ser Ser Leu Ser Thr Asp
            20                  25                  30

His Gly Thr Val Thr Ile Asp Ser Ala Thr Gly Glu Tyr Thr Phe Thr
        35                  40                  45

Pro Asn Ala Glu Ala Gln Ala Leu Gly Val Gly Ala Val Gln Ser Asp
    50                  55                  60
```

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

Thr Val Gly Val Thr Ile Thr Gly Ser Asn Asp Gly Pro Ile Val Ser
85 90 95

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

Thr Lys Ala Gln Leu Leu Ala Asn Ala Ser Asp Val Asp Gly Asp Ser
115 120 125

Leu Ser Val Ser Asn Leu Thr Ser Ala Asn Gly Thr Ile Thr Glu Asn
130 135 140

Ser Asp Gly Thr Tyr Thr Phe Thr Pro Ala Glu Asn Phe Ser Gly Ser
145 150 155 160

Val Asp Val Ser Tyr Thr Val Ser Asp Gly Gln Gly Gly Thr Thr Ala
165 170 175

Gly Ser Ala Ser Leu Asp Val Ser Ala Val Ala Asp Gln Ala Ser Val
180 185 190

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

Val Thr
210

<210> 118
<211> 168
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 118

Asp His Ile Gln Leu Gly Asp Gly Asp Asn Val Ile Leu Asp Met Thr
1 5 10 15

Thr Ser Arg Tyr Asp Tyr Gly Asp Leu Thr Val Ala Gly Gly Thr Gly
20 25 30

His Asp Val Ile Trp Ser Ala Ser Gly Asp Asp Leu Leu Val Ala Gly
35 40 45

Asp Gly Gly Asn Thr Ile His Gly Gly Ala Gly Asp Asp Thr Ile Val
50 55 60

Ala Gly Ala Gly Ser Asp Asp Leu Met Gly Gln Asp Gly Ser Asp Leu
65 70 75 80

Phe Leu Phe Asp Phe Gly Thr Gly His Asp Thr Val Asn Gly Gly Ala

85 90 95

Gly Gly Asn Trp Thr Asp Thr Ile Asp Leu Ser Thr Asn Met Gly Glu
100 105 110

Gly Ala Ser Ile Thr Ile Ser Thr Gly Gly Ser Asp Trp Thr Val Ala
115 120 125

Ser Asp Gly Asp His Asp Ala Ala Gly Thr Ile Asn Leu Gly Gln Asp
130 135 140

Lys Ser Gly Thr Ile Thr Val His Ser Gln Asp Gly Asp Gln Thr Ile
145 150 155 160

Glu Phe Thr Asn Ile Glu Ser Ile
165

<210> 119
<211> 410
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 119

Met Asn Ser Asp His Leu Val His Ala Glu Asp Ser Ser Ala Val Ser
1 5 10 15

Gly Asn Gln Asn Trp Glu Asp Leu Asn Gly Gly Gly Asp Arg Asp Tyr
20 25 30

Asn Asp Val Asn Met Ser Val Ser Trp Gly Asn Ala Ala Pro Thr Ala
35 40 45

Ser His Ala Leu Ser Val Ser Ala Ser Phe Pro Asp Met Asp Gly Ser
50 55 60

Glu Ser His Thr Val Ser Ile Ser Gly Leu Pro Ala Gly Ala Thr Leu
65 70 75 80

Tyr Gln Asn Gly Val Ala Leu Val Ala Gly Ala Asp Gly Ser Tyr Ser
85 90 95

Leu Asn Pro Ala Gln Leu Gly Gly Leu Ser Val Lys Thr Pro Ala Gly
100 105 110

Phe Thr Gly Asp Leu Asn Val Asn Val Thr Ala Val Ala Thr Asp Gly
115 120 125

Thr Ser Val Ala Ser Ser Ser Ala Ser Ala Ser Val His Asp Asp Leu
130 135 140

Ala Asn His Gly Pro Asp Ala Gly Asp Pro Thr Ser Val His Gly Ala
145 150 155 160

```
Ala Gly Ala Thr Ile Thr Ser Ala Val Gly Val Thr Asp Val Asp Gly
                165                 170                 175

Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn Asn Gly Pro Gln His
            180                 185                 190

Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe Ser Tyr Thr Pro Thr
        195                 200                 205

Gly Asn Tyr Ser Gly Thr Asp Thr Phe Lys Val Thr Val Ser Asp Gly
    210                 215                 220

His Gly Gly Thr Thr Thr Glu Thr Val Asn Val Thr Val Glu Asn Gly
225                 230                 235                 240

Ala Pro Thr Leu Thr Thr Ala Asn Ala Thr Thr Ala Asn Asp His Ser
                245                 250                 255

Ala Val Thr Gly His Val Thr Gly Thr Asp Ser Pro Gly Asp Thr Leu
            260                 265                 270

Ser Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val Ser Ser Leu Val
        275                 280                 285

Thr Asp His Gly Thr Val Ser Ile Asn Ser Ala Thr Gly Asp Tyr Thr
    290                 295                 300

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

Thr Asp Ser Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp Ser
                325                 330                 335

Asn Val Gly Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly Pro
            340                 345                 350

Thr Val Ser Ala Ser Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile
        355                 360                 365

Thr Gly His Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Ala
    370                 375                 380

Tyr His Leu Val Asp Gly Ser Gly Asn Gln Val Asp Ser Leu Thr Thr
385                 390                 395                 400

Ala His Gly Thr Val Thr Ile Asn Ser Ala
                405                 410
```

<210> 120
<211> 154

<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 120

Val Thr Gly His Val Thr Gly Thr Asp Ser Pro Gly Asp Thr Leu Ser
1 5 10 15

Tyr Ser Leu Val Asp Ala Asn Gly Asn His Val Ser Ser Leu Val Thr
20 25 30

Asp His Gly Thr Val Ser Ile Asn Ser Ala Thr Gly Asp Tyr Thr Phe
35 40 45

Thr Pro Lys Ala Gly Asp Ala Ser Leu Gly Val Gly Ala Ser Ala Thr
50 55 60

Asp Ser Phe Lys Val Val Ala Thr Asp Ser His Gly Ala Asp Ser Asn
65 70 75 80

Val Gly Thr Val Asn Val Thr Val Thr Gly Ser Asn Asp Gly Pro Thr
85 90 95

Val Ser Ala Ser Asn Val Thr Thr Ala Asn Asp His Thr Ala Ile Thr
100 105 110

Gly His Ala Ser Gly Ala Asp Val Asp Thr Gly Asp Thr Val Ala Tyr
115 120 125

His Leu Val Asp Gly Ser Gly Asn Gln Val Asp Ser Leu Thr Thr Ala
130 135 140

His Gly Thr Val Thr Ile Asn Ser Ala Thr
145 150

<210> 121
<211> 68
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 121

Ala Ala Gly Ala Thr Ile Thr Ser Ala Val Gly Val Thr Asp Val Asp
1 5 10 15

Gly Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn Asn Gly Pro Gln
20 25 30

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

Thr Gly Asn Tyr Ser Gly Thr Asp Thr Phe Lys Val Thr Val Ser Asp
50 55 60

Gly His Gly Gly
65

<210> 122
<211> 56
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 122

Thr Asp Val Asp Gly Asp His Leu Ser Tyr Ala Val Gly Thr Gly Asn
1 5 10 15

Asn Gly Pro Gln His Gly Thr Val Val Val Asn Thr Asp Gly Thr Phe
20 25 30

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

Thr Val Ser Asp Gly His Gly Gly
50 55

<210> 123
<211> 1352
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 123

Met Pro Ile Asp Pro Ser Gln Leu Pro Ala Ala Lys Thr Leu Ala Thr
1 5 10 15

Pro Val Ala Asp Thr Gln Gly Ser Ala Ala Asp Lys Pro Ala Ala Thr
20 25 30

Val Ile Gly Lys Val Asp Lys Leu Gln Gly Asp Ala Trp Ile Val His
35 40 45

Asp Gly Gln Lys Val Pro Ala Lys Ile Gly Ala Ala Leu Met Gln Gly
50 55 60

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

Asp Arg Thr Thr Phe Val Leu Lys Asp Lys Gly Leu Val Gly Leu Asp
85 90 95

Glu Phe Ser Tyr Asp Pro Ala Thr Lys Thr Gly Lys Glu Thr Phe Leu
100 105 110

Val Ala Gln Gly Ala Phe Ser Phe Val Ser Gly Asp Ile Ala Lys Thr
115 120 125

Gln Pro Asp Ala Ala Arg Leu Ala Thr Pro Val Met Thr Met Gly Ile
130 135 140

```
Arg Gly Thr Thr Val Gly Gly Thr Val Ala Ala Asp Gly Asn Thr Ser
145                 150                 155                 160

Val Ala Leu Leu Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val Ala
                165                 170                 175

Ile Ser Ala Leu Gly Gly Gly Gln Ser Phe Thr Leu Asn Ser Ala Gly
            180                 185                 190

Ser Gly Ile Val Gly Ala Ser Ser Gly Gly Ser Trp Ser Val Ser Ala
        195                 200                 205

Asn Ala Gly Ala Ala Ile Ala Ser Ser Met Pro Ser Pro Ala Pro Pro
    210                 215                 220

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

Gly Gly Pro Gly Asn Thr Gly Thr Gly Asn Ala Gly Thr Gly Glu Thr
                245                 250                 255

His Asn Thr Ala Pro Glu Pro Pro Pro Leu Pro Pro Gln Pro Val Gly
            260                 265                 270

Leu Pro Thr Pro Asn Pro Glu Pro Lys Pro Glu Pro Lys Pro Glu Pro
        275                 280                 285

Lys Pro Glu Pro Lys Pro Glu Pro Lys Ser Asp Pro Pro Lys Pro Asp
    290                 295                 300

Pro Val Gln Gln Asn His Asp Pro Thr Thr Ser Asp Val Thr Leu Pro
305                 310                 315                 320

Gly Ser Thr Ala Gly Thr Ser Ile Thr Phe Ser Lys Ser Glu Leu Leu
                325                 330                 335

Ala Asn Ala Arg Asp Ser Asp Gly Asp Ala Leu Ser Ile Lys Leu Asn
            340                 345                 350

Ser Gly His Ser Asp His Gly Thr Ala Val Val Asn Ala Asp Gly Ser
        355                 360                 365

Ile Thr Phe Thr Ala Thr Ala Gly Tyr Ser Gly Ala Ala Thr Ile Thr
    370                 375                 380

Tyr Thr Ile Thr Asp Gly His Gly Gly Ser Val Gln Gly Thr Ala Phe
385                 390                 395                 400

Ser Ala Val Thr Val Gly Thr Gln Val Thr Thr Ala Gly Thr Asp His
                405                 410                 415
```

```
Leu Asp Gly Gly Ala Gly Ala Ser Ala Tyr Leu Ser Ser Val Ala Asn
            420                 425                 430

Phe Thr Ala Gly Asp Thr Ile Ser Asp Ser Gly Gly Leu Asp Thr Leu
        435                 440                 445

Thr Val Ser Asp Ala Gly Thr Ile Asn Leu Ala Ala Gly Thr Val Thr
    450                 455                 460

Gly Ile Glu Ile Leu Thr Leu Ala Ala Gly Gly Asn Thr Val Ile Leu
465                 470                 475                 480

Gly Gly Gly Val Asn Pro Gln Gln Phe Thr Thr Ile Val Gly Gly Ala
                485                 490                 495

Gly Thr Asp Val Ile Lys Gln Ala Asp Gly Gly Gly Thr Phe Asp Leu
            500                 505                 510

Thr Gly Ile Val Leu Thr Ser Val Glu Ser Ile Ala Thr Gly Thr Gly
        515                 520                 525

Thr Ser Ser Ile Thr Phe Asp Glu Val Ser Ala Ala Gly Val Asn Thr
    530                 535                 540

Val Val Asp Ala Val Ser Gly Asp Gly Asp Ser Val Thr Phe Tyr Gln
545                 550                 555                 560

Thr Thr Ala Gly Thr Leu Asn Ile Ser Ala Lys Thr Phe Val Asn Ile
                565                 570                 575

Glu Gly Ile Ile Leu Asp Gly Ser Thr Ala Ser Gly Asp Val Val Leu
            580                 585                 590

Val Gly Gly Ala Gln Gly Ala Thr Ile Ile Gly Gly Ser Gly Asn Asp
        595                 600                 605

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

Asn Asp Val Ile Tyr Ala Asn Gln Gly Asp Pro Leu Ile Asn Gly Gly
625                 630                 635                 640

Ile Gly Thr Asp Thr Leu Val Ile Thr Ala Thr Thr Phe Asp Asp Asn
                645                 650                 655

Asn Phe Asp Asp Thr His Leu Gln Gly Ile Glu Val Ile Asn Ile Thr
            660                 665                 670

Asn Ala Ser Val Ala Gly Gln Tyr Phe Lys Val Asp Asn Gln Ser Glu
        675                 680                 685
```

```
Gly Phe Thr Ile Asn Val Thr Ser Ser Ala His Val Thr Val Leu Gly
    690                 695                 700

Gly Thr Gly Asn Asp Val Ile Asn Gly Gly Ser Ala Gly Glu Tyr Leu
705                 710                 715                 720

Trp Gly Tyr Gln Gly Asn Asp Thr Ile Thr Gly Asn Ala Gly Asn Asp
                725                 730                 735

Thr Ile Val Gly Asp Ala Gly Ala Asp Val Ala Val Phe Thr Gly Asn
            740                 745                 750

Ala Ala Asp Tyr Leu Leu Thr Thr Ser Ser Gly Thr Leu Thr Val Thr
        755                 760                 765

Asp Arg Ser Gly Thr Asp Gly Thr Asp Thr Leu Thr Gly Ile Glu Thr
    770                 775                 780

Leu Thr Phe Ala Asp Gly Ser Phe Ala Val Ser Ala Ser Gly Thr Thr
785                 790                 795                 800

Leu Thr Ala Leu Gly Ala Ser Ser Thr Leu Thr Val Gly Ser Gly Phe
                805                 810                 815

Ala Glu Val Ile Met Gly Ser Gly Thr Asn Lys Leu Val Thr Asp Met
            820                 825                 830

Ala Thr Leu Ser Ala Gly Leu Ser Ile Leu Gly Gly Ala Gly Leu Asp
        835                 840                 845

Thr Val Val Ile Ser Asp Thr Ala Ser Met Gly Ser Val Gln Met Pro
    850                 855                 860

Ala Leu Thr Gly Ile Glu Thr Leu Thr Leu Ala Ser Ser Ile Thr Ala
865                 870                 875                 880

Ala Gln Ser Val Tyr Leu Gly Gly Gln Ala Glu Ser Ala Gly Leu Asn
                885                 890                 895

Val Val Asp Ala Ser Ala Ala Thr Gly Ala Val Glu Ile His Gly Ala
            900                 905                 910

Phe Arg Ser Asp Asp Leu Thr Leu Thr Gly Gly Ser Gly Asn Asp Thr
        915                 920                 925

Ile His Gly Ala Ala Gly Asn Asp Thr Leu Val Gly Gly Gly Gly Ser
    930                 935                 940

Asn Thr Ile Asp Ala Gly Ala Gly Thr Asp Thr Val Ser Tyr Gly Ser
945                 950                 955                 960
```

```
Met Gly Ser Gly Ile Thr Ala Thr Leu Asn Gly Ser Ser Ala Val Val
               965                 970                 975

Thr His Ser Ala Ser Thr Asp Thr Val Thr Asn Thr Glu Ile Leu Arg
           980                 985                 990

Gly Ser Gly His Asp Asp Val Phe  Phe Val Ala Ser Ala  Ser Val Gly
       995                1000                1005

Val Thr  Val Asp Gly Gly Ala  Gly Val Asp Thr Met  Asp Tyr Ser
    1010                1015                1020

Ala Met  Gly Ala Gly Ile Thr  Ala Thr Val Thr Gly  Thr Ser Ala
    1025                1030                1035

Ser Val  Val His Ala Gly Gly  Thr Asp Ala Ile Thr  Asn Val Glu
    1040                1045                1050

Ala Trp  Val Gly Ser Ala His  Asp Asp Thr Phe Ile  Gly Asp Ser
    1055                1060                1065

Gly Gly  Asp Thr Phe Phe Gly  Gly Ile Gly Ala Asp  His Leu Thr
    1070                1075                1080

Gly Gly  Gly Gly Ala Asp Thr  Phe Val Tyr Thr Asp  Val Asn Gln
    1085                1090                1095

Ser Gln  Asp Ser Ala Ser Val  Arg Asp Val Ile Thr  Asp Phe Thr
    1100                1105                1110

Thr Gly  Thr Asp His Ile Asp  Ile Ser Leu Ser Gly  Thr His Val
    1115                1120                1125

Asp Val  Ser Gly Phe Glu Val  Val Gly Ser Tyr Asn  Ala Gly Gln
    1130                1135                1140

Ser Ser  Leu Thr Gly Gly Val  Ala Arg Thr Gly Gly  Val Glu Gly
    1145                1150                1155

Asp Gly  Phe Tyr Ser Thr Phe  Asp Gln Ala Leu Tyr  Ile Tyr Gln
    1160                1165                1170

Gly Ser  Thr Asp Ser Gly Ile  Gly Thr Asp Gly Gly  Tyr Val Ile
    1175                1180                1185

Gly Ser  Ala Gly Thr Ile Thr  Ala Ala Asp Leu Asn  Phe Asn Ile
    1190                1195                1200

Thr Gly  Thr Ala Gly Asn Asp  Thr Leu Val Gly Gly  Leu Gly Asn
    1205                1210                1215
```

Asp Ile Leu Ala Gly Gly Thr Gly Thr Asn Thr Leu Thr Gly Gly
1220 1225 1230

Gly Gly Ser Asp Ser Phe Val Leu Asp Ser Thr Gly Thr Ala Val
1235 1240 1245

Ile Thr Asp Phe Asn Ser Ala Ala Asp Asn Ile Thr Leu Ser Asn
1250 1255 1260

Gly Ser Phe Gly Leu Gly Ser Ser Gly Thr Leu Thr Ala Gly Thr
1265 1270 1275

Val Gly Ala Thr Tyr Ala Glu Gly Thr Thr Ser Ile Ser Ser Thr
1280 1285 1290

Ala Gln Asp Phe Gly Asp Ala Asn Ala Gly Ile Val Ala Ile Gln
1295 1300 1305

Asn Gly Ala Asn Val Glu Leu Trp His Thr Thr Asn Met Gly Ala
1310 1315 1320

Ala Asp Asn Thr Asn Ser Thr Leu Val Gly Thr Leu Asn Asn Val
1325 1330 1335

Asn Thr Ser Ala Leu Asp Gln Thr Asn Phe His Leu Ala Val
1340 1345 1350

<210> 124
<211> 807
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 124

Phe Glu Val Ala Thr Gly Thr Gln Ser Val Thr Leu Asp Ala Tyr Ala
1 5 10 15

Ala Ser Ala Gly Val Thr Arg Ile Asp Ala Ser Gly Ala Ser Gly Gly
20 25 30

Val Ala Asn Thr Gly Gly Val Thr Val Asn Ala Ser Ala Tyr Ser Thr
35 40 45

Ala Val Ser Ile Ser Gly Gly Ser Gly Ala Asp Thr Phe Thr Gly Gly
50 55 60

Ser Gly Ala Asp Ser Phe Val Gly Gly Gly Gly Asn Asp Val Ile His
65 70 75 80

Ala Ala Ser Asn Asp Ala Leu Ile Asp Gly Gly Ala Gly Thr Ala Asp
85 90 95

```
Val Leu Ser Val Asp Ala Val Asn Phe Asp Asp Gly Leu Gly Asn Asn
            100                 105                 110

Gly Gln Ile Val Asn Ile Glu Thr Ile Asn Ile Thr Asn Ala Thr Thr
        115                 120                 125

Ala Gly Gln Trp Phe Lys Phe Asp Asp Gln Ser Asp Gly Phe Thr Ile
    130                 135                 140

Asn Val Thr Ser Ser Ala Asn Val Thr Val Gln Gly Ser Gln Gly Asn
145                 150                 155                 160

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

Gly Asn Asp Thr Ile Ala Gly Gly Gln Gly Asn Asp Thr Ile Leu Gly
            180                 185                 190

Gly Ala Gly Thr Asp Val Ala Val Phe Thr Gly Ala Met Ala Asn Tyr
        195                 200                 205

Ala Val Thr Ala Ser Gly Gly Thr Leu Thr Val Ala Ala Gln Ser Gly
    210                 215                 220

Thr Asp Gly Thr Asp Lys Leu Ser Gly Met Glu Thr Leu Ala Phe Thr
225                 230                 235                 240

Asp Gly Ser Phe Thr Val Ser Ala Ser Gly Thr Thr Leu Thr Ala Leu
                245                 250                 255

Gly Ser Ser Ser Thr Leu Thr Val Gly Ser Gly Ile Thr Glu Val Val
            260                 265                 270

Met Gly Ser Gly Thr Asn Glu Val Ile Thr Asp Met Ala Thr Leu Ser
        275                 280                 285

Ala Gly Leu Ser Ile Leu Gly Gly Ala Gly Leu Asp Gln Leu Lys Ile
    290                 295                 300

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

Val Glu Met Leu Thr Leu Ser Ser Thr Asn Thr Thr Ser Gln Thr Val
                325                 330                 335

Asn Leu Gly Ser Asp Gly Val Asn Ser Glu Val Thr Val Ile Asp Ala
            340                 345                 350

Ser Ala Ala Thr Gly Gly Val Tyr Ile Asn Ala Ala Pro Arg Thr Thr
        355                 360                 365
```

```
Gly Leu Thr Leu Ile Gly Gly Ala Gly Asn Asp Gln Phe Leu Gly Ser
    370                 375                 380

Leu Gly Asn Asp Thr Ile Thr Gly Gly Gly Gly Thr Asn Ser Met Asp
385                 390                 395                 400

Gly Gly Gly Gly Thr Asp Thr Val Ser Tyr Gly Ser Met Thr Ser Gly
                405                 410                 415

Ile Thr Ala Ser Ile Asp Gly Thr Ser Ala Thr Ile Thr His Ser Thr
            420                 425                 430

Gly Thr Asp Ser Leu Thr Asn Val Ala Ile Leu Gln Gly Ser Asn Tyr
        435                 440                 445

Ala Asp Thr Phe Ser Val Ala Ser Ala Ser Ala Gly Val Thr Val Asp
    450                 455                 460

Gly Gly Ser Gly Val Asp Thr Met Asp Tyr Ser Ala Met Gly Ala Gly
465                 470                 475                 480

Ile Thr Ala Thr Val Thr Gly Thr Ser Ala Ser Val Val His Ser Gly
                485                 490                 495

Gly Thr Asp Ala Ile Thr His Val Glu Val Leu Val Gly Ser Gly Tyr
            500                 505                 510

Asp Asp Val Phe Thr Gly Gly Thr Gly Asn Asp Thr Phe Ser Gly Gly
        515                 520                 525

Ala Gly Asn Asp Thr Phe Phe Gly Gly Val Gly Ala Asp Gln Leu Thr
    530                 535                 540

Gly Gly Leu Gly Ala Asp Thr Phe Val Tyr Thr Ala Ala Ala Gln Ser
545                 550                 555                 560

Gln Asp Ser Leu Ser Ala Arg Asp Ile Ile Ser Asp Phe Thr Thr Gly
                565                 570                 575

Thr Asp His Ile Lys Leu Ser Leu Thr Gly Thr His Val Asp Val Ser
            580                 585                 590

Thr Phe Asn Asp Ser Ala Gly Ser Tyr Asn Gly Gly Gln Ala Thr Leu
        595                 600                 605

Met Leu Gly Gly Val Val Gly Asp Gly Phe Tyr Ser Ser Gly Asp Ala
    610                 615                 620

Ala Phe Tyr Ile Tyr Thr Gln Gly Thr Thr Ser Ala Val Gly Ser Gly
625                 630                 635                 640
```

```
Asp Tyr Val Ile Gly Ser Thr Asn Ala Ile His Ala Val Asp Leu Gln
                645                 650                 655

Phe Asp Ile Thr Gly Thr Thr Gly Asn Asp Thr Leu Val Gly Gly Ala
            660                 665                 670

Gly Asp Asp Thr Leu Ala Gly Gly Ala Gly Thr Asn Thr Leu Ser Gly
        675                 680                 685

Gly Ser Gly Ser Asp Thr Phe Val Leu Asp Ala Gly Ala Thr Ser Thr
    690                 695                 700

Ala Val Ile Thr Asp Phe Asn Thr Ala Ala Asp Asn Val Thr Leu Ser
705                 710                 715                 720

Asn Ala Ser Phe Gly Leu Gly Ser Ser Gly Thr Leu Asn Asn Gly Val
                725                 730                 735

Asn Tyr Ala Glu Gly Thr Thr Thr Ile Ser Gly Ala Ala Gln Asn Phe
            740                 745                 750

Gly Ser Gly Thr Asp Gly Val Val Ala Ile Gln Asn Gly Ala Asn Val
        755                 760                 765

Glu Val Trp His Thr Thr Asn Met Ala Ala Ala Asp Asn Thr Asn Ser
    770                 775                 780

His Leu Met Ala Thr Leu Asn Asn Val Asn Thr Ser Ala Leu Asp Gln
785                 790                 795                 800

Thr Asn Phe His Leu Ala Val
                805
```

<210> 125
<211> 715
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 125

```
Pro Pro Pro Asn Asp Lys Pro Thr Ala Ser Pro Val Thr Leu Ser Gly
1               5                   10                  15

Ser Thr Ser Gly Thr Thr Val Thr Ile Thr Phe Glu Thr Leu Leu Ser
            20                  25                  30

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

Phe Thr Ser Ser Gln Gly Ala Phe Ser Asn Glu Thr Ala Thr Ser Val
    50                  55                  60
```

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

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

Ser Thr Val Ala Ile Gly Thr Met Val Thr Thr Ser Gly Val Asp Thr
            100                 105                 110

Tyr Asp Gly Gly Ala Gly Ala Asn Asn Tyr Glu Thr Ala Val Ala Asn
        115                 120                 125

Phe Thr Ala Gly Asp Ser Ile Ala Asp Thr Gly Ala Ser Gly Thr Asp
    130                 135                 140

Thr Leu Thr Val Thr Asp Ala Gly Thr Leu Asp Leu Ala Ala Gly Thr
145                 150                 155                 160

Val Thr Gly Ile Asp Val Leu Ala Leu Ala Ala Gly Gly Asn Thr Val
                165                 170                 175

Ile Leu Gly Gly Gly Ala Asn Pro Gln Gln Phe Thr Thr Ile Val Gly
            180                 185                 190

Gly Ala Gly Thr Asp Val Ile Arg Gln Ala Asp Gly Gly Gly Ala Phe
        195                 200                 205

Asp Leu Thr Gly Ile Val Leu Thr Ser Val Glu Ser Ile Ala Thr Gly
    210                 215                 220

Thr Gly Thr Ser Ser Ile Thr Phe Asp Asp Val Ser Ala Ala Gly Ala
225                 230                 235                 240

Gly Val Val Val Asp Ser Ala Ser Ser Asp Gly Asp Ser Val Thr Phe
                245                 250                 255

Tyr Gln Thr Val Ala Gly Thr Leu Asp Ile Ser Gly Lys Thr Ile Thr
            260                 265                 270

Asn Phe Glu Gly Ile Ile Leu Asp Gly Ser Thr Ser Ser Gly Asn Val
        275                 280                 285

Val Leu Val Gly Gly Ala Gln Ala Ala Thr Ile Ile Gly Gly Ser Gly
    290                 295                 300

Asn Asp Thr Leu Thr Gly Gly Ala Gly Val Asp Ser Phe Thr Gly Ser
305                 310                 315                 320

Leu Gly Asp Asp Val Ile His Gly Ala Ser Gly Asp Ala Leu Met Asp
                325                 330                 335
```

```
Gly Gly Gly Gly Thr Gly Asp Val Leu Ser Val Asp Ala Val Asn Phe
            340                 345                 350

Asp Asp Val Asn Asp Gly Gln Ile Ala Asn Ile Glu Thr Val Asn Ile
        355                 360                 365

Thr Ser Ala Ser Thr Ala Gly Gln Trp Phe Lys Phe Asp Asn Gln Ser
    370                 375                 380

Asp Gly Phe Thr Ile Asn Val Thr Ser Ser Gln Asn Val Thr Val Gln
385                 390                 395                 400

Gly Ser Gln Gly Asn Asp Ile Val Asn Gly Gly Asn Ala Gly Glu Tyr
                405                 410                 415

Leu Trp Gly Asp Gly Gly Asn Asp Thr Ile Thr Gly Gly Gln Gly Asn
            420                 425                 430

Asp Thr Ile Leu Gly Ala Ala Gly Thr Asp Val Ala Val Phe Asn Asn
        435                 440                 445

Asn Ala Gln Asp Tyr Ser Tyr Thr Leu Ser Gly Thr Thr Ile Thr Val
    450                 455                 460

Ala Ala Gln Ser Gly Thr Asp Gly Thr Asp Lys Val Asp Thr Val Glu
465                 470                 475                 480

Thr Leu Arg Phe Ala Asp Gly Asp Val Ala Val Thr Thr Asn Ala Gly
                485                 490                 495

Val Ala Val Ser Ala Met Asn Phe Ser Thr Val Thr Gly Ser Ile Thr
            500                 505                 510

Val Asp Ala Ser Ala Leu Thr Thr Ala Leu Thr Leu Thr Gly Ser Asn
        515                 520                 525

Gly Ala Asp Thr Phe Thr Gly Gly Ser Gly Ala Asp Ser Phe Leu Gly
    530                 535                 540

Gly Leu Gly Asp Asp Val Ile Tyr Gly Ala Ser Asn Asp Ala Val Met
545                 550                 555                 560

Asp Gly Gly Gly Gly Thr Gly Asp Val Leu Ser Ile Gly Ala Val Asn
                565                 570                 575

Phe Glu Asp Gly Leu Gly Ala Asn Gly Gln Ile Val Asn Ile Glu Thr
            580                 585                 590

Ile Asn Leu Thr Asn Ala Thr Thr Ala Gly Gln Trp Phe Lys Phe Asp
        595                 600                 605
```

Asp Gln Asn Asp Gly Phe Thr Ile Asn Ile Thr Ser Thr Ala Thr Val
610 615 620

Thr Val Gln Gly Ser Gln Gly Asn Asp Val Ile Asn Gly Gly Asn Gly
625 630 635 640

Gly Glu Tyr Leu Phe Ser Asp Gln Gly Asn Asp Thr Val Tyr Gly Gly
645 650 655

Gln Gly Asn Asp Val Ile Asp Ala Gly Ala Gly Thr Asn Val Val Gly
660 665 670

Phe Ser Gly Ala Ala Ser Asn Tyr Ala Ile Ser Leu Ser Ser Ser Thr
675 680 685

Leu Thr Val Ala Ala Gln Ser Gly Ser Asp Gly Thr Asp Thr Val Thr
690 695 700

Asn Val Gln Thr Leu Arg Phe Ser Asp Arg Asp
705 710 715

<210> 126
<211> 157
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 126

Val Val Gly Ser Asp Phe Asn Asp Ser Ile Thr Gly Ser Asp Ala Gly
1 5 10 15

Ala Asn Tyr Leu Asp Gly Gly Phe Gly Ala Asn Ile Leu Thr Gly Gly
20 25 30

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

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

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

Thr Gly Thr Thr Gly Ala Thr Tyr Ala Glu Gly Thr Thr Thr Ile Ser
85 90 95

Gly Ala Ala Gln Asp Phe Gly Asp Ala Asn Ala Gly Ile Val Ala Ile
100 105 110

Asp Asn Gly Gly Asn Val Glu Leu Trp His Thr Thr Asp Met Ser Ala
115 120 125

Ala Asp Ser Thr Asn Ser His Leu Val Gly Thr Leu Asn Gly Val Asn

130 135 140

Thr Ser Ala Leu Asp Asn Thr Ser Phe His Leu Ala Val
145 150 155

<210> 127
<211> 207
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 127

Met His Ile Asp Pro Ser Gln Leu Pro Ala Ala Lys Asn Leu Ala Thr
1 5 10 15

Pro Val Ala Asp Thr Lys Asp Ala Gly Ala Asp Lys Ser Ala Ala Val
20 25 30

Val Ile Gly Lys Val Asp Lys Leu Gln Gly Asp Ala Trp Val Ile His
35 40 45

Asp Gly Gln Lys Val Pro Ala Lys Ile Gly Ala Ala Leu Met Gln Gly
50 55 60

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

Asp Arg Thr Thr Phe Val Leu Lys Asp Lys Gly Leu Val Gly Leu Asp
85 90 95

Glu Phe Ser Tyr Asp Pro Ala Thr Lys Thr Gly Lys Glu Ser Phe Leu
100 105 110

Val Ala Gln Gly Gly Phe Ser Phe Val Ser Gly Asp Ile Ala Lys Thr
115 120 125

Gln Pro Asp Ala Ala Arg Leu Ala Thr Pro Val Met Thr Met Gly Ile
130 135 140

Arg Gly Thr Thr Val Gly Gly Ser Val Ala Ala Asp Gly Asn Thr Ser
145 150 155 160

Val Ala Leu Phe Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val Ser
165 170 175

Val Ala Ala Leu Gly Gly Gly Gly Gln Ser Phe Thr Leu Asn Ser Ala
180 185 190

Gly Ser Gly Ile Val Gly Ala Ser Ser Gly Gly Ser Trp Ser Val
195 200 205

<210> 128
<211> 209

<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 128

Met Arg Leu Asp Pro Ser Ile Leu Pro Ala Ala Pro Asn Leu Thr Ser
1 5 10 15

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

Ala Val Ile Gly Lys Ile Asp Lys Leu Ser Gly Asp Ala Trp Ile Ile
35 40 45

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

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

Ala Asp Arg Thr Thr Phe Thr Leu Lys Asp Lys Gly Leu Val Gly Leu
85 90 95

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

Leu Val Ala Gln Gly Gly Phe Ser Phe Val Ser Gly Asp Ile Ala Lys
115 120 125

Thr Gln Pro Asp Ser Ala Arg Ile Val Thr Pro Val Met Ser Leu Gly
130 135 140

Ile Arg Gly Thr Thr Val Ala Gly Ser Val Gly Glu Gly Gly Ala Thr
145 150 155 160

Thr Val Ala Leu Leu Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val
165 170 175

Ala Val Ser Ala Leu Ser Gly Gly Gly Gln Ser Phe Thr Leu Asn Ser
180 185 190

Ala Gly Ser Gly Ile Val Gly Ala Thr Ser Ala Gly Ser Trp Ser Val
195 200 205

Ser

<210> 129
<211> 529
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 129

```
Leu Ser Gly Ile Ser Thr Leu Glu Ile Asn Thr Gly Ser Ala Ala Leu
1               5                  10                  15

Asn Leu Thr Leu Gly Thr Val Ala Glu Ala Ala Gly Thr Gly Val Val
            20                  25                  30

Asp Gly Ser Gln Ala Thr Gly Ser Ile Val Ala Asn Ala Ser Ala Tyr
        35                  40                  45

Ser Thr Gly Leu Asp Ile Thr Thr Gly Ser Gly Asn Asp Thr Ile Thr
    50                  55                  60

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

Ile Asn Ala Ala Thr Gly Ile Asp Thr Val Asp Tyr Gly Ala Ala Leu
                85                  90                  95

Ser Ala Ile Thr Ala Thr Ile Gly Ser Gly Ser Ala Thr Val Val His
            100                 105                 110

Ser Gly Gly Thr Asp Thr Leu Ser Gly Val Glu Ile Ile Gln Gly Ser
        115                 120                 125

Thr Phe Gly Asp Thr Phe Ile Val Gly Val Ala Ser Thr Gly Ser Ile
    130                 135                 140

Leu Gly Gly Gly Gly Ser Asp Val Leu Asp Ile Thr Ala Leu Pro Thr
145                 150                 155                 160

Gly Asn Leu Ala Leu Asp Gly Ala Gly Ala Asn Glu Ser Ile His Phe
                165                 170                 175

Asp Ile Ala Gly Arg His Met Glu Ser Leu Val Arg Asp Leu Ser Leu
            180                 185                 190

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

Ile Ala Ser Val Thr Thr Asp Thr Ile Ile Asp Pro Ala Gly Asp Thr
    210                 215                 220

His Arg Ile Val Gly Gln Gly Gly Ala Thr Thr Ala Gly Thr Asp Tyr
225                 230                 235                 240

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

Asp Asp Leu Leu Val Trp His Ser Gly Asn Thr Ser Leu Val Gly Gly
            260                 265                 270
```

```
Gly Gly His Asp Leu Ala Asp Phe Arg His Ala Ala Gly Ala Ile Val
        275                 280                 285

Ala Asp Met Tyr Gly Gly Thr Ser Ala Val Ile Gly Gly Ser Thr Thr
    290                 295                 300

Val Gly Leu Ser Gly Ile Ser Glu Ile Leu Gly Gly Asn Ser Ala Asp
305                 310                 315                 320

Thr Leu Thr Ala Gly Thr Gly Glu Trp Met Leu Ala Gly Gly Gly Gly
                325                 330                 335

Asn Asn Val Met Asp Gly Ser His Gly Thr Thr Thr Val Ser Tyr Gln
            340                 345                 350

Asp Gln Val Thr Gly Val Thr Ile Asp Leu Ala Gly Gly Thr Ala Thr
        355                 360                 365

His Gly Ala Tyr Thr Asp Thr Leu Thr Gly Met Gly Gly Ala Val Gly
    370                 375                 380

Ser Asp Phe Ala Asp Thr Ile Ile Gly Gly Thr Gly Ala Glu Tyr Leu
385                 390                 395                 400

Asp Gly Gly Phe Gly Ala Asn Thr Val Thr Gly Gly Ser Gly Val Asp
                405                 410                 415

Thr Phe Val Leu His Ser Ser Thr Ser Ala Thr Ala Thr Gln Ser Ile
            420                 425                 430

Thr Asp Phe Ala Gly Asp Gln Phe Ser Leu Ser Asp Arg Glu Phe Gly
        435                 440                 445

Leu Gly Ser Ser Gly Thr Leu Ala Ala Ala Asn Tyr Ala Glu Gly Thr
    450                 455                 460

Ala Thr Val Ser Gly Ser Ala Gln Asp Phe Gly Asn Val Asn Ala Gly
465                 470                 475                 480

Ile Val Ala Ile Gln Asn Gly Ala Asn Val Glu Leu Trp His Thr Thr
                485                 490                 495

Asn Met Asp Ala Ala Thr Ser Ser Asn Ser His Leu Val Gly Thr Leu
            500                 505                 510

Glu Asn Ile Asn Thr Ser Ala Leu Asp Asn Thr Asn Phe His Leu Ala
        515                 520                 525

Ile
```

<210> 130
<211> 5299
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (889)..(889)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (2656)..(2656)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (2825)..(2825)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (3672)..(3672)
<223> Xaa can be any naturally occurring amino acid

<400> 130

Met Ser Asp Arg Val Phe Val Arg Leu Glu Gln Arg Ala Val Leu Glu
1 5 10 15

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

Asp Met Asn Lys Val Ala Gly Asp Arg Ala Val Tyr Thr Ala Leu Leu
35 40 45

Thr Pro Gln Gly Lys Phe Leu Tyr Asp Leu Phe Val Val Glu Leu Gly
50 55 60

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

Lys Lys Leu Ser Met Tyr Lys Leu Arg Ser Lys Val Ser Val Ala Val
85 90 95

Ala Ala Asn Val Ala Val Phe Ala Leu Met Gly Glu Gly Ala Ala Ser
100 105 110

Thr Phe Asp Leu Ala Ala Glu Ala Gly Ala Ala Thr Glu Phe Arg Asp
115 120 125

Gln Gly Arg Asp Ala Val Pro Gln Thr Gly Thr Gly Pro Val Ala Gly
130 135 140

Ala Thr Ile Thr Ser Gln Val Gln Glu Val Val Gln Ala Glu Val Ala
145 150 155 160

```
Ala Ala Pro Ala Val Asp Asn Ala Pro Asp Ile Gln Ala Val Ala Val
                165                 170                 175

Asn His Ala Pro Ile Val Ala Gly Val Ala Asp Ile Gly Thr Ile Asp
            180                 185                 190

Glu Asp His Pro Leu Thr Met Thr Ala Ala Glu Trp Gln Ala Lys Leu
        195                 200                 205

Leu Ala Asn Ala Thr Asp Ser Asp Gly Asp Thr Leu Ser Ile Leu Ser
    210                 215                 220

Leu Asp Asp Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala Asp
225                 230                 235                 240

Gly Thr Tyr Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile Asn
                245                 250                 255

Ala Thr Tyr Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly Ser
            260                 265                 270

Ala Ser Leu His Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr Gly
        275                 280                 285

Asp Thr Ala Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly Asn
    290                 295                 300

Leu Asp Ala Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala Thr
305                 310                 315                 320

Thr Ala Asp Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln Trp
                325                 330                 335

Ser Phe Ala Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp His
            340                 345                 350

Leu Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln Thr
        355                 360                 365

Val Thr Val Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser Gly
    370                 375                 380

Asp Ala Lys Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln Thr
385                 390                 395                 400

Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala His
                405                 410                 415

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

```
Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val
        435                 440                 445

Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr
    450                 455                 460

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

Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly
                485                 490                 495

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

Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln
        515                 520                 525

Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn
    530                 535                 540

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

Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val
                565                 570                 575

Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp
            580                 585                 590

Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr
        595                 600                 605

Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr
    610                 615                 620

Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys
625                 630                 635                 640

Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly
                645                 650                 655

Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly
            660                 665                 670

Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser
        675                 680                 685

Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr
    690                 695                 700
```

```
Ser Thr Ala Thr Gly Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu
705                 710                 715                 720

Ala His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr
                725                 730                 735

Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro
            740                 745                 750

Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr
        755                 760                 765

Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile
    770                 775                 780

His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly
785                 790                 795                 800

Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val Ser
                805                 810                 815

Asp Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr
            820                 825                 830

Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala
        835                 840                 845

Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser
    850                 855                 860

Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln
865                 870                 875                 880

Glu Val Thr Val Thr Ile Asn Gly Xaa Asn Asp Thr Ala Thr Ile Ser
                885                 890                 895

Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala Thr
            900                 905                 910

Gly Thr Leu Asn Val Ser Asp Val Asp Asn Gly Glu Ala His Val Gln
        915                 920                 925

Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp
    930                 935                 940

Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala
945                 950                 955                 960

Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala
                965                 970                 975
```

```
Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His Gly Ser Asn
           980                 985                 990

Asp Ser Ala Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
        995                 1000                1005

Gly Thr  Ser Thr Ala Thr Gly  Thr Leu Asn Val Ser  Asp Val Asp
    1010                1015                1020

Ser Gly  Glu Ala His Val Gln  Ala Thr Ser Val Glu  Thr Asp Gln
    1025                1030                1035

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    1040                1045                1050

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Asn Glu Ser
    1055                1060                1065

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    1070                1075                1080

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    1085                1090                1095

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Ser
    1100                1105                1110

Thr Ala  Thr Gly Thr Leu Asn  Val Ala Asp Val Asp  Asn Gly Glu
    1115                1120                1125

Ala His  Val Gln Ala Thr Ser  Val Glu Thr Asp Gln  Gly Thr Phe
    1130                1135                1140

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    1145                1150                1155

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly Asp Ser  Met Thr Lys
    1160                1165                1170

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    1175                1180                1185

Thr Val  Thr Ile Asn Gly Ser  Asn Asp Asn Ala Thr  Ile Ser Gly
    1190                1195                1200

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Ser  Thr Ala Thr
    1205                1210                1215

Gly Thr  Leu Asn Val Ser Asp  Val Asp Asn Gly Glu  Ala His Val
    1220                1225                1230
```

```
Gln Ala  Thr Ser Ile Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    1235                1240                1245

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    1250                1255                1260

Val Gln  Ala Leu Gly Ala Asn  Glu Ser Met Thr Lys  Thr Phe Thr
    1265                1270                1275

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    1280                1285                1290

Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile Ser Gly  Asp Ile Ala
    1295                1300                1305

Gly Gly  Val Gly Glu Asp Gly  Thr Gly Thr Ala Thr  Gly Thr Leu
    1310                1315                1320

Asn Val  Ala Asp Val Asp Asn  Gly Glu Ala His Val  Gln Ala Thr
    1325                1330                1335

Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr Ile Gly  Glu Asp Gly
    1340                1345                1350

Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp Pro Ala  Val Gln Ala
    1355                1360                1365

Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr Phe Thr  Val Thr Ser
    1370                1375                1380

Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr Val Thr  Ile His Gly
    1385                1390                1395

Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp Ile Ala  Gly Gly Val
    1400                1405                1410

Gly Glu  Asp Gly Thr Ser Thr  Ala Thr Gly Thr Leu  His Val Ser
    1415                1420                1425

Asp Val  Asp Thr Gly Glu Ala  His Val Gln Ala Thr  Ser Val Glu
    1430                1435                1440

Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu Asp Gly  Lys Trp Ser
    1445                1450                1455

Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val Gln Ala  Leu Gly Ala
    1460                1465                1470

Asn Asp  Ser Met Thr Lys Thr  Phe Thr Val Thr Ser  Ala Asp Gly
    1475                1480                1485
```

```
Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile His Gly  Ser Asn Asp
    1490                1495                1500

Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
    1505                1510                1515

Gly Thr  Gly Thr Ala Thr Gly  Thr Leu Asn Val Ala  Asp Val Asp
    1520                1525                1530

Asn Gly  Glu Ala His Val Gln  Ala Thr Ser Val Glu  Thr Asp Gln
    1535                1540                1545

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    1550                1555                1560

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Asn Asp Ser
    1565                1570                1575

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    1580                1585                1590

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    1595                1600                1605

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Gly
    1610                1615                1620

Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp Val Asp  Ser Gly Glu
    1625                1630                1635

Ala His  Val Gln Ala Thr Ser  Val Glu Thr Asp Gln  Gly Thr Phe
    1640                1645                1650

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    1655                1660                1665

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Asn Glu Ser  Met Thr Lys
    1670                1675                1680

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    1685                1690                1695

Thr Val  Thr Ile His Gly Ser  Asn Asp Ser Ala Thr  Ile Ser Gly
    1700                1705                1710

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Ser  Thr Ala Thr
    1715                1720                1725

Gly Thr  Leu His Val Ser Asp  Val Asp Thr Gly Glu  Ala His Val
    1730                1735                1740
```

```
Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    1745                1750                1755

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    1760                1765                1770

Val Gln  Ala Leu Gly Ala Asn  Asp Ser Met Thr Lys  Thr Phe Thr
    1775                1780                1785

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    1790                1795                1800

Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile Ser Gly  Asp Ile Ala
    1805                1810                1815

Gly Gly  Val Gly Glu Asp Gly  Thr Gly Thr Ala Thr  Gly Thr Leu
    1820                1825                1830

Asn Val  Ala Asp Val Asp Asn  Gly Glu Ala His Val  Gln Ala Thr
    1835                1840                1845

Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr Ile Gly  Glu Asp Gly
    1850                1855                1860

Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp Pro Ala  Val Gln Ala
    1865                1870                1875

Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr Phe Thr  Val Thr Ser
    1880                1885                1890

Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr Val Thr  Ile Asn Gly
    1895                1900                1905

Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp Ile Ala  Gly Gly Val
    1910                1915                1920

Gly Glu  Asp Gly Thr Gln Ala  Ala Thr Gly Thr Leu  Asn Val Ala
    1925                1930                1935

Asp Val  Asp Ser Gly Glu Ala  His Val Gln Ala Thr  Ser Val Glu
    1940                1945                1950

Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu Asp Gly  Lys Trp Ser
    1955                1960                1965

Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val Gln Ala  Leu Gly Ala
    1970                1975                1980

Asn Asp  Ser Met Thr Lys Thr  Phe Thr Val Thr Ser  Ala Asp Gly
    1985                1990                1995
```

```
Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile His Gly  Ser Asn Asp
    2000                2005                2010

Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
    2015                2020                2025

Gly Thr  Ser Thr Ala Thr Gly  Thr Leu His Val Ser  Asp Val Asp
    2030                2035                2040

Thr Gly  Glu Ala His Val Gln  Ala Thr Ser Val Glu  Thr Asp Gln
    2045                2050                2055

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    2060                2065                2070

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Asn Glu Ser
    2075                2080                2085

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    2090                2095                2100

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    2105                2110                2115

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Ser
    2120                2125                2130

Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp Val Asp  Asn Gly Glu
    2135                2140                2145

Ala His  Val Gln Ala Thr Ser  Ile Glu Thr Asp Gln  Gly Thr Phe
    2150                2155                2160

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    2165                2170                2175

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly Asp Ser  Met Thr Lys
    2180                2185                2190

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    2195                2200                2205

Thr Val  Thr Ile His Gly Ser  Asn Asp Ser Ala Thr  Ile Ser Gly
    2210                2215                2220

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Gly  Thr Ala Thr
    2225                2230                2235

Gly Thr  Leu Asn Val Ser Asp  Val Asp Ser Gly Glu  Ala His Val
    2240                2245                2250
```

```
Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    2255                2260                2265

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    2270                2275                2280

Val Gln  Ala Leu Gly Ala Asn  Glu Ser Met Thr Lys  Thr Phe Thr
    2285                2290                2295

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    2300                2305                2310

Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile Ser Gly  Asp Ile Ala
    2315                2320                2325

Gly Gly  Val Gly Glu Asp Gly  Thr Ser Thr Ala Thr  Gly Thr Leu
    2330                2335                2340

Asn Val  Ala Asp Val Asp Asn  Gly Glu Ala His Val  Gln Ala Thr
    2345                2350                2355

Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr Ile Gly  Glu Asp Gly
    2360                2365                2370

Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp Pro Ala  Val Gln Ala
    2375                2380                2385

Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr Phe Thr  Val Thr Ser
    2390                2395                2400

Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr Val Thr  Ile Asn Gly
    2405                2410                2415

Ser Asn  Asp Asn Ala Thr Ile  Ser Gly Asp Ile Ala  Gly Gly Val
    2420                2425                2430

Gly Glu  Asp Gly Thr Ser Thr  Ala Thr Gly Thr Leu  Asn Val Ser
    2435                2440                2445

Asp Val  Asp Asn Gly Glu Ala  His Val Gln Ala Thr  Ser Ile Glu
    2450                2455                2460

Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu Asp Gly  Lys Trp Ser
    2465                2470                2475

Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val Gln Ala  Leu Gly Ala
    2480                2485                2490

Asn Glu  Ser Met Thr Lys Thr  Phe Thr Val Thr Ser  Ala Asp Gly
    2495                2500                2505
```

```
Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile His Gly  Ser Asn Asp
    2510                 2515                 2520

Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
    2525                 2530                 2535

Gly Thr  Gly Thr Ala Thr Gly  Thr Leu Asn Val Ala  Asp Val Asp
    2540                 2545                 2550

Asn Gly  Glu Ala His Val Gln  Ala Thr Ser Val Glu  Thr Asp Gln
    2555                 2560                 2565

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    2570                 2575                 2580

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Gly Asp Ser
    2585                 2590                 2595

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    2600                 2605                 2610

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    2615                 2620                 2625

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Ser
    2630                 2635                 2640

Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp Val Asp  Xaa Gly Glu
    2645                 2650                 2655

Ala His  Val Gln Ala Thr Ser  Val Glu Thr Asp Gln  Gly Thr Phe
    2660                 2665                 2670

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    2675                 2680                 2685

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly Asp Ser  Met Thr Lys
    2690                 2695                 2700

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    2705                 2710                 2715

Thr Val  Thr Ile His Gly Ser  Asn Asp Ser Ala Thr  Ile Ser Gly
    2720                 2725                 2730

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Gly  Thr Ala Thr
    2735                 2740                 2745

Gly Thr  Leu Asn Val Ser Asp  Val Asp Ser Gly Glu  Ala His Val
    2750                 2755                 2760
```

```
Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    2765                2770                2775

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    2780                2785                2790

Val Gln  Ala Leu Gly Ala Asn  Glu Ser Met Thr Lys  Thr Phe Thr
    2795                2800                2805

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    2810                2815                2820

Ile Xaa  Gly Ser Asn Asp Ser  Ala Thr Ile Ser Gly  Asp Ile Ala
    2825                2830                2835

Gly Gly  Val Gly Glu Asp Gly  Thr Ser Thr Ala Thr  Gly Thr Leu
    2840                2845                2850

Asn Val  Ser Asp Val Asp Asn  Gly Glu Ala His Val  Gln Ala Thr
    2855                2860                2865

Ser Ile  Glu Thr Asp Gln Gly  Thr Phe Thr Ile Gly  Glu Asp Gly
    2870                2875                2880

Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp Pro Ala  Val Gln Ala
    2885                2890                2895

Leu Gly  Ala Asn Glu Ser Met  Thr Lys Thr Phe Thr  Val Thr Ser
    2900                2905                2910

Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr Val Thr  Ile His Gly
    2915                2920                2925

Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp Ile Ala  Gly Gly Val
    2930                2935                2940

Gly Glu  Asp Gly Thr Gly Thr  Ala Thr Gly Thr Leu  Asn Val Ala
    2945                2950                2955

Asp Val  Asp Asn Gly Glu Ala  His Val Gln Ala Thr  Ser Val Glu
    2960                2965                2970

Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu Asp Gly  Lys Trp Ser
    2975                2980                2985

Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val Gln Ala  Leu Gly Ala
    2990                2995                3000

Gly Asp  Ser Met Thr Lys Thr  Phe Thr Val Thr Ser  Ala Asp Gly
    3005                3010                3015
```

```
Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile His Gly  Ser Asn Asp
    3020                3025                3030

Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
    3035                3040                3045

Gly Thr  Gly Thr Ala Thr Gly  Thr Leu Asn Val Ser  Asp Val Asp
    3050                3055                3060

Ser Gly  Glu Ala His Val Gln  Ala Thr Ser Val Glu  Thr Asp Gln
    3065                3070                3075

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    3080                3085                3090

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Asn Asp Ser
    3095                3100                3105

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    3110                3115                3120

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    3125                3130                3135

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Ser
    3140                3145                3150

Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp Val Asp  Ser Gly Glu
    3155                3160                3165

Ala His  Val Gln Ala Thr Ser  Val Glu Thr Asp Gln  Gly Thr Phe
    3170                3175                3180

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    3185                3190                3195

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly Asp Ser  Met Thr Lys
    3200                3205                3210

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    3215                3220                3225

Thr Val  Thr Ile His Gly Ser  Asn Asp Ser Ala Thr  Ile Ser Gly
    3230                3235                3240

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Gly  Thr Ala Thr
    3245                3250                3255

Gly Thr  Leu Asn Val Ser Asp  Val Asp Ser Gly Glu  Ala His Val
    3260                3265                3270
```

```
Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    3275                3280                3285

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    3290                3295                3300

Val Gln  Ala Leu Gly Ala Asn  Asp Ser Met Thr Lys  Thr Phe Thr
    3305                3310                3315

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    3320                3325                3330

Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile Ser Gly  Asp Ile Ala
    3335                3340                3345

Gly Gly  Val Gly Glu Asp Gly  Thr Ser Thr Ala Ser  Gly Thr Leu
    3350                3355                3360

Asn Val  Ser Asp Val Asp Asn  Gly Glu Ala His Val  Gln Ala Thr
    3365                3370                3375

Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr Ile Gly  Glu Asp Gly
    3380                3385                3390

Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp Pro Ala  Val Gln Ala
    3395                3400                3405

Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr Phe Thr  Val Thr Ser
    3410                3415                3420

Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr Val Thr  Ile His Gly
    3425                3430                3435

Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp Ile Ala  Gly Gly Val
    3440                3445                3450

Gly Glu  Asp Gly Thr Gly Thr  Ala Thr Gly Thr Leu  Asn Val Ser
    3455                3460                3465

Asp Val  Asp Asn Gly Glu Ala  His Val Gln Ala Thr  Ser Val Glu
    3470                3475                3480

Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu Asp Gly  Lys Trp Ser
    3485                3490                3495

Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val Gln Ala  Leu Gly Ala
    3500                3505                3510

Asn Glu  Ser Met Thr Lys Thr  Phe Thr Val Thr Ser  Ala Asp Gly
    3515                3520                3525
```

```
Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile Asn Gly  Ser Asn Asp
    3530                3535                3540

Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
    3545                3550                3555

Gly Thr  Ser Thr Ala Thr Gly  Thr Leu Asn Val Ser  Asp Val Asp
    3560                3565                3570

Asn Gly  Glu Ala His Val Gln  Ala Thr Ser Ile Glu  Thr Asp Gln
    3575                3580                3585

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    3590                3595                3600

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Asn Glu Ser
    3605                3610                3615

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    3620                3625                3630

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    3635                3640                3645

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Gly
    3650                3655                3660

Thr Ala  Thr Gly Thr Leu Asn  Val Xaa Asp Val Asp  Asn Gly Glu
    3665                3670                3675

Ala His  Val Gln Ala Thr Ser  Val Glu Thr Asp Gln  Gly Thr Phe
    3680                3685                3690

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    3695                3700                3705

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly Asp Ser  Met Thr Lys
    3710                3715                3720

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    3725                3730                3735

Thr Val  Thr Ile His Gly Ser  Asn Asp Ser Ala Thr  Ile Ser Gly
    3740                3745                3750

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Gly  Thr Ala Thr
    3755                3760                3765

Gly Thr  Leu Asn Val Ser Asp  Val Asp Ser Gly Glu  Ala His Val
    3770                3775                3780
```

```
Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    3785                 3790                 3795

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    3800                 3805                 3810

Val Gln  Ala Leu Gly Ala Asn  Glu Ser Met Thr Lys  Thr Phe Thr
    3815                 3820                 3825

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    3830                 3835                 3840

Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile Ser Gly  Asp Ile Ala
    3845                 3850                 3855

Gly Gly  Val Gly Glu Asp Gly  Thr Ser Thr Ala Thr  Gly Thr Leu
    3860                 3865                 3870

Asn Val  Ser Asp Val Asp Ser  Gly Glu Ala His Val  Gln Ala Thr
    3875                 3880                 3885

Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr Ile Gly  Glu Asp Gly
    3890                 3895                 3900

Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp Pro Ala  Val Gln Ala
    3905                 3910                 3915

Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr Phe Thr  Val Thr Ser
    3920                 3925                 3930

Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr Val Thr  Ile His Gly
    3935                 3940                 3945

Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp Ile Ala  Gly Gly Val
    3950                 3955                 3960

Gly Glu  Asp Gly Thr Gly Thr  Ala Thr Gly Thr Leu  Asn Val Ser
    3965                 3970                 3975

Asp Val  Asp Ser Gly Glu Ala  His Val Gln Ala Thr  Ser Val Glu
    3980                 3985                 3990

Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu Asp Gly  Lys Trp Ser
    3995                 4000                 4005

Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val Gln Ala  Leu Gly Ala
    4010                 4015                 4020

Asn Asp  Ser Met Thr Lys Thr  Phe Thr Val Thr Ser  Ala Asp Gly
    4025                 4030                 4035
```

```
Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile His Gly  Ser Asn Asp
    4040                4045                4050

Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly Gly Val  Gly Glu Asp
    4055                4060                4065

Gly Thr  Ser Thr Ala Ser Gly  Thr Leu Asn Val Ser  Asp Val Asp
    4070                4075                4080

Asn Gly  Glu Ala His Val Gln  Ala Thr Ser Val Glu  Thr Asp Gln
    4085                4090                4095

Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys Trp Ser  Phe Ala Leu
    4100                4105                4110

Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu Gly Ala  Gly Asp Ser
    4115                4120                4125

Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala Asp Gly  Thr Asp Thr
    4130                4135                4140

Gln Glu  Val Thr Val Thr Ile  His Gly Ser Asn Asp  Ser Ala Thr
    4145                4150                4155

Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly Glu Asp  Gly Thr Gly
    4160                4165                4170

Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp Val Asp  Asn Gly Glu
    4175                4180                4185

Ala His  Val Gln Ala Thr Ser  Val Glu Thr Asp Gln  Gly Thr Phe
    4190                4195                4200

Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe Ala Leu  Asn Asn Asp
    4205                4210                4215

Asp Pro  Ala Val Gln Ala Leu  Gly Ala Asn Glu Ser  Met Thr Lys
    4220                4225                4230

Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr Asp Thr  Gln Glu Val
    4235                4240                4245

Thr Val  Thr Ile His Gly Ser  Asn Asp Ser Ala Thr  Ile Ser Gly
    4250                4255                4260

Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly Thr Gly  Thr Ala Thr
    4265                4270                4275

Gly Thr  Leu Asn Val Ser Asp  Val Asp Ser Gly Glu  Ala His Val
    4280                4285                4290
```

```
Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly Thr Phe  Thr Ile Gly
    4295                4300                4305

Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn Asn Asp  Asp Pro Ala
    4310                4315                4320

Val Gln  Ala Leu Gly Ala Gly  Asp Ser Met Thr Lys  Thr Phe Thr
    4325                4330                4335

Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln Glu Val  Thr Val Thr
    4340                4345                4350

Ile Asn  Gly Ser Asn Asp Gly  Pro Val Val Ser Gly  Pro Val Asp
    4355                4360                4365

Leu Gly  Ala Thr Ala Glu Asp  His Ser Ile Thr Phe  Thr Ala Gln
    4370                4375                4380

Gln Leu  Leu Gly His Ala Ser  Asp Ile Asp Gly Asp  Ser Leu Ser
    4385                4390                4395

Val Ser  Asn Leu Ser Ala Gly  Asn Gly Thr Ile Ser  Gln Asn Ala
    4400                4405                4410

Asp Gly  Ser Tyr Thr Phe Thr  Pro Asn Ala Asp Phe  Asn Gly Glu
    4415                4420                4425

Val Asn  Val Thr Tyr Thr Val  Ser Asp Gly His Gly  Gly Thr Thr
    4430                4435                4440

Ser Gly  Ser Ala Ser Phe Asp  Val Thr Ser Val Asn  Asp Gly Pro
    4445                4450                4455

Thr Thr  Ser Asp Val Thr Leu  Ala Ser Gly Thr Glu  Asp Arg Ser
    4460                4465                4470

Val Thr  Ile Lys Ala Ser Asp  Leu Leu Gly Asn Ala  His Asp Val
    4475                4480                4485

Asp Gly  Asp Thr Leu Ser Val  Ser Asn Leu Ser Ala  Ser Asn Gly
    4490                4495                4500

Thr Ile  Thr Asp Asn His Asp  Gly Thr Tyr Thr Phe  Thr Pro Asn
    4505                4510                4515

His Asp  Phe Ser Gly Asn Val  Asp Leu Ser Tyr Thr  Val Ser Asp
    4520                4525                4530

Gly Gln  Gly Gly Ser Thr Ala  Gly Thr Ala His Phe  Gly Met Ala
    4535                4540                4545
```

```
Ala Val  Ala Asp Ser Pro Val  Leu Ser Ala Ser Asn  Ile Thr Val
    4550                 4555                 4560

Asp Leu  Gly Ala Gly Gln Ala  Gln Thr Leu Asn Gly  Thr Thr Gly
    4565                 4570                 4575

Asn Asp  Thr Leu Ser Gly Gly  Ser Gly Asn Asp Val  Val Asn Gly
    4580                 4585                 4590

Ser Ser  Gly Asp Asp Val Leu  Tyr Gly Asp Gly Thr  Gly Ser Val
    4595                 4600                 4605

Thr Val  Pro Leu Asn Ile Ser  Asp Arg Leu Ser Asp  Thr Asp Gly
    4610                 4615                 4620

Ser Glu  Ser Leu Gly Ser Val  Thr Ile Gly Gly Leu  Pro Ala Gly
    4625                 4630                 4635

Ala Ser  Leu Ser Ala Gly Thr  His Asn Ser Asp Gly  Thr Trp Thr
    4640                 4645                 4650

Leu Thr  Pro Ala Gln Leu Thr  Gly Leu Ser Val Thr  Thr Thr Glu
    4655                 4660                 4665

Gly Thr  Ala Leu His Leu Ser  Val Thr Ala Thr Ser  Thr Glu Ala
    4670                 4675                 4680

Ser Asn  Gly Ser Thr Ala Thr  Thr Thr Thr Ser Phe  Asp Val Ser
    4685                 4690                 4695

Phe Ser  Gly Thr Ala Ala Gly  Asn Asp Thr Leu Asp  Gly Gly Ala
    4700                 4705                 4710

Gly Asn  Asp Thr Leu Phe Gly  Gly Ala Gly Asn Asp  Thr Leu Thr
    4715                 4720                 4725

Gly Gly  Ala Gly Ala Asp Leu  Leu Glu Gly Gly Asp  Gly Asn Asp
    4730                 4735                 4740

Val Leu  Asn Tyr Ser Thr Asp  Gly Thr Trp Ser Gly  Gly Phe Val
    4745                 4750                 4755

Ser Gln  Asn Val Gly Asp Thr  Thr His Ala Gly Thr  Asn Glu Thr
    4760                 4765                 4770

Tyr Thr  Ile Thr Gly Asp Asn  Asp Ser Gln Asp Val  Phe Arg Gly
    4775                 4780                 4785

Gly Ala  Gly Thr Asp Thr Leu  Val Met Gly Ser Gly  Asn Asp Ala
    4790                 4795                 4800
```

```
Leu Phe  Leu Asp Asp Gly Tyr  Ser Gly Ser Pro Thr  Gly Gly Ala
    4805                 4810                 4815

Arg Ile  Asp Gly Ile Glu Ser  Ile Val Ala Gly Asp  Gly Asn Asp
    4820                 4825                 4830

Val Val  Asp Leu Thr Ser Ser  Lys Tyr Thr Tyr Gly  Asp Val Thr
    4835                 4840                 4845

Ile Asp  Gly Gly Ala Gly Asn  Asp Val Leu Met Gly  Asn Ala Gly
    4850                 4855                 4860

Asn Asp  Val Ile Asp Gly Gly  Thr Gly Asn Asp Val  Leu Tyr Gly
    4865                 4870                 4875

Ala Ser  Gly Asn Asp Thr Leu  Arg Gly Gly Asp Gly  Ala Asp Thr
    4880                 4885                 4890

Leu Asp  Gly Gly Tyr Gly Ala  Asp Thr Ile Asp Ala  Gly Ala Gly
    4895                 4900                 4905

Asn Asp  Leu Gly Ile Ile Lys  Gly Gly Gln Ser Ala  Gly Asp Asn
    4910                 4915                 4920

Tyr Asp  Gly Gly Thr Gly Thr  Asp Thr Leu Arg Ile  Asp Leu Ser
    4925                 4930                 4935

Gly Ser  Gln Tyr Thr Ala Ala  Val Arg Ala Glu Leu  Gln Gln Phe
    4940                 4945                 4950

Gln Ser  Phe Ile Ala Asp Pro  Ala His Ala Gly Gln  Ser Phe His
    4955                 4960                 4965

Phe Asn  Thr Leu Gly Val Asp  Ala Lys Asn Trp Glu  Ser Leu Lys
    4970                 4975                 4980

Leu Thr  Val Asp Gly Arg Asp  Val Ser Leu Glu Asn  Ala Pro Thr
    4985                 4990                 4995

Val Thr  Ser Ala Thr Ala Val  Ser Thr Asp Glu Asp  His Ser Gly
    5000                 5005                 5010

Ala Gly  Arg Val Val Gly Thr  Asp Gln Asp Val Gly  Asp Ser Val
    5015                 5020                 5025

Arg Tyr  His Leu Met Asp Ala  Ser Gly Asn Gln Val  Asp Ser Leu
    5030                 5035                 5040

Ser Thr  Ala His Gly Thr Val  Thr Ile Asn Ser Ala  Thr Gly Glu
    5045                 5050                 5055
```

```
Tyr Thr  Phe Thr Pro Asn Ala  Asp Ala Gln Ser Leu  Arg Ala Gly
    5060                5065                5070

Asp Val  Gln Thr Asp Ser Phe  Lys Val Val Ala Thr  Asp Gly Thr
    5075                5080                5085

Met Thr  Ser Ala Pro Ser Thr  Val Gly Val Thr Ile  Thr Gly Ser
    5090                5095                5100

Asn Asp  Gly Ala Val Ile Thr  Gly Thr Ser Val Gly  Thr Val Gly
    5105                5110                5115

Glu Asp  Gly Asn Arg Ser Val  Thr Gly Thr Leu Asn  Val Ala Asp
    5120                5125                5130

Val Asp  Gln Gly Gln Ala His  Val Thr Ala Gln Thr  Val Gln Thr
    5135                5140                5145

Asp Gln  Gly Thr Phe Ser Ile  Gly Glu Asn Gly Gln  Trp Thr Phe
    5150                5155                5160

Gln Val  Asn Ser Gly Asn Ala  Asp Val Gln Ala Leu  Gly Ala Gly
    5165                5170                5175

Glu Ser  Met Thr Lys Thr Phe  Ala Val Ala Ser Ala  Asp Gly Thr
    5180                5185                5190

Ala Thr  Gln Asn Val Thr Val  Thr Ile Asn Gly Ala  Asn Asp Ser
    5195                5200                5205

Ala Thr  Ile Ser Gly Ser Thr  Thr Gly Ala Val Ala  Glu Asp Gly
    5210                5215                5220

Asn Gly  Arg Ala Thr Gly Thr  Leu Ser Val Ala Asp  Val Asp His
    5225                5230                5235

Gly Gln  Ala His Val Thr Ala  Gln Thr Val Gln Thr  Asp Gln Gly
    5240                5245                5250

Thr Phe  Ser Ile Gly Glu Asn  Gly Gln Trp Thr Phe  Gln Val Asn
    5255                5260                5265

Ser Ala  Asn Ala Asp Val Gln  Ala Leu Gly Ala Gly  Glu Ser Met
    5270                5275                5280

Thr Lys  Thr Phe Ala Val Ala  Ser Ala Asp Gly Thr  Ala Pro Arg
    5285                5290                5295

Thr
```

<210> 131
<211> 3060
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<220>
<221> misc_feature
<222> (1317)..(1317)
<223> Xaa can be any naturally occurring amino acid

<400> 131

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

Ala Glu Glu Asn Ala Gln Gln Ser Leu Asp Asp Leu Thr Val Leu Gln
20 25 30

Asn Val Gln Asn Gln Asn Met Gly Asp Ala Arg Leu Asn Val Ala Arg
35 40 45

Ala Val Asp Val Ser Asp Thr Gln Leu Gly Asn Leu Ala Asn Val Gln
50 55 60

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

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

Asn Ser Val Ala Pro Pro Glu Leu Asp Gly Leu Ala Val Asp Ile Arg
100 105 110

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

Asn Val Gln Glu Leu Pro Asp Leu Ala Arg Pro Asp Ala Glu Phe Arg
130 135 140

Asp Gln Gly Arg Asp Ala Val Pro Gln Thr Gly Thr Gly Pro Val Ala
145 150 155 160

Gly Ala Thr Ile Thr Ser Gln Val Gln Glu Val Val Gln Ala Glu Val
165 170 175

Ala Ala Ala Pro Ala Val Asp Asn Ala Pro Asp Ile Gln Ala Val Ala
180 185 190

Val Asn His Ala Pro Ile Val Ala Gly Val Ala Asp Ile Gly Thr Ile
195 200 205

Asp Glu Asp His Pro Leu Thr Met Thr Ala Ala Glu Trp Gln Ala Lys
210 215 220

```
Leu Leu Ala Asn Ala Thr Asp Ser Asp Gly Asp Thr Leu Ser Ile Leu
225                 230                 235                 240

Ser Leu Asp Asp Ile Arg Ile Asp His Gly Ser Phe Ala Arg Asn Ala
                245                 250                 255

Asp Gly Thr Tyr Thr Phe Thr Pro Asp Ala Asn Phe Asn Gly Glu Ile
            260                 265                 270

Asn Ala Thr Tyr Thr Ile Ser Asp Gly His Gly Gly Leu Ala Thr Gly
        275                 280                 285

Ser Ala Ser Leu His Val Asn Ala Val Asn Asp Ala Ala Glu Ile Thr
    290                 295                 300

Gly Asp Thr Ala Val Val Val Gly Glu Asp Thr Ala Arg Ala Ala Gly
305                 310                 315                 320

Asn Leu Asp Ala Thr Asp Ile Asp Ser Pro Ala Thr Phe Val Ala Ala
                325                 330                 335

Thr Thr Ala Asp Asp Tyr Gly Thr Phe Ser Val Asp Glu Ser Gly Gln
            340                 345                 350

Trp Ser Phe Ala Met Asn Asp Ser Val Gln Ser Leu Gly Ala Gly Asp
        355                 360                 365

His Leu Thr Arg Thr Phe Glu Val Gln Thr Ala Asp Gly Thr Ser Gln
    370                 375                 380

Thr Val Thr Val Thr Ile Asp Gly Ala Asn Asp Gln Ala Val Ile Ser
385                 390                 395                 400

Gly Asp Ala Lys Asp Leu Ser Gly Ser Val Gly Glu Asp Gly Thr Gln
                405                 410                 415

Thr Ala Thr Gly Thr Leu His Val Ser Asp Val Asp Ser Gly Glu Ala
            420                 425                 430

His Val Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile
        435                 440                 445

Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala
    450                 455                 460

Val Gln Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val
465                 470                 475                 480

Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile His
                485                 490                 495
```

```
Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val
            500                 505                 510

Gly Glu Asp Gly Thr Gly Thr Ala Thr Gly Thr Leu Asn Val Ser Asp
        515                 520                 525

Val Asp Ser Gly Glu Ala His Val Gln Ala Thr Ser Val Glu Thr Asp
    530                 535                 540

Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu
545                 550                 555                 560

Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Asp Ser Met
                565                 570                 575

Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu
            580                 585                 590

Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly
        595                 600                 605

Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly
    610                 615                 620

Thr Leu Asn Val Ala Asp Val Asp Asn Gly Glu Ala His Val Gln Ala
625                 630                 635                 640

Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly
                645                 650                 655

Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu
            660                 665                 670

Gly Ala Asn Glu Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp
        675                 680                 685

Gly Thr Asp Thr Gln Glu Val Thr Val Thr Ile Asn Gly Ser Asn Asp
    690                 695                 700

Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly
705                 710                 715                 720

Thr Ser Thr Ala Thr Gly Thr Leu Ser Val Ala Asp Val Asp Asn Gly
                725                 730                 735

Glu Ala His Val Gln Ala Thr Ser Ile Glu Thr Asp Gln Gly Thr Phe
            740                 745                 750

Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp
        755                 760                 765
```

```
Pro Ala Val Gln Ala Leu Gly Ala Asn Glu Ser Met Thr Lys Thr Phe
    770                 775                 780

Thr Val Thr Ser Ala Asp Gly Thr Asp Thr Gln Glu Val Thr Val Thr
785                 790                 795                 800

Ile Asn Gly Ser Asn Asp Ser Ala Thr Ile Ser Gly Asp Ile Ala Gly
                805                 810                 815

Gly Val Gly Glu Asp Gly Thr Ser Thr Ala Thr Gly Thr Leu Asn Val
            820                 825                 830

Ser Asp Val Asp Asn Gly Glu Ala His Val Gln Ala Thr Ser Ile Glu
        835                 840                 845

Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu Asp Gly Lys Trp Ser Phe
    850                 855                 860

Ala Leu Asn Asn Asp Asp Pro Ala Val Gln Ala Leu Gly Ala Asn Glu
865                 870                 875                 880

Ser Met Thr Lys Thr Phe Thr Val Thr Ser Ala Asp Gly Thr Asp Thr
                885                 890                 895

Gln Glu Val Thr Val Thr Ile His Gly Ser Asn Asp Ser Ala Thr Ile
            900                 905                 910

Ser Gly Asp Ile Ala Gly Gly Val Gly Glu Asp Gly Thr Gly Thr Ala
        915                 920                 925

Thr Gly Thr Leu Asn Val Ser Asp Val Asp Ser Gly Glu Ala His Val
    930                 935                 940

Gln Ala Thr Ser Val Glu Thr Asp Gln Gly Thr Phe Thr Ile Gly Glu
945                 950                 955                 960

Asp Gly Lys Trp Ser Phe Ala Leu Asn Asn Asp Asp Pro Ala Val Gln
                965                 970                 975

Ala Leu Gly Ala Asn Asp Ser Met Thr Lys Thr Phe Thr Val Thr Ser
            980                 985                 990

Ala Asp Gly Thr Asp Thr Gln Glu  Val Thr Val Thr Ile  His Gly Ser
        995                 1000                1005

Asn Asp  Ser Ala Thr Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly
    1010                1015                1020

Glu Asp  Gly Thr Gly Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp
    1025                1030                1035
```

```
Val Asp  Ser Gly Glu Ala His  Val Gln Ala Thr Ser  Val Glu Thr
    1040                1045                1050

Asp Gln  Gly Thr Phe Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe
    1055                1060                1065

Ala Leu  Asn Asn Asp Asp Pro  Ala Val Gln Ala Leu  Gly Ala Asn
    1070                1075                1080

Asp Ser  Met Thr Lys Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr
    1085                1090                1095

Asp Thr  Gln Glu Val Thr Val  Thr Ile His Gly Ser  Asn Asp Ser
    1100                1105                1110

Ala Thr  Ile Ser Gly Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly
    1115                1120                1125

Thr Ser  Thr Ala Thr Gly Thr  Leu Asn Val Ser Asp  Val Asp Ser
    1130                1135                1140

Gly Glu  Ala His Val Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly
    1145                1150                1155

Thr Phe  Thr Ile Gly Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn
    1160                1165                1170

Asn Asp  Asp Pro Ala Val Gln  Ala Leu Gly Ala Gly  Asp Ser Met
    1175                1180                1185

Thr Lys  Thr Phe Thr Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln
    1190                1195                1200

Glu Val  Thr Val Thr Ile Asn  Gly Ser Asn Asp Ser  Ala Thr Ile
    1205                1210                1215

Ser Gly  Asp Ile Ala Gly Gly  Val Gly Glu Asp Gly  Thr Gln Ala
    1220                1225                1230

Ala Thr  Gly Thr Leu Asn Val  Ala Asp Val Asp Ser  Gly Glu Ala
    1235                1240                1245

His Val  Gln Ala Thr Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr
    1250                1255                1260

Ile Gly  Glu Asp Gly Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp
    1265                1270                1275

Pro Ala  Val Gln Ala Leu Gly  Ala Asn Asp Ser Met  Thr Lys Thr
    1280                1285                1290
```

```
Phe Thr  Val Thr Ser Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr
    1295                 1300                 1305

Val Thr  Ile His Gly Ser Asn  Asp Xaa Ala Thr Ile  Ser Gly Asp
    1310                 1315                 1320

Ile Ala  Gly Gly Val Gly Glu  Asp Gly Thr Ser Thr  Ala Thr Gly
    1325                 1330                 1335

Thr Leu  His Val Ser Asp Val  Asp Thr Gly Glu Ala  His Val Gln
    1340                 1345                 1350

Ala Thr  Ser Val Glu Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu
    1355                 1360                 1365

Asp Gly  Lys Trp Ser Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val
    1370                 1375                 1380

Gln Ala  Leu Gly Ala Asn Glu  Ser Met Thr Lys Thr  Phe Thr Val
    1385                 1390                 1395

Thr Ser  Ala Asp Gly Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile
    1400                 1405                 1410

His Gly  Ser Asn Asp Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly
    1415                 1420                 1425

Gly Val  Gly Glu Asp Gly Thr  Gly Thr Ala Thr Gly  Thr Leu Asn
    1430                 1435                 1440

Val Ala  Asp Val Asp Asn Gly  Glu Ala His Val Gln  Ala Thr Ser
    1445                 1450                 1455

Val Glu  Thr Asp Gln Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys
    1460                 1465                 1470

Trp Ser  Phe Ala Leu Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu
    1475                 1480                 1485

Gly Ala  Asn Asp Ser Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala
    1490                 1495                 1500

Asp Gly  Thr Asp Thr Gln Glu  Val Thr Val Thr Ile  His Gly Ser
    1505                 1510                 1515

Asn Asp  Ser Ala Thr Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly
    1520                 1525                 1530

Glu Asp  Gly Thr Gly Thr Ala  Thr Gly Thr Leu Asn  Val Ser Asp
    1535                 1540                 1545
```

```
Val Asp  Ser Gly Glu Ala His  Val Gln Ala Thr Ser  Val Glu Thr
    1550                1555                1560

Asp Gln  Gly Thr Phe Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe
    1565                1570                1575

Ala Leu  Asn Asn Asp Asp Pro  Ala Val Gln Ala Leu  Gly Ala Asn
    1580                1585                1590

Glu Ser  Met Thr Lys Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr
    1595                1600                1605

Asp Thr  Gln Glu Val Thr Val  Thr Ile His Gly Ser  Asn Asp Ser
    1610                1615                1620

Ala Thr  Ile Ser Gly Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly
    1625                1630                1635

Thr Ser  Thr Ala Thr Gly Thr  Leu His Val Ser Asp  Val Asp Thr
    1640                1645                1650

Gly Glu  Ala His Val Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly
    1655                1660                1665

Thr Phe  Thr Ile Gly Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn
    1670                1675                1680

Asn Asp  Asp Pro Ala Val Gln  Ala Leu Gly Ala Asn  Asp Ser Met
    1685                1690                1695

Thr Lys  Thr Phe Thr Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln
    1700                1705                1710

Glu Val  Thr Val Thr Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile
    1715                1720                1725

Ser Gly  Asp Ile Ala Gly Gly  Val Gly Glu Asp Gly  Thr Gly Thr
    1730                1735                1740

Ala Thr  Gly Thr Leu Asn Val  Ala Asp Val Asp Asn  Gly Glu Ala
    1745                1750                1755

His Val  Gln Ala Thr Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr
    1760                1765                1770

Ile Gly  Glu Asp Gly Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp
    1775                1780                1785

Pro Ala  Val Gln Ala Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr
    1790                1795                1800
```

```
Phe Thr  Val Thr Ser Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr
    1805                 1810                 1815

Val Thr  Ile Asn Gly Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp
    1820                 1825                 1830

Ile Ala  Gly Gly Val Gly Glu  Asp Gly Thr Gln Ala  Ala Thr Gly
    1835                 1840                 1845

Thr Leu  Asn Val Ala Asp Val  Asp Ser Gly Glu Ala  His Val Gln
    1850                 1855                 1860

Ala Thr  Ser Val Glu Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu
    1865                 1870                 1875

Asp Gly  Lys Trp Ser Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val
    1880                 1885                 1890

Gln Ala  Leu Gly Ala Asn Asp  Ser Met Thr Lys Thr  Phe Thr Val
    1895                 1900                 1905

Thr Ser  Ala Asp Gly Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile
    1910                 1915                 1920

His Gly  Ser Asn Asp Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly
    1925                 1930                 1935

Gly Val  Gly Glu Asp Gly Thr  Ser Thr Ala Thr Gly  Thr Leu His
    1940                 1945                 1950

Val Ser  Asp Val Asp Thr Gly  Glu Ala His Val Gln  Ala Thr Ser
    1955                 1960                 1965

Val Glu  Thr Asp Gln Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys
    1970                 1975                 1980

Trp Ser  Phe Ala Leu Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu
    1985                 1990                 1995

Gly Ala  Gly Asp Ser Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala
    2000                 2005                 2010

Asp Gly  Thr Asp Thr Gln Glu  Val Thr Val Thr Ile  His Gly Ser
    2015                 2020                 2025

Asn Asp  Ser Ala Thr Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly
    2030                 2035                 2040

Glu Asp  Gly Thr Gly Thr Ala  Thr Gly Thr Leu Asn  Val Ala Asp
    2045                 2050                 2055
```

```
Val Asp  Asn Gly Glu Ala His  Val Gln Ala Thr Ser  Val Glu Thr
    2060                 2065                 2070

Asp Gln  Gly Thr Phe Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe
    2075                 2080                 2085

Ala Leu  Asn Asn Asp Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly
    2090                 2095                 2100

Asp Ser  Met Thr Lys Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr
    2105                 2110                 2115

Asp Thr  Gln Glu Val Thr Val  Thr Ile Asn Gly Ser  Asn Asp Ser
    2120                 2125                 2130

Ala Thr  Ile Ser Gly Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly
    2135                 2140                 2145

Thr Gln  Ala Ala Thr Gly Thr  Leu Asn Val Ala Asp  Val Asp Ser
    2150                 2155                 2160

Gly Glu  Ala His Val Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly
    2165                 2170                 2175

Thr Phe  Thr Ile Gly Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn
    2180                 2185                 2190

Asn Asp  Asp Pro Ala Val Gln  Ala Leu Gly Ala Asn  Asp Ser Met
    2195                 2200                 2205

Thr Lys  Thr Phe Thr Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln
    2210                 2215                 2220

Glu Val  Thr Val Thr Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile
    2225                 2230                 2235

Ser Gly  Asp Ile Ala Gly Gly  Val Gly Glu Asp Gly  Thr Ser Thr
    2240                 2245                 2250

Ala Thr  Gly Thr Leu His Val  Ser Asp Val Asp Thr  Gly Glu Ala
    2255                 2260                 2265

His Val  Gln Ala Thr Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr
    2270                 2275                 2280

Ile Gly  Glu Asp Gly Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp
    2285                 2290                 2295

Pro Ala  Val Gln Ala Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr
    2300                 2305                 2310
```

```
Phe Thr  Val Thr Ser Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr
    2315                 2320                 2325

Val Thr  Ile His Gly Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp
    2330                 2335                 2340

Ile Ala  Gly Gly Val Gly Glu  Asp Gly Thr Gly Thr  Ala Thr Gly
    2345                 2350                 2355

Thr Leu  Asn Val Ser Asp Val  Asp Ser Gly Glu Ala  His Val Gln
    2360                 2365                 2370

Ala Thr  Ser Val Glu Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu
    2375                 2380                 2385

Asp Gly  Lys Trp Ser Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val
    2390                 2395                 2400

Gln Ala  Leu Gly Ala Asn Asp  Ser Met Thr Lys Thr  Phe Thr Val
    2405                 2410                 2415

Thr Ser  Ala Asp Gly Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile
    2420                 2425                 2430

His Gly  Ser Asn Asp Ser Ala  Thr Ile Ser Gly Asp  Ile Ala Gly
    2435                 2440                 2445

Gly Val  Gly Glu Asp Gly Thr  Ser Thr Ala Ser Gly  Thr Leu Asn
    2450                 2455                 2460

Val Ser  Asp Val Asp Asn Gly  Glu Ala His Val Gln  Ala Thr Ser
    2465                 2470                 2475

Val Glu  Thr Asp Gln Gly Thr  Phe Thr Ile Gly Glu  Asp Gly Lys
    2480                 2485                 2490

Trp Ser  Phe Ala Leu Asn Asn  Asp Asp Pro Ala Val  Gln Ala Leu
    2495                 2500                 2505

Gly Ala  Gly Asp Ser Met Thr  Lys Thr Phe Thr Val  Thr Ser Ala
    2510                 2515                 2520

Asp Gly  Thr Asp Thr Gln Glu  Val Thr Val Thr Ile  His Gly Ser
    2525                 2530                 2535

Asn Asp  Ser Ala Thr Ile Ser  Gly Asp Ile Ala Gly  Gly Val Gly
    2540                 2545                 2550

Glu Asp  Gly Thr Ser Thr Ala  Ser Gly Thr Leu Asn  Val Ser Asp
    2555                 2560                 2565
```

```
Val Asp  Asn Gly Glu Ala His  Val Gln Ala Thr Ser  Val Glu Thr
    2570                 2575                 2580

Asp Gln  Gly Thr Phe Thr Ile  Gly Glu Asp Gly Lys  Trp Ser Phe
    2585                 2590                 2595

Ala Leu  Asn Asn Asp Asp Pro  Ala Val Gln Ala Leu  Gly Ala Gly
    2600                 2605                 2610

Asp Ser  Met Thr Lys Thr Phe  Thr Val Thr Ser Ala  Asp Gly Thr
    2615                 2620                 2625

Asp Thr  Gln Glu Val Thr Val  Thr Ile His Gly Ser  Asn Asp Ser
    2630                 2635                 2640

Ala Thr  Ile Ser Gly Asp Ile  Ala Gly Gly Val Gly  Glu Asp Gly
    2645                 2650                 2655

Thr Gly  Thr Ala Thr Gly Thr  Leu Asn Val Ser Asp  Val Asp Asn
    2660                 2665                 2670

Gly Glu  Ala His Val Gln Ala  Thr Ser Val Glu Thr  Asp Gln Gly
    2675                 2680                 2685

Thr Phe  Thr Ile Gly Glu Asp  Gly Lys Trp Ser Phe  Ala Leu Asn
    2690                 2695                 2700

Asn Asp  Asp Pro Ala Val Gln  Ala Leu Gly Ala Gly  Asp Ser Met
    2705                 2710                 2715

Thr Lys  Thr Phe Thr Val Thr  Ser Ala Asp Gly Thr  Asp Thr Gln
    2720                 2725                 2730

Glu Val  Thr Val Thr Ile His  Gly Ser Asn Asp Ser  Ala Thr Ile
    2735                 2740                 2745

Ser Gly  Asp Ile Ala Gly Gly  Val Gly Glu Asp Gly  Ile Gly Thr
    2750                 2755                 2760

Ala Thr  Gly Thr Leu Asn Val  Ser Asp Val Asp Asn  Gly Glu Ala
    2765                 2770                 2775

His Val  Gln Ala Thr Ser Val  Glu Thr Asp Gln Gly  Thr Phe Thr
    2780                 2785                 2790

Ile Gly  Glu Asp Gly Lys Trp  Ser Phe Ala Leu Asn  Asn Asp Asp
    2795                 2800                 2805

Pro Ala  Val Gln Ala Leu Gly  Ala Gly Asp Ser Met  Thr Lys Thr
    2810                 2815                 2820
```

```
Phe Thr  Val Thr Ser Ala Asp  Gly Thr Asp Thr Gln  Glu Val Thr
    2825                 2830                 2835

Val Thr  Ile His Gly Ser Asn  Asp Ser Ala Thr Ile  Ser Gly Asp
    2840                 2845                 2850

Ile Ala  Gly Gly Val Gly Glu  Asp Gly Thr Gly Thr  Ala Thr Gly
    2855                 2860                 2865

Thr Leu  Asn Val Ser Asp Val  Asp Asn Gly Glu Ala  His Val Gln
    2870                 2875                 2880

Ala Thr  Ser Val Glu Thr Asp  Gln Gly Thr Phe Thr  Ile Gly Glu
    2885                 2890                 2895

Asp Gly  Lys Trp Ser Phe Ala  Leu Asn Asn Asp Asp  Pro Ala Val
    2900                 2905                 2910

Gln Ala  Leu Gly Ala Asn Glu  Ser Met Thr Lys Thr  Phe Thr Val
    2915                 2920                 2925

Thr Ser  Ala Asp Gly Thr Asp  Thr Gln Glu Val Thr  Val Thr Ile
    2930                 2935                 2940

Asn Gly  Ser Asn Asp Gly Pro  Val Val Ser Gly Pro  Val Asp Leu
    2945                 2950                 2955

Gly Ala  Thr Ala Glu Asp His  Ser Ile Thr Phe Thr  Ala Gln Gln
    2960                 2965                 2970

Leu Leu  Gly His Ala Ser Asp  Ile Asp Gly Asp Ser  Leu Ser Val
    2975                 2980                 2985

Ser Asn  Leu Ser Ala Gly Asn  Gly Thr Ile Ser Gln  Asn Ala Asp
    2990                 2995                 3000

Gly Ser  Tyr Thr Phe Thr Pro  Asn Ala Asp Phe Asn  Gly Glu Val
    3005                 3010                 3015

Asn Val  Thr Tyr Thr Val Ser  Asp Gly His Gly Gly  Thr Thr Ser
    3020                 3025                 3030

Gly Ser  Ala Ser Phe Asp Val  Thr Ser Val Asn Asp  Gly Pro Thr
    3035                 3040                 3045

Thr Ser  Asp Val Thr Leu Ala  Ser Gly Thr Glu Asp
    3050                 3055                 3060

<210>  132
<211>  1274
<212>  PRT
```

<213> Magnetospirillum magneticum AMB-1

<400> 132

```
Met Arg Leu Asp Pro Ser Ile Leu Pro Ala Ala Pro Asn Leu Thr Ser
1               5                  10                  15

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

Ala Val Ile Gly Lys Ile Asp Lys Leu Ser Gly Asp Ala Trp Ile Ile
        35                  40                  45

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

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

Ala Asp Arg Thr Thr Phe Thr Leu Lys Asp Lys Gly Leu Val Gly Leu
                85                  90                  95

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

Leu Val Ala Gln Gly Gly Phe Ser Phe Val Ser Gly Asp Ile Ala Lys
        115                 120                 125

Thr Gln Pro Asp Ser Ala Arg Ile Val Thr Pro Val Met Ser Leu Gly
    130                 135                 140

Ile Arg Gly Thr Thr Val Ala Gly Ser Val Gly Glu Gly Gly Ala Thr
145                 150                 155                 160

Thr Val Ala Leu Leu Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val
                165                 170                 175

Ala Val Ser Ala Leu Ser Gly Gly Gly Gln Ser Phe Thr Leu Asn Ser
            180                 185                 190

Ala Gly Ser Gly Ile Val Gly Ala Thr Ser Ala Gly Ser Trp Ser Val
        195                 200                 205

Ser Ala Asn Ala Ala Ala Ala Val Ala Ala Leu Ala Pro Gln Pro Ala
    210                 215                 220

Pro Pro Pro Ala Val Ala Pro Ala Leu Pro Ala Ala Pro Ala Pro Ala
225                 230                 235                 240

Pro Ala Gly Gly Thr Gly Ala Gly Gly Ser Lys Gly Ala Gly Gln Gly
                245                 250                 255
```

```
Ala Gly Ala Gly Gly Gly Ala Glu Ala Ala Val Val Asp Val Ala Pro
            260                 265                 270

Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro Pro
        275                 280                 285

Pro Pro Pro Ser Pro Pro Ala Pro Ala Pro Pro Pro Pro Pro Pro Ala
    290                 295                 300

Pro Pro Pro Pro Pro Pro Ala Pro Pro Pro Pro Ala Pro Val Asn Asn
305                 310                 315                 320

Asp Pro Thr Ser Ser Ala Val Thr Leu Pro Gly Ser Thr Ala Gly Ser
                325                 330                 335

Ala Thr Thr Ile Leu Lys Ser Asp Leu Leu Ala Asn Ala Ser Asp Pro
            340                 345                 350

Asn His Asp Val Leu Ser Ile Arg Leu Gly Ser Val Ser Ala Thr His
        355                 360                 365

Gly Thr Val Thr Glu Thr Ala Thr Thr Val Val Phe Thr Pro Thr Thr
    370                 375                 380

Gly Tyr Ser Gly Pro Ala Thr Leu Ser Tyr Thr Ile Val Asp Gly Arg
385                 390                 395                 400

Gly Gly Leu Val Thr Ala Ser Ala Thr Thr Thr Val Ser Ala Pro Ser
                405                 410                 415

His Gly Leu Leu Ala Glu Val Ala Ser Asn Pro Ile Val Asn Gly Asp
            420                 425                 430

Phe Glu Thr Gly Thr Phe Thr Gly Trp Val Ala Ser Leu Ser Pro Thr
        435                 440                 445

Val Ala Asn Gly Gly Ser Pro Leu Thr Asn Trp Met Val Tyr Pro Ala
    450                 455                 460

Ser Ser Leu Asn Gly Ser His Val Ala Leu Asn Gly Phe Asp Gly Gly
465                 470                 475                 480

Val Leu Asp Gly Asn Gly Ala Ile Leu Tyr Glu Thr Pro Leu Tyr Phe
                485                 490                 495

His Leu Gln Gln Pro Ile Thr Leu Thr Gly Ala Pro Val His Ala Ser
            500                 505                 510

Leu Ser Phe Ser Phe Lys Val Ser Gly Gly Pro Ser Phe Ser Val Ala
        515                 520                 525
```

```
Arg Asp Gly Gln Pro Thr Ala Asp Arg Val Phe Thr Val His Val Thr
    530                 535                 540

Asp Gly Ser Gly Asp Val Met Pro Thr Val Tyr Thr Tyr Thr Val Pro
545                 550                 555                 560

Gly Thr Thr Val Asp Ala Gly Ala Val His Asn Val Asn Ile Asp Leu
                565                 570                 575

Ser Ser Gln Met Ala Ala Leu Ser Pro Gly Thr Tyr Thr Leu Asp Leu
            580                 585                 590

Gln Glu Leu Val Pro Gln Tyr Tyr Thr Gly Pro Ala Glu Ile Gln Leu
        595                 600                 605

Asp Asn Ile Ala Leu Lys Leu Ser Gln Gly Ser Ala Thr Ala Ser Glu
    610                 615                 620

Ala Val Thr Ala Asp Gln Gly Val Ser Gly Trp Val Leu Gly Leu Pro
625                 630                 635                 640

Ala Thr Thr Ala Ser Ser Asp Thr Val Ser Phe His Ile Ile Asp Gly
                645                 650                 655

Ser Gly Asn Pro Gln Ser Ser Leu Ala Thr Thr His Gly Thr Ala Ser
            660                 665                 670

Ile Asp Ala Ile Thr Gly Lys Trp Thr Phe Thr Pro Leu Ala Thr Leu
        675                 680                 685

Ala Ala Asn Leu Ser Val Thr Asp Thr Phe Val Val Gly Val Val Asp
    690                 695                 700

Asp Gln Thr Ser Gln Val Ala Gln Ala Thr Ile Gln Val Asn Ile Ser
705                 710                 715                 720

Ser Pro Val Thr Ser Ser Gly Ala Val Ala His Ile Thr Ser Ala Ser
                725                 730                 735

Thr Val Val Asp Ala Asn Phe Ser Gly Leu Ser Gly Ile Ser Thr Leu
            740                 745                 750

Glu Ile Asn Thr Gly Ser Ala Ala Leu Asn Leu Thr Leu Gly Thr Val
        755                 760                 765

Ala Glu Ala Ala Gly Thr Gly Val Val Asp Gly Ser Gln Ala Thr Gly
    770                 775                 780

Ser Ile Val Ala Asn Ala Ser Ala Tyr Ser Thr Gly Leu Asp Ile Thr
785                 790                 795                 800
```

```
Thr Gly Ser Gly Asn Asp Thr Ile Thr Thr Gly Ser Gly Ser Asp Thr
                805                 810                 815

Ile Ala Gly Gly Leu Gly Ser Asn Ile Ile Asn Ala Ala Thr Gly Ile
            820                 825                 830

Asp Thr Val Asp Tyr Gly Ala Ala Leu Ser Ala Ile Thr Ala Thr Ile
        835                 840                 845

Gly Ser Gly Ser Ala Thr Val Val His Ser Gly Gly Thr Asp Thr Leu
    850                 855                 860

Ser Gly Val Glu Ile Ile Gln Gly Ser Thr Phe Gly Asp Thr Phe Ile
865                 870                 875                 880

Val Gly Val Ala Ser Thr Gly Ser Ile Leu Gly Gly Gly Gly Ser Asp
                885                 890                 895

Val Leu Asp Ile Thr Ala Leu Pro Thr Gly Asn Leu Ala Leu Asp Gly
            900                 905                 910

Ala Gly Ala Asn Glu Ser Ile His Phe Asp Ile Ala Gly Arg His Met
        915                 920                 925

Glu Ser Leu Val Arg Asp Leu Ser Leu Ser Gly Ser Asn Leu Val Ala
    930                 935                 940

Val Leu Asp Gly Gly Gly Thr Leu Ser Ile Ala Ser Val Thr Thr Asp
945                 950                 955                 960

Thr Ile Ile Asp Pro Ala Gly Asp Thr His Arg Ile Val Gly Gln Gly
                965                 970                 975

Gly Ala Thr Thr Ala Gly Thr Asp Tyr Val Val Val Gly Thr Ala Ser
            980                 985                 990

Asp Ser Ser Leu Thr Gly Asn Thr  Gly Asp Asp Leu Leu  Val Trp His
        995                 1000                1005

Ser Gly  Asn Thr Ser Leu Val  Gly Gly Gly Gly His  Asp Leu Ala
    1010                1015                1020

Asp Phe  Arg His Ala Ala Gly  Ala Ile Val Ala Asp  Met Tyr Gly
    1025                1030                1035

Gly Thr  Ser Ala Val Ile Gly  Gly Ser Thr Thr Val  Gly Leu Ser
    1040                1045                1050

Gly Ile  Ser Glu Ile Leu Gly  Gly Asn Ser Ala Asp  Thr Leu Thr
    1055                1060                1065
```

```
Ala Gly  Thr Gly Glu Trp Met  Leu Ala Gly Gly Gly  Gly Asn Asn
    1070                1075                1080

Val Met  Asp Gly Ser His Gly  Thr Thr Thr Val Ser  Tyr Gln Asp
    1085                1090                1095

Gln Val  Thr Gly Val Thr Ile  Asp Leu Ala Gly Gly  Thr Ala Thr
    1100                1105                1110

His Gly  Ala Tyr Thr Asp Thr  Leu Thr Gly Met Gly  Gly Ala Val
    1115                1120                1125

Gly Ser  Asp Phe Ala Asp Thr  Ile Ile Gly Gly Thr  Gly Ala Glu
    1130                1135                1140

Tyr Leu  Asp Gly Gly Phe Gly  Ala Asn Thr Val Thr  Gly Gly Ser
    1145                1150                1155

Gly Val  Asp Thr Phe Val Leu  His Ser Ser Thr Ser  Ala Thr Ala
    1160                1165                1170

Thr Gln  Ser Ile Thr Asp Phe  Ala Gly Asp Gln Phe  Ser Leu Ser
    1175                1180                1185

Asp Arg  Glu Phe Gly Leu Gly  Ser Ser Gly Thr Leu  Ala Ala Ala
    1190                1195                1200

Asn Tyr  Ala Glu Gly Thr Ala  Thr Val Ser Gly Ser  Ala Gln Asp
    1205                1210                1215

Phe Gly  Asn Val Asn Ala Gly  Ile Val Ala Ile Gln  Asn Gly Ala
    1220                1225                1230

Asn Val  Glu Leu Trp His Thr  Thr Asn Met Asp Ala  Ala Thr Ser
    1235                1240                1245

Ser Asn  Ser His Leu Val Gly  Thr Leu Glu Asn Ile  Asn Thr Ser
    1250                1255                1260

Ala Leu  Asp Asn Thr Asn Phe  His Leu Ala Ile
    1265                1270
```

<210> 133
<211> 511
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 133

```
Val Val Asp Ala Ser Ala Ala Asn Gly Ile Val Lys Val Tyr Gly Thr
1               5                  10                  15

Ser Arg Ser Ala Asp Leu Thr Leu Thr Gly Gly Ala Gly Ser Asp Ser
```

```
            20                  25                  30

Leu Tyr Gly Gly Gly Gly Gly Asp Thr Leu Val Gly Gly Ser Gly Ser
        35                  40                  45

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

Met Gly Ala Gly Ile Thr Ala Thr Ile Ser Gly Ala Ala Ala Thr Val
65                  70                  75                  80

Val His Ser Gly Gly Thr Asp Thr Val Thr Asn Val Glu Val Leu Thr
                85                  90                  95

Gly Ser Thr Tyr Gly Asp Ser Val Ser Ile Asn Gly Thr Val Ala Gly
            100                 105                 110

Thr Phe Ala Gly Gly Gly Gly Thr Asp His Val Thr Leu Thr Ala Ser
        115                 120                 125

Pro Thr Ala Asn Leu Thr Ile Gly Asn Ser Ser Gly Asn Gly Ala Met
    130                 135                 140

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

Ala Trp Ser Gly Ser Asp Met Val Leu Thr Phe Asp Gly Gly Gly Thr
                165                 170                 175

Val Thr Asn Val Gly Asn Ala Leu Asn Gly Val Val Asp Pro Leu Asp
            180                 185                 190

Gly Ser Thr Arg Tyr Ile Val Gly Glu Gly Gly Ala Thr Thr Ala Gly
        195                 200                 205

Thr Asp Tyr Ile Val Val Gly Lys Ala Ser Asp Thr Ser Leu Thr Gly
    210                 215                 220

Asn Ser Gly Asp Asp Leu Leu Leu Trp His Ser Gly Asn Ala Thr Leu
225                 230                 235                 240

Thr Gly Gly Gly Gly Thr Asp Thr Ala Asp Phe Gly His Ala Ser Gly
                245                 250                 255

Ala Val Val Ala Asn Leu Tyr Ser Gly Thr Thr Ala Val Ile Gly Gly
            260                 265                 270

Ser Glu Thr Val His Leu Gln Ser Ala Phe Thr Glu Ile Arg Gly Gly
        275                 280                 285

Asp Tyr Asn Asp Thr Leu Thr Ala Gly Thr Gly Ala Thr Thr Leu Met
```

290 295 300

Gly Gly Asp Gly Ser Asn Val Leu Asp Gly Ser Gln Ser Thr Ser Ala
305 310 315 320

Thr Ala Ser Tyr Arg Asp Gln Leu Ala Gly Val Thr Val Ser Leu Ser
325 330 335

Ser Gly Thr Ala Ile His Gly Ala Gly Thr Asp Thr Leu Thr Gly Ile
340 345 350

Ser Asn Val Val Gly Ser Asp Phe Asn Asp Ser Ile Thr Gly Ser Asp
355 360 365

Ala Gly Ala Asn Tyr Leu Asp Gly Gly Phe Gly Ala Asn Ile Leu Thr
370 375 380

Gly Gly Thr Gly Ala Ala Val Asp Thr Phe Val Leu His Ser Ser Ala
385 390 395 400

Asp Ala Thr Ala Thr Gln Thr Ile Thr Asp Phe Glu Val Gly Thr Asp
405 410 415

His Leu Ala Leu Ser Asp Arg Glu Phe Asp Leu Gly Ser Ser Gly Thr
420 425 430

Leu Thr Thr Gly Thr Thr Gly Ala Thr Tyr Ala Glu Gly Thr Thr Thr
435 440 445

Ile Ser Gly Ala Ala Gln Asp Phe Gly Asp Ala Asn Ala Gly Ile Val
450 455 460

Ala Ile Asp Asn Gly Gly Asn Val Glu Leu Trp His Thr Thr Asp Met
465 470 475 480

Ser Ala Ala Asp Ser Thr Asn Ser His Leu Val Gly Thr Leu Asn Gly
485 490 495

Val Asn Thr Ser Ala Leu Asp Asn Thr Ser Phe His Leu Ala Val
500 505 510

<210> 134
<211> 208
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 134

Met Tyr Ile Asp Pro Ser Gln Val Pro Ala Ala Lys Asn Leu Ala Thr
1 5 10 15

Pro Val Ala Asp Ile Gln Asp Ala Ala Asp Lys Pro Ala Gly Asn Val
20 25 30

```
Val Ile Gly Lys Val Asp Lys Leu Gln Gly Asp Ala Trp Ile Val Arg
        35                  40                  45

Asn Gly Gln Glu Ala Pro Ala Gln Ile Gly Ala Pro Leu Val Gln Gly
    50                  55                  60

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

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

Glu Phe Ser Tyr Asn Pro Ala Thr Lys Thr Gly Lys Glu Thr Leu Leu
            100                 105                 110

Val Ala Lys Gly Ser Phe Ser Phe Val Ser Gly Asp Ile Ala Lys Thr
        115                 120                 125

Gln Pro Asp Ala Ala Arg Leu Ala Thr Pro Val Met Ser Leu Gly Ile
    130                 135                 140

Arg Gly Thr Thr Val Ala Gly Ala Val Gly Ala Asp Gly Asn Thr Thr
145                 150                 155                 160

Val Ala Leu Leu Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val Ala
                165                 170                 175

Val Ser Ala Leu Gly Gly Gly Gly Gly Ser Phe Thr Leu Asn Ser Ala
            180                 185                 190

Gly Ser Gly Ile Val Gly Ala Thr Ser Gly Gly Ser Trp Ser Val Ser
        195                 200                 205


<210>  135
<211>  404
<212>  PRT
<213>  Magnetospirillum magneticum AMB-1

<400>  135

Met Pro Ile Asp Pro Ser Gln Leu Pro Ala Ala Lys Thr Leu Ala Thr
1               5                   10                  15

Pro Val Ala Asp Thr Gln Gly Ser Ala Ala Asp Lys Pro Ala Ala Thr
            20                  25                  30

Val Ile Gly Lys Val Asp Lys Leu Gln Gly Asp Ala Trp Ile Val His
        35                  40                  45

Asp Gly Gln Lys Val Pro Ala Lys Ile Gly Ala Ala Leu Met Gln Gly
    50                  55                  60
```

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

Asp Arg Thr Thr Phe Val Leu Lys Asp Lys Gly Leu Val Gly Leu Asp
                85                  90                  95

Glu Phe Ser Tyr Asp Pro Ala Thr Lys Thr Gly Lys Glu Thr Phe Leu
            100                 105                 110

Val Ala Gln Gly Ala Phe Ser Phe Val Ser Gly Asp Ile Ala Lys Thr
        115                 120                 125

Gln Pro Asp Ala Ala Arg Leu Ala Thr Pro Val Met Thr Met Gly Ile
    130                 135                 140

Arg Gly Thr Thr Val Gly Gly Thr Val Ala Ala Asp Gly Asn Thr Ser
145                 150                 155                 160

Val Ala Leu Leu Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val Ala
                165                 170                 175

Ile Ser Ala Leu Gly Gly Gly Gln Ser Phe Thr Leu Asn Ser Ala Gly
            180                 185                 190

Ser Gly Ile Val Gly Ala Ser Ser Gly Gly Ser Trp Ser Val Ser Ala
        195                 200                 205

Asn Ala Gly Ala Ala Ile Ala Ser Ser Met Pro Ser Pro Ala Pro Pro
    210                 215                 220

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

Gly Gly Pro Gly Asn Thr Gly Thr Gly Asn Ala Gly Thr Gly Glu Thr
                245                 250                 255

His Asn Thr Ala Pro Glu Pro Pro Pro Leu Pro Pro Gln Pro Val Gly
            260                 265                 270

Leu Pro Thr Pro Asn Pro Glu Pro Lys Pro Glu Pro Lys Pro Glu Pro
        275                 280                 285

Lys Pro Glu Pro Lys Pro Glu Pro Lys Ser Asp Pro Pro Lys Pro Asp
    290                 295                 300

Pro Val Gln Gln Asn His Asp Pro Thr Thr Ser Asp Val Thr Leu Pro
305                 310                 315                 320

Gly Ser Thr Ala Gly Thr Ser Ile Thr Phe Ser Lys Ser Glu Leu Leu
                325                 330                 335
```

```
Ala Asn Ala Arg Asp Ser Asp Gly Asp Ala Leu Ser Ile Lys Leu Asn
            340                 345                 350

Ser Gly His Ser Asp His Gly Thr Ala Val Val Asn Ala Asp Gly Ser
        355                 360                 365

Ile Thr Phe Thr Ala Thr Ala Gly Tyr Ser Gly Ala Ala Thr Ile Thr
    370                 375                 380

Tyr Thr Ile Thr Asp Gly His Gly Gly Ser Val Gln Gly Thr Ala Phe
385                 390                 395                 400

Ser Ala Val Thr
```

<210> 136
<211> 207
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 136

```
Met His Ile Asp Pro Ser Gln Leu Pro Ala Ala Lys Asn Leu Ala Thr
1               5                   10                  15

Pro Val Ala Asp Thr Lys Asp Ala Gly Ala Asp Lys Ser Ala Ala Val
            20                  25                  30

Val Ile Gly Lys Val Asp Lys Leu Gln Gly Asp Ala Trp Val Ile His
        35                  40                  45

Asp Gly Gln Lys Val Pro Ala Lys Ile Gly Ala Ala Leu Met Gln Gly
    50                  55                  60

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

Asp Arg Thr Thr Phe Val Leu Lys Asp Lys Gly Leu Val Gly Leu Asp
                85                  90                  95

Glu Phe Ser Tyr Asp Pro Ala Thr Lys Thr Gly Lys Glu Ser Phe Leu
            100                 105                 110

Val Ala Gln Gly Gly Phe Ser Phe Val Ser Gly Asp Ile Ala Lys Thr
        115                 120                 125

Gln Pro Asp Ala Ala Arg Leu Ala Thr Pro Val Met Thr Met Gly Ile
    130                 135                 140

Arg Gly Thr Thr Val Gly Gly Ser Val Ala Ala Asp Gly Asn Thr Ser
145                 150                 155                 160
```

Val Ala Leu Phe Pro Asp Pro Gly Ser Asn Phe Val Gly Glu Val Ser
165 170 175

Val Ala Ala Leu Gly Gly Gly Gly Gln Ser Phe Thr Leu Asn Ser Ala
180 185 190

Gly Ser Gly Ile Val Gly Ala Ser Ser Gly Gly Ser Trp Ser Val
195 200 205

<210> 137
<211> 505
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 137

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

Ser Gly Val Glu Met Leu Thr Leu Ser Ser Thr Asn Thr Thr Ser Gln
20 25 30

Thr Val Asn Leu Gly Ser Asp Gly Val Asn Ser Glu Val Thr Val Ile
35 40 45

Asp Ala Ser Ala Ala Thr Gly Gly Val Tyr Ile Asn Ala Ala Pro Arg
50 55 60

Thr Thr Gly Leu Thr Leu Ile Gly Gly Ala Gly Asn Asp Gln Phe Leu
65 70 75 80

Gly Ser Leu Gly Asn Asp Thr Ile Thr Gly Gly Gly Gly Thr Asn Ser
85 90 95

Met Asp Gly Gly Gly Gly Thr Asp Thr Val Ser Tyr Gly Ser Met Thr
100 105 110

Ser Gly Ile Thr Ala Ser Ile Asp Gly Thr Ser Ala Thr Ile Thr His
115 120 125

Ser Thr Gly Thr Asp Ser Leu Thr Asn Val Ala Ile Leu Gln Gly Ser
130 135 140

Asn Tyr Ala Asp Thr Phe Ser Val Ala Ser Ala Ser Ala Gly Val Thr
145 150 155 160

Val Asp Gly Gly Ser Gly Val Asp Thr Met Asp Tyr Ser Ala Met Gly
165 170 175

Ala Gly Ile Thr Ala Thr Val Thr Gly Thr Ser Ala Ser Val Val His
180 185 190

Ser Gly Gly Thr Asp Ala Ile Thr His Val Glu Val Leu Val Gly Ser

```
        195                 200                 205

Gly Tyr Asp Asp Val Phe Thr Gly Gly Thr Gly Asn Asp Thr Phe Ser
    210                 215                 220

Gly Gly Ala Gly Asn Asp Thr Phe Phe Gly Gly Val Gly Ala Asp Gln
225                 230                 235                 240

Leu Thr Gly Gly Leu Gly Ala Asp Thr Phe Val Tyr Thr Ala Ala Ala
                245                 250                 255

Gln Ser Gln Asp Ser Leu Ser Ala Arg Asp Ile Ile Ser Asp Phe Thr
            260                 265                 270

Thr Gly Thr Asp His Ile Lys Leu Ser Leu Thr Gly Thr His Val Asp
        275                 280                 285

Val Ser Thr Phe Asn Asp Ser Ala Gly Ser Tyr Asn Gly Gly Gln Ala
    290                 295                 300

Thr Leu Met Leu Gly Gly Val Val Gly Asp Gly Phe Tyr Ser Ser Gly
305                 310                 315                 320

Asp Ala Ala Phe Tyr Ile Tyr Thr Gln Gly Thr Thr Ser Ala Val Gly
                325                 330                 335

Ser Gly Asp Tyr Val Ile Gly Ser Thr Asn Ala Ile His Ala Val Asp
            340                 345                 350

Leu Gln Phe Asp Ile Thr Gly Thr Thr Gly Asn Asp Thr Leu Val Gly
        355                 360                 365

Gly Ala Gly Asp Asp Thr Leu Ala Gly Gly Ala Gly Thr Asn Thr Leu
    370                 375                 380

Ser Gly Gly Ser Gly Ser Asp Thr Phe Val Leu Asp Ala Gly Ala Thr
385                 390                 395                 400

Ser Thr Ala Val Ile Thr Asp Phe Asn Thr Ala Ala Asp Asn Val Thr
                405                 410                 415

Leu Ser Asn Ala Ser Phe Gly Leu Gly Ser Ser Gly Thr Leu Asn Asn
            420                 425                 430

Gly Val Asn Tyr Ala Glu Gly Thr Thr Thr Ile Ser Gly Ala Ala Gln
        435                 440                 445

Asn Phe Gly Ser Gly Thr Asp Gly Val Val Ala Ile Gln Asn Gly Ala
    450                 455                 460

Asn Val Glu Val Trp His Thr Thr Asn Met Ala Ala Ala Asp Asn Thr
```

465 470 475 480

Asn Ser His Leu Met Ala Thr Leu Asn Asn Val Asn Thr Ser Ala Leu
485 490 495

Asp Gln Thr Asn Phe His Leu Ala Val
500 505

<210> 138
<211> 171
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 138

Val Asp Asn Gly Asn Gly Thr Tyr Thr Tyr Thr Pro Ala Thr Asn Tyr
1 5 10 15

Thr Gly Pro Val Asn Phe Thr Tyr Thr Val Thr Asp Gly His Gly Gly
20 25 30

Thr Val Ala Asp Ser Ala Ser Thr Gly Val Ile Thr Pro Thr Ser Val
35 40 45

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

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

Glu Val Ala Thr Gly Thr Gln Ser Val Thr Leu Asp Ala Tyr Ala Ala
85 90 95

Ser Ala Gly Val Thr Arg Ile Asp Ala Ser Gly Ala Ser Gly Gly Val
100 105 110

Ala Asn Thr Gly Gly Val Thr Val Asn Ala Ser Ala Tyr Ser Thr Ala
115 120 125

Val Ser Ile Ser Gly Gly Ser Gly Ala Asp Thr Phe Thr Gly Gly Ser
130 135 140

Gly Ala Asp Ser Phe Val Gly Gly Gly Gly Asn Asp Val Ile His Ala
145 150 155 160

Ala Ser Asn Asp Ala Leu Ile Asp Gly Gly Ala
165 170

<210> 139
<211> 99
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 139

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

Ser Pro Ile Ala Gly Ala Ala Thr Thr Ile Ser Ile Ala Ser Leu Val
20 25 30

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

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

Thr Pro Ser Ser Ser Gly Val Leu Thr Leu Thr Tyr Thr Val Asp Asp
65 70 75 80

Gly His Gly Gly Thr Val Thr Asp Tyr Ala Thr Ile Ser Val Gly Ala
85 90 95

Ser Ala Asn

<210> 140
<211> 98
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 140

Ala Ser Ala Asn His Ala Pro Val Ser Asn Ala Thr Pro Thr Leu Leu
1 5 10 15

Thr Leu Ala Glu Asp Thr Ser Val Asn Ile Ala Gly Ser Trp Leu Lys
20 25 30

Ser Gln Phe Thr Thr Asn Ala Thr Asp Ala Asp Gly Asp Thr Leu Thr
35 40 45

Val Thr Asn Ile Thr Ala Asn His Gly Asn Leu Ser Leu Leu Gly Asp
50 55 60

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

Leu Thr Ala Thr Ile Asp Asp Gly His Gly Gly Thr Thr Thr Gly Gln
85 90 95

Ala Thr

<210> 141
<211> 949
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 141

```
Ser Gly Asn Gly Ser Ala Ile Val Thr Ala Val Ser Leu Thr Gly Ala
1               5                  10                  15

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

Leu Arg Ala Gly Leu Phe Asp Val Asp His Leu Asn Tyr Ser Gln Pro
        35                  40                  45

Thr Trp Ala Thr Val Ala Gln Gly Pro Gln His Gly Thr Leu Ser Leu
    50                  55                  60

Val Gly Thr Thr Val Leu Gly Thr Thr Thr Leu Ser Ala Gly Ser Val
65                  70                  75                  80

Phe Leu Thr Gly Gly Ser Met Ser Ala Gly Ala Ser Gly Tyr Ser Tyr
                85                  90                  95

Thr Pro Asp Ala Asn Tyr Phe Gly Ser Asp Tyr Phe Val Val Ala Ile
            100                 105                 110

Asn Asp Gly Ser Gly Asn Leu Thr Tyr Gly Thr Val Gly Ile Gly Val
        115                 120                 125

Arg Ser Val Arg Asp Ala Pro Ala Ile Val Gly Gly Ala Asp Phe Ser
    130                 135                 140

Val Val Lys Asn Gly Ser Glu Thr Leu Asn Leu Gln Val Val Asp Glu
145                 150                 155                 160

Val Gly Ala Leu Gly Gly Asp Gln Tyr Ser Val Ala Leu Thr Val Gly
                165                 170                 175

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

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

Ile Asn Ala Ala Leu Met Glu Val Val Tyr Gln Ser Asp Pro Ala Ser
    210                 215                 220

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

Ile Thr Val Ser Lys Thr Met Ala Val Thr Val Ser Pro Ala Asn Leu
                245                 250                 255

Ala Pro Glu Ile Thr Gly Gly Asp Ile Gly Glu Ser Val Ala Gly Ala
```

```
            260                 265                 270

Val Tyr Asn Gly Met Leu Leu Ala Thr Asp Pro Glu Gly Gly Gln Leu
        275                 280                 285

Thr Phe Thr Lys Thr Gly Asn Pro Ser His Gly Thr Ala Thr Val Thr
    290                 295                 300

Asp Ala Ala Thr Gly Ala Tyr Thr Tyr Thr Gly Thr Ala Gly Tyr Ser
305                 310                 315                 320

Gly Trp Asp Ser Phe Thr Trp Ser Val Gly Asp Gly Val Thr Thr Thr
                325                 330                 335

Ile Gly Gly Ile Glu His Ile Ala Val Tyr Asp His Asn Arg Thr Trp
            340                 345                 350

Ala Gly Gly Ala Ser Gly Thr Trp Gly Thr Ala Ala Ser Trp Asn Thr
        355                 360                 365

Thr Leu Val Pro Asp Ser Asp Ala Arg Ala Val Ile Gly Asn Ala Thr
    370                 375                 380

Val Asp His Leu Ser Gly Ser Asp Ser Val Ala Gly Leu Ser Leu Ser
385                 390                 395                 400

Gly Ala Thr Leu Asn Leu Ser Gly Gly Thr Leu Ala Leu Gly Leu Glu
                405                 410                 415

Gly Arg Leu Asp Gly Pro Ser Gln Leu Asn Val Ala Gly Gly Val Leu
            420                 425                 430

Ser Leu Ala Ser Gly Ala Ile Leu Ser Asp Phe Gly Gly Phe Asp Leu
        435                 440                 445

Ser Thr Gly Gly Ser Leu Ala Gly Ser Gly Tyr Leu Gly Ile Ser Gly
    450                 455                 460

Ala Ala Val Met Ser Gly Thr Val Gly Ile Gly Gly Asn Thr Leu Ala
465                 470                 475                 480

Val Tyr Asn Gly Gly Ala Met Thr Ser Thr Ser Leu Ser Gly Thr Gly
                485                 490                 495

Thr Met Arg Val Gln Gly Gly Ser Phe Ile Met Lys Gly Ala Asp Tyr
            500                 505                 510

Ile Gly Ser Tyr Leu Glu Val Ala Ala Ala Ala Val Leu Tyr Met Asp
        515                 520                 525

Ser Asn Leu Thr Val Gly Thr Asp Ser Val Ser Ala Ser Val His Leu
```

```
    530                 535                 540

Ala His Ala Phe Asn Asn Tyr Gly Asp Ile Gln Met Thr Gly Gly Ser
545                 550                 555                 560

Gly Phe Val Gly Thr Ser Leu Met Val Ala Asp Ala Leu Thr Asn His
                565                 570                 575

Gly Ser Ile Glu Val Gly Gly Phe Asn Gly Ala Gly Thr Ile Ala Ala
            580                 585                 590

Thr Ser Phe Ser Asn Tyr Gly Glu Val Asn Val Gly His Ala Leu Asn
        595                 600                 605

Leu Val Ala Asp Ala Phe Asp Asn His Ala Thr Leu Thr Leu Ser Asn
    610                 615                 620

Asn His Met Leu Thr Val Ser Asp Thr Ser Ala Thr Ser His Ala Leu
625                 630                 635                 640

Ile Asp Asn Leu Gly Lys Ile Ala Gly Ser Gly Thr Ile Asn Ala Thr
                645                 650                 655

Asp Ala Asp Phe Ile Asn His Gly Tyr Ile Asn Pro Gly Asp Ser Ser
            660                 665                 670

Ser Ala Gly Thr Leu Gly Val Thr Gly Ser Leu Ser Leu Ala Glu Ser
        675                 680                 685

Ser His Leu Val Leu Asp Tyr Trp Asn Gly Ser Phe Asp Arg Met Asn
    690                 695                 700

Val Ser Gly Ser Leu Thr Leu Asp Gly Thr Leu Asp Ile Tyr Ser His
705                 710                 715                 720

Gly Thr Ile Ser Gly Asn Pro Thr Ala Thr Leu Leu Thr Trp Gly Thr
                725                 730                 735

Gly Gly Leu Ser Gly Ala Phe Glu Val Ile His Gly Ile Asp Ser Gly
            740                 745                 750

Thr Gly Trp Ile Trp Asp Pro Thr Leu Asn Gly Thr Ser Leu Ser Val
        755                 760                 765

Thr Ala His Ala Ala Thr Thr Val Asn Gly Asn Ser Thr Tyr Asn Gly
    770                 775                 780

Gly Ala Thr Ala Asp Tyr Val Ile Gly Leu Gly Gln Asn Glu Met Val
785                 790                 795                 800

His Leu Gly Gly Gly Ala Asp Val Tyr Ala Gly His Gly Ser Tyr Asn
```

805 810 815

Thr Ile Gly Val Ser Asp Met Asn Phe His Phe Leu Asp Gly Gly Ala
820 825 830

Gly Gly Gly Asn Thr Leu Gln Trp Glu Asn Leu Asn Asn Gln Ala Phe
835 840 845

Asp Leu Thr Gly Leu Trp Asn Asn Ala Val Gln Asn Phe Asp Val Leu
850 855 860

Asp Leu Ser His Ala Asn Asn Asn Asn Ala Val Leu Asp Leu Ala His
865 870 875 880

Leu Gln Ser Met Leu Asn Gly Thr Asn Ala Val Thr Gly Thr Gly Asn
885 890 895

Ala Leu Val Val Ile Gly Gly Asn Ser Val Thr Leu Ala Gly Ser Gly
900 905 910

Trp Gln Ala Asn Gly Thr Ala Glu Leu Thr Val Asn Gly Gln His Asp
915 920 925

Ser Tyr Thr Gln Tyr Ser Asn Gly Asp Thr His Val Tyr Val Glu Asn
930 935 940

His Thr His Val Gly
945

<210> 142
<211> 101
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 142

Val Val Asn Met Ala Gly Pro Asp Ala Thr Ala Thr Gly Asn Val Thr
1 5 10 15

Ala Ser Val Gly Pro Tyr Gly Ser Ala Pro Val Gly Ser Asp His Val
20 25 30

Ser Thr Tyr Ala Gly His Ala Ile Ser Gly Thr Val Ser Ile Phe Asp
35 40 45

Gln Glu Gly Ser Gly Leu Thr Leu Ser Gln Thr Gly Thr Ala Pro Ala
50 55 60

His Gly Thr Leu Ser Leu Gly Ala Asn Gly Ala Phe Thr Tyr Thr Pro
65 70 75 80

Thr Ser Gly Tyr Val Gly Ser Asp Thr Phe Thr Leu Gln Leu Ser Asp
85 90 95

Gly Thr Ser Ser Ser
100

<210> 143
<211> 118
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 143

Val Tyr Asp Pro Asp Pro Ala Phe Thr Gly His Asp Lys Phe Val Val
1 5 10 15

Gln Ala Asp Asp Gly His Gly Gly Ile Thr Thr Gln Thr Ile Ser Val
20 25 30

Ala Val Ser Asn Ser Gly Val Phe Asn Gln Ser Pro Val Ser Gly Gly
35 40 45

Thr Leu Leu Leu Glu Gly Ser Tyr Gly Met Thr Leu Ser Gln Ser Ala
50 55 60

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

Gly Ser Leu Thr Ala His Gly Thr Ala Thr Val Asn Gly Ser Gly Met
85 90 95

Val Ser Tyr Thr Gly Asn Thr Gly Phe Gly Gly Ser Glu Thr Leu Thr
100 105 110

Leu Arg Thr Ser Asp Gly
115

<210> 144
<211> 945
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 144

Thr Gly Asn Gly Asp Gly Thr Val Thr Ala Ile Ser Phe Ser Gly Ala
1 5 10 15

Lys Ala Ala Ile Phe Asp Asp Val Val Thr Thr Arg Glu Asp Thr Glu
20 25 30

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

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

```
Thr Gly Thr Thr Val Leu Gly Thr Thr Thr Leu Ser Ala Gly Ser Val
65                  70                  75                  80

Phe Leu Thr Gly Gly Ser Leu Ser Ala Gly Ala Gly Gly Tyr Ser Tyr
                85                  90                  95

Thr Pro Asp Ala Asn Tyr Phe Gly Ser Asp Tyr Phe Val Val Ala Ile
            100                 105                 110

Asp Asp Gly Ser Gly Asn Leu Thr Tyr Gly Thr Val Gly Ile Gly Val
        115                 120                 125

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

Val Ala Glu Asn Gly Ser His Thr Leu Asn Ile Gln Val Ala Asp Glu
145                 150                 155                 160

Val Gly Ala Leu Gly Gly Asp Gln Phe Thr Val Asn Met Thr Ile Gly
                165                 170                 175

His Gly Ser Val Thr Leu Asp Thr Val Gly Gly Ile Thr Phe Ser Ser
            180                 185                 190

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

Arg Ile Asn Ala Ala Leu Ser Gly Ala Val Tyr Thr Ala Glu Ser Leu
    210                 215                 220

Trp Thr Gly Ser Asp Ser Ile Ala Leu Ser Val Trp Asp Ala Ala Asn
225                 230                 235                 240

Gly Thr Ser Leu Val Ser Ser Glu Thr Ile Ala Val Thr Thr Ser Gly
                245                 250                 255

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

Val Ala Gly Ala Val His Asn Gly Met Leu Met Ala Ser Asp Pro Glu
        275                 280                 285

Gly Gly Thr Leu Thr Phe Ala Lys Thr Gly Asp Pro Thr His Gly Thr
    290                 295                 300

Val Thr Val Gly Ser Gly Gly Gly Tyr Ala Tyr Asn Gly Ser Ala Gly
305                 310                 315                 320

Tyr Thr Gly Trp Asp Ser Phe Gly Tyr Ser Val Ser Asp Gly Ala Asn
                325                 330                 335
```

```
Thr Val Thr Ala Thr Ala Gln Val Ala Val Tyr Asp His Thr Arg Thr
            340                 345                 350

Trp Asp Gly Gly Ala Ser Gly Thr Trp Ser Ala Ala Ala Gly Trp Ser
        355                 360                 365

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

Thr Ile Asp His Met Ser Gly Ser Asp Ala Ile Gly Gly Leu Ser Leu
385                 390                 395                 400

Thr Gly Ala Ser Leu Thr Leu Ser Gly Gly Thr Val Ser Leu Ala Val
                405                 410                 415

Ala Gly Glu Leu Asp Asn Ala Ser Arg Leu Ser Ile Gly Gly Thr Ala
            420                 425                 430

Val Leu Ser Leu Ala Asp Asp Ala Ile Leu Thr Asp Tyr Gly Ser Phe
        435                 440                 445

Asn Leu Ser Gly Gly Gly Thr Leu Ala Gly Asp Gly Thr Leu Val Ala
    450                 455                 460

Asn Gly Val Thr Thr Leu Ser Gly Thr Ala Gly Leu Gly Ala Asn Thr
465                 470                 475                 480

Val Ile Leu Asn Asn Gly Ala Thr Leu Ser Gly Ala Ser Leu Ser Gly
                485                 490                 495

Thr Gly Asn Val Arg Leu Asn Asn Gly Ser Ile Phe Ile Ala Ala Thr
            500                 505                 510

Ser Asn Trp Ile Gly Ala Ala Phe Glu Thr Ala Ala Ala Thr Leu Leu
        515                 520                 525

Leu Ile Asp Ser Asn Gly Gly Ser Ala Asn Leu Thr Leu Gly His Ala
    530                 535                 540

Phe Asp Asn Thr Gly Glu Ile Gln Leu Thr Gly Asn Gly Ala Phe Thr
545                 550                 555                 560

Thr Ser Val Val Val Asp Asp Ala Leu Thr Asn Ser Gly Ser Ile Val
                565                 570                 575

Ser Gly Gly Phe Thr Ser Phe Ala Ser Thr Ile Ala Ala Thr Ser Phe
            580                 585                 590

Asp Asn Phe Gly Val Leu Glu Val Gly His Ala Leu Asp Leu Thr Val
        595                 600                 605
```

```
Gly Thr Phe Asp Asn His Ala Thr Leu Thr Leu Ser Gly Gly Asn Ala
    610                 615                 620

Leu Thr Ile Thr Asp Asn Thr Ala Gly Thr His Ala Gln Phe Asp Asn
625                 630                 635                 640

Leu Gly Lys Ile Gly Gly Ser Gly Thr Ile Asn Ala Ala Asp Ala Asp
                645                 650                 655

Phe Val Ser His Gly Tyr Ile Asn Pro Gly Asp Thr Ser Ser Ala Gly
            660                 665                 670

Thr Leu Ser Val Thr Gly Asp Met Ile Phe Gly Asp Asp Ala His Leu
        675                 680                 685

Val Leu Asn Ser Trp Ala Gly Ser Phe Asp Arg Leu Asn Val Ser Gly
    690                 695                 700

Glu Leu Thr Leu Asp Gly Met Leu Asp Leu Tyr Thr Asn Ser Asn Pro
705                 710                 715                 720

Thr Gly Gly Gln Ser Ala Thr Leu Leu Ser Trp Gly Thr Leu Ser Gly
                725                 730                 735

Ser Phe Glu Val Ile His Gly Ile Asp Ser Gly Ser Gly Trp Ile Trp
            740                 745                 750

Asp Pro Thr Val Thr Gly Asn Ser Leu Ser Val Thr Ala His Asn Leu
        755                 760                 765

Thr Gly Thr Val Ser Gly Asn Gly Tyr Tyr Ser Gly Ser Gly Thr Ala
    770                 775                 780

Asp Tyr Val Val Gly Tyr Gly Ser Asn His Glu Val His Leu Gly Gly
785                 790                 795                 800

Gly Asp Asp Val Tyr Val Gly His Gly Ser Tyr Asn Thr Ile Gly Val
                805                 810                 815

Thr Asp Thr Ala Phe Asp Phe Leu Asp Gly Gly Asn Gly Gly Gly Asn
            820                 825                 830

Thr Leu Gln Trp Glu Asn Ile Asn Gly Gln Ser Phe Asp Leu Ser Ala
        835                 840                 845

Leu Trp Asn Asn Val Leu Gln Asn Phe Asp Val Leu Asp Leu Ser Arg
    850                 855                 860

Ala Ser Asn Gly Ser Ala Thr Leu Asp Leu Ala His Leu Gln Ser Met
865                 870                 875                 880
```

```
Leu Asn Gly Thr Asn Ala Phe Thr Gly Thr Ala Asn Ala Leu Val Val
                885                 890                 895


Ile Gly Ala Asp Asn Leu Thr Leu Ala Asp Ser Gly Trp Gln Ala Val
            900                 905                 910


Gly Ser Ala Glu Leu Thr Val Asn Gly Gln Gln Asp Ser Tyr Thr Gln
        915                 920                 925


Tyr Ala Asn Gly Asn Thr Asn Val Tyr Val Asp Ser Gln Thr His Val
    930                 935                 940


Gly
945


<210>  145
<211>  101
<212>  PRT
<213>  Magnetospirillum sp. SO-1

<400>  145

Pro Asp His Gly Ala Leu Val Leu Gly Gly Arg Val Leu Ala Val Gly
1               5                   10                  15


Asp Ala Phe Asn Ala Ser Asp Leu Val Ala Gly Thr Met Gly Leu Asn
            20                  25                  30


Tyr Tyr Asn Asp Gly Ser Ala His Ala Ser Asp Ser Phe Gln Leu Arg
        35                  40                  45


Leu Thr Asp Gly Gln Thr Pro Leu Ala Pro Gln Thr Val Ser Ile Ala
    50                  55                  60


Val Gln Pro Val Asn Gln Ala Pro Val Ala Gly Ala Gly Ala Gly Tyr
65                  70                  75                  80


Ala Leu Tyr Met Thr Gly Ser Asn Asn Glu Ala Val Met Val Asn Asp
                85                  90                  95


Ala Gly Gly Lys Leu
            100


<210>  146
<211>  296
<212>  PRT
<213>  Magnetospirillum sp. SO-1

<400>  146

Val Ala Gly Gly Thr Lys Thr Ala His Gly Thr Val Thr Ile Thr Gly
1               5                   10                  15


Gly Asn Leu Thr Tyr Thr Ala Asp Thr Gly Tyr Ala Gly Ser Asp Thr
            20                  25                  30
```

```
Phe Thr Val Glu Ala Asn Asp Gly Thr Gly Asn Val Val Ala Gln Ala
        35                  40                  45

Phe Thr Ala Asn Val Gly Tyr Asp Ser His Ala Leu Thr Leu Ala Thr
    50                  55                  60

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

Tyr Leu Asn Pro Met Asn Gly Ile Gln Val Gly Asp Thr Asn Leu Val
                85                  90                  95

Tyr Thr Val Gly Gly Gly Leu Ala Pro Leu Gly Val Leu Met Lys Gly
            100                 105                 110

Thr Leu Ala Leu Gly Ala Gly Ala Thr Phe Thr Gln Ala Asp Val Ala
        115                 120                 125

Ala Gly Leu Ile Ser Phe Val Ala Asp Gly Ala Pro Gly Val Asp Ser
    130                 135                 140

Phe Asp Phe Ser Leu Thr Asp Gly Ile Gly Gly Thr Leu Thr Gly Asn
145                 150                 155                 160

Thr Ile Val Ser Phe Ser Val Ile Ala Ser Asn Thr Ala Pro Ala Leu
                165                 170                 175

Thr Val Ala Ser Gly Leu Thr Ala Ala Gln Gly Ser Ser Leu Asn Ile
            180                 185                 190

Met Ser Gly Pro Ser Gly Leu Asp Ala Ser Asp Ser Asn Gly Gly Pro
        195                 200                 205

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

Ala Leu Val Leu Gly Gly Arg Val Leu Ala Val Gly Asp Ala Phe Asn
225                 230                 235                 240

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

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

Gln Thr Pro Leu Ala Pro Gln Thr Val Ser Ile Ala Val Gln Pro Val
        275                 280                 285

Asn Gln Ala Pro Val Ala Gly Ala
    290                 295
```

<210> 147
<211> 149
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 147

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

Asp Val Arg Ile Trp Gly Ala Thr Arg Thr Gln Ala Gln Val Gln Ala
20 25 30

Asp Met Ala Pro Ala Glu Glu Gly Ala Gln Ser Gly Leu Leu Gly Ala
35 40 45

Trp Thr Val Glu Asn Gly Glu Ile Val Thr Leu Thr Gly Pro Ala Val
50 55 60

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

Asp His Ile Ala Thr Tyr Ala Gly His Ala Val Ser Gly Thr Val Ala
85 90 95

Thr Phe Asp Gln Asp Gly Gly Thr Leu Thr Leu Gly Ile Glu Thr Gly
100 105 110

Gly Glu Pro Ala Ser Gly Thr Leu Thr Leu Gly Ala Asn Gly Thr Phe
115 120 125

Thr Tyr Thr Pro Asp Thr Gly Phe Val Gly Thr Asp Ser Phe Thr Leu
130 135 140

Glu Leu Asp Asp Gly
145

<210> 148
<211> 698
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 148

Gln Ala Ile Ala Gly Ala Ala Ala Thr Ser Gly Thr Val Ala Ser Ala
1 5 10 15

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

Thr Val Ser Gly Asn Thr Glu Thr Leu Val Thr Ser Ser Gly Thr Ile
35 40 45

```
Ala Leu Asp Thr Thr Thr Gly Val Tyr Gly Tyr Thr Ala Thr Ala Gly
    50                  55                  60

Gln Ala Ala Leu Asp Ile Ile Thr Tyr Thr Val Thr Asp Thr Thr Gly
65                  70                  75                  80

His Val Ser Thr Arg Thr Ile Arg Ala Ala Glu Tyr Asp His Ser Arg
                85                  90                  95

Ser Trp Gly Gly Gly Met Gly Ala Trp Glu Thr Ala Ala Asn Trp Thr
            100                 105                 110

Gly Ser Leu Ala Pro Asp Ser Leu Ala Leu Ala Thr Ile Thr Asn Gly
        115                 120                 125

Thr Val Ser His Ala Ser Gly Ser Asp Thr Met Gly Gly Leu Lys Leu
    130                 135                 140

Thr Gly Ser Ser Leu Ser Leu Ser Gly Gly Thr Val Ala Leu Thr Val
145                 150                 155                 160

Thr Gly Gly Ala Asp Asn Asn Ser Ala Ile Asn Ile Asn Gly Gly Thr
                165                 170                 175

Leu Ala Leu Ser Asn Ser Ser Met Leu Tyr Lys Asp Phe Gly Ala Leu
            180                 185                 190

Asn Phe Thr Ser Gly Ala Met Thr Gly Gly Gly Thr Phe Ile Ala Phe
        195                 200                 205

Gly Thr Thr Asn Leu Ala Val Ala Ser Ser Thr Asp Gln Leu Asp Ala
    210                 215                 220

Lys Leu Met Leu Thr Lys Gly Gly Ser Leu Ser Gly Gly Thr Met Thr
225                 230                 235                 240

Gly Ala Gly Thr Leu Asn Leu Ala Gly Gly Asn Leu Phe Val Thr Gly
                245                 250                 255

Ala Gly Asn Asp Ile Gly Val Ala Phe Gln Asn Ala Ala Ala Thr Met
            260                 265                 270

Leu Leu Leu Glu Gly Thr Asn Ala Gly Ala Asn Thr Thr Leu Thr Leu
        275                 280                 285

Glu His Ala Phe Asp Asn Leu Gly Val Val Asp Met Phe Gly Phe Ser
    290                 295                 300

Gly Ala Ser Gly Ala Leu Ser Leu Asn Val Leu Gly Ala Leu Thr Asn
305                 310                 315                 320
```

```
Asp Gly Ser Ile Val Ala Glu Thr Ser Ala Gly Ser Ala Tyr Gln Val
                325                 330                 335

Ser Ala Thr Asn Phe Asp Asn Tyr Gly Val Val Gln Ile Ala Arg Asn
            340                 345                 350

Leu Gly Leu Thr Val Gly Thr Phe Asp Asn His Ala Thr Leu Thr Leu
        355                 360                 365

Ala Gly Thr Gln Met Leu Thr Val Ser Asp Asn Val Ala Ala Thr His
    370                 375                 380

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

Val Thr Asp Ala Asp Phe Val Asn His Gly Tyr Leu Thr Pro Gly Asp
                405                 410                 415

Ser Ser Ser Ala Gly Thr Leu Ala Val Thr Gly Ser Leu Thr Leu Ala
            420                 425                 430

Ser Asp Ser His Leu Val Leu Asp Tyr Trp Ser Gly Thr Gly Phe Asp
        435                 440                 445

Arg Leu Asn Val Ser Asp Ser Leu Thr Leu Asp Gly Thr Leu Asp Ile
    450                 455                 460

Tyr Ser His Gly Ala Pro Thr Asn Gly Ala Ser Ala Thr Leu Leu Ser
465                 470                 475                 480

Trp Gly Gly Thr Ser Gly Leu Ser Gly Ser Phe Glu Val Ile His Gly
                485                 490                 495

Ile Asp Ser Asn Thr Gly Tyr Ile Trp Asp Pro Thr Leu Ser Gly Thr
            500                 505                 510

Ser Leu Ser Val Thr Ala His Ala Val Thr Ser Thr Ile Tyr Ser Asn
        515                 520                 525

Ser Glu Tyr Asn Gly Thr Ser Gly Ala Asp Tyr Val Val Gly Tyr Gly
    530                 535                 540

Ala Asn Glu Val Val His Leu Gly Gly Gly Ala Asp Val Tyr Ala Gly
545                 550                 555                 560

His Gly Asn Tyr Asn Thr Val Gly Val Ser Asp Leu Asn Phe His Phe
                565                 570                 575

Leu Asp Gly Gly Ala Gly Gly Gly Asn Thr Leu Gln Trp Glu Asn Gln
            580                 585                 590
```

Thr Asn Gln Thr Phe Asp Leu Ser Ala Leu Trp Asn Asn Ala Val Gln
595 600 605

Asn Phe Asp Val Leu Asp Leu Gly His Ala Ser Asn Asn Asn Ala Val
610 615 620

Leu Asp Leu Ala His Leu His Ser Ile Val Asn Gly Thr Asn Ala Val
625 630 635 640

Thr Gly Thr Ser Asn Ala Leu Val Val Ile Gly Gly Asn Ser Val Thr
645 650 655

Leu Ala Gly Ser Gly Trp Arg Ala Asp Ala Thr Ala Glu Leu Thr Val
660 665 670

Asn Gly Gln His Asp Ser Tyr Thr Gln Tyr Ser Asn Gly Asp Thr His
675 680 685

Val Tyr Val Gln Asn His Thr His Val Gly
690 695

<210> 149
<211> 240
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 149

Ser Leu Tyr Asn Asp Ala Ala Ile Thr Arg Glu Asp Thr Glu Leu Arg
1 5 10 15

Ser Gly Leu Phe Asp Pro Asp Tyr Ala Ser Thr Thr Ala Ser Val Asn
20 25 30

Val Arg Ile Val Gln Gly Pro Gln His Gly Thr Val Leu Leu Thr Asn
35 40 45

Gly Thr Thr Val Leu Gly Ala Gly Ala Ser Thr Thr Ser Gly Thr Gly
50 55 60

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

Phe Gly Ser Asp Tyr Phe Val Val Gly Val Thr Asp Pro Gly Gly Asn
85 90 95

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

Pro Thr Leu Ser Gly Leu Ser Asp Phe Ser Val Ala Glu Asn Gly Ser
115 120 125

Gln Thr Leu Asn Val Gln Val Ser Asp Asp Ile Gly Ala Leu Gly Gly

130 135 140

Asp Arg Phe Ser Ala Thr Ile Thr Ala Ser His Gly Gly Val Thr Leu
145 150 155 160

His Thr Leu Gly Gly Val Thr Ile Thr Ser Gly Ser Asn Gly Gly His
165 170 175

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

Gly Ala Val Tyr Gln Ser Asp Ser Met Trp Thr Gly Gly Asp Ser Val
195 200 205

Asn Phe Gln Val Thr Asp Ile Ser Asn Gly Ser Leu Thr Gly Ser Gly
210 215 220

Ser Met Ala Val Ser Leu Ser Gly Ala Asn Asn Leu Ala Pro Val Ile
225 230 235 240

<210> 150
<211> 101
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 150

Val Thr Asn Leu Val Gly Pro Ala Ala Thr Ala Thr Gly Asn Val Thr
1 5 10 15

Ala Val Glu Gly Pro Tyr Gly Ser Ala Pro Val Gly Ser Asp His Ile
20 25 30

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

Gln Asp Gly Gly Thr Leu Val Leu Ser Gln Thr Gly Thr Ala Pro Ala
50 55 60

His Gly Thr Leu Asn Phe Gly Ala Asn Gly Ala Phe Thr Tyr Thr Pro
65 70 75 80

Thr Thr Gly Tyr Val Gly Ser Asp Thr Phe Thr Leu Ser Leu Thr Asp
85 90 95

Gly Thr Ala Thr Thr
100

<210> 151
<211> 295
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 151

```
Ser Leu Val Gly Ala Thr Lys Thr Ala His Gly Thr Val Thr Val Thr
1               5                  10                  15

Gly Ala Ala Leu Thr Tyr Gln Ala Asp Ser Gly Tyr Val Gly Ser Asp
            20                  25                  30

Thr Phe Thr Ile Asn Ala Asp Asp Gly His Gly Asn Val Val Ala Gln
        35                  40                  45

Ala Phe Thr Ala Asn Met Gly Tyr Asp Trp His Ser Leu Thr Leu Ala
    50                  55                  60

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

Ala Tyr Leu Arg Pro Tyr Asp Ala Ile Gln Val Gly Asp Ser Asn Leu
                85                  90                  95

Val Tyr Thr Val Gly Thr Leu Ala His Gln Gly Thr Leu Tyr Lys Gly
            100                 105                 110

Ser Thr Ala Leu Ala Ser Gly Ala Thr Phe Thr Gln Ala Asp Val Asn
        115                 120                 125

Ala Asp Ile Ile Thr Tyr Val Ala Ala Gly Thr Val Gly Ala Asp Ala
    130                 135                 140

Ile Asp Leu Val Val Asn Asp Gly Met Gly Gly Thr Leu Thr Gly Met
145                 150                 155                 160

Gly Ser Leu Ser Leu Thr Val Val Ala Ser Asn Thr Ala Pro Thr Leu
                165                 170                 175

Thr Val Gly Ser Thr Phe Val Asp Ser Gln Gly Ser Ser Ile Asn Ile
            180                 185                 190

Met Ser Gly Ala Asn Gly Leu Asn Ala Thr Asp Ser Glu Gly Ala Ala
        195                 200                 205

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

Leu Val Val Asn Gly Arg Val Leu Ala Val Gly Asp Ala Phe Ser Gly
225                 230                 235                 240

Ala Asp Leu Ser Gly Gly Thr Met Gly Leu Arg Tyr Phe Asn Asp Gly
                245                 250                 255

Ser Ser His Thr Ser Asp Ser Phe Gln Val Arg Leu Ser Asp Gly Gln
            260                 265                 270
```

```
Tyr Leu Thr Ser Pro Gln Thr Val Ser Ile Thr Val Gln Ser Val Asn
        275                 280                 285


Gln Ala Pro Val Ala Gly Ala
    290                 295


<210>  152
<211>  462
<212>  PRT
<213>  Phaeospirillum fulvum MGU-K5

<400>  152

Ser Leu Ser Gly Ala Arg Leu Ala Gly Thr Gly Thr Leu Asp Leu Val
1               5                   10                  15


Ser Gly Gly Ser Leu Ala Leu Arg Leu Ala Thr Glu Val Gly Ile Ala
            20                  25                  30


Leu Thr Thr Ala Ala Ala Ala Gln Ile Leu Ile Asp Gly Gly Thr Ala
        35                  40                  45


Ser Ala Ser Val Leu Phe Asp Gln Thr Leu Ile Asn Asn Gly Thr Leu
    50                  55                  60


Thr Leu Ser Ala Gly Ala Gly Asn Ser Ala Ala Leu Ser Val Ala Pro
65                  70                  75                  80


Gly Met Glu Asn Tyr Gly Thr Leu Leu Val Ser Gly Asp Ala Ala Gly
                85                  90                  95


Ser Ala Ala Ile Asn Ala Asp Asn Leu Gly Asn Ser Gly Gln Met Thr
            100                 105                 110


Val Gly Gln Asp Leu Thr Val Thr Ala Arg Glu Phe Gly Asn Gly Gly
        115                 120                 125


Thr Leu Thr Val Asn Ala Thr Leu Ala Leu Arg Asp Asp Thr Asp Ser
    130                 135                 140


Ala Pro Asp Ser His Leu Ala Phe Thr Asn Asp Gly Leu Leu Ala Gly
145                 150                 155                 160


Thr Gly Thr Leu Asp Leu Ser Asp Ala Thr Phe Thr Asn Gln Gly Tyr
                165                 170                 175


Leu Ser Pro Gly Gly Leu Gly Thr Ala Gly Thr Leu Thr Val Glu Gly
            180                 185                 190


Ala Met Thr Leu Gly Asn Ser Ser Val Leu Ala Leu Asp Leu Ala Gly
        195                 200                 205
```

```
Pro Ala Ile Ser Asp His Leu Thr Val Gln Gly Gly Ala Leu Thr Tyr
    210                 215                 220

Gly Gly Thr Leu Val Phe Ser Ile Leu Ala Asn Pro Thr Leu Asp Thr
225                 230                 235                 240

Pro Ile Ser Val Ile Ser Ala Pro Asp Gln Pro Ile Ala Gly Tyr Phe
                245                 250                 255

Thr Ala Leu Arg Gly Met Asp Asn Gly Thr Leu Val Val Asp Pro Leu
            260                 265                 270

Phe Gly Gly His Gly Leu Ser Val Ala Leu His Ala Ala Thr Arg Leu
        275                 280                 285

Gly Ser Asn Ala Thr Tyr Asp Ser Ser Gly Glu Thr Val Asn Asp Tyr
    290                 295                 300

Leu Ile Gly Thr Gly Ile Asn Glu Thr Val Ser Leu Lys Gly Gly Ala
305                 310                 315                 320

Asp Val Phe Val Gly His Gly Gly Gly Asn Arg Ile Gly Val Ser Ala
                325                 330                 335

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

Arg Trp Asp Gly Gly Ser Asp Ser Leu Phe Asp Ala Thr Gln Ile Arg
        355                 360                 365

Pro Glu Ala Leu Gln His Phe Asp Leu Leu Asn Leu Ser Gly Gly Gly
    370                 375                 380

Asp Ala Val Leu Asp Tyr Ala His Val Lys Ala Met Thr Gly Gly Thr
385                 390                 395                 400

Asn Ser Tyr Thr Gly Thr Gly His Thr Leu Leu Val Ile Gly Gly Asp
                405                 410                 415

Ala Asn His Val Gln Leu Ala Gly Gly Gly Trp Glu His Gly Asp Ser
            420                 425                 430

Val Asn Val Thr Val Asn Gly His Gln Glu Ser Tyr Thr Gln Tyr Ser
        435                 440                 445

Asn Asp Gly Val Arg Val Leu Val Asp His Asn Ala His Ile
    450                 455                 460
```

<210> 153
<211> 578
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 153

```
Gly Thr Ser Ser Thr Trp Thr Gly Gly Ala Thr Pro Thr Thr Gly Asp
1               5                  10                  15

Val Ala Ile Ile Thr Thr Gly Asp Val Val Ser Met Ala Ser Gly Ser
            20                  25                  30

Leu Thr Leu Asp Gly Leu Arg Ser Ala Gly Thr Leu Asp Leu Asn Gly
        35                  40                  45

Gly Thr Leu Thr Val Asn Gly Ala Thr Thr Phe Thr Asn Asn Ser Thr
    50                  55                  60

Leu Ala Leu Ser Gly Thr Gly Ile Trp Ala Gly Ser Gly Asp Ile His
65                  70                  75                  80

Asn His Gly Ile Leu Thr Leu Asn Gly Gly Thr Leu Gly Gly Thr Gly
                85                  90                  95

Thr Ala Tyr Val Ala Met Asp Gly Gln Ile Ala Ile Thr Gly Ser Ser
            100                 105                 110

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

Gly Gly Thr Leu Ser Gly Thr Gly Thr Leu Ala Val Thr Glu Asp Gly
    130                 135                 140

Met Leu Thr Val Arg Gly Asp Ser Thr Leu Ser Ala Thr Leu Ser Leu
145                 150                 155                 160

Ala Ala Thr Pro Asp Tyr Ala Gly Thr Val Glu Ile Leu Ala Glu Ser
                165                 170                 175

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

Ile Ile Leu Asn Ser Ser Gly Ile Ala Gly His Ser Ala Gly Leu Ala
        195                 200                 205

Leu Ser Ser Gly Thr Phe Thr Asn Ala His Leu Phe Thr Ser Thr Ser
    210                 215                 220

Asn Ser Val Leu Asn Val Leu Ser Ala Thr Thr Val Asn Thr Gly Thr
225                 230                 235                 240

Met Gln Ile Asn Gly Met Gly Leu Asp Phe Ala Gly Ile Ser Leu Thr
                245                 250                 255

Asn Ala Ile Gly Gly Val Ile Ser Val Ala Asp Ile Ser Thr Leu Asp
```

```
            260                 265                 270

Ile Asn Arg Ala Gly Ala Ser Phe Ile Asn Asn Gly Thr Leu Glu Gly
        275                 280                 285

Phe Gly Thr Ile Asp Val Thr Gly Ala Gly Phe Thr Asn Asn Gly Leu
    290                 295                 300

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

Thr Val Thr Leu Gly Ala Asn Ser Thr Val Glu Ala Tyr Val Gly Ser
                325                 330                 335

Asn Asn Gly Met Asp Phe Ser Thr Leu Val Asn Ile Asp Gly Gln Leu
            340                 345                 350

Asn Leu Asn Gly Ile Leu His Ile Thr Gly Asn Gly Ser Asp Leu Asp
        355                 360                 365

Gly Asn Thr Gln Val Leu Ser Trp Asp Ser Ala Ser Gly Ser Phe Ser
    370                 375                 380

Asp Ile Val Gly Leu Asp Ala Pro Leu Ala Gly Gly Trp Ala Tyr Asp
385                 390                 395                 400

Ile Arg Phe Asp Gly Asn Gly Ile His Val Gly Thr Leu His Gln Ser
                405                 410                 415

Gln Tyr Glu Thr Thr Gly Asp Asp Phe Ile Gln Gly Ser Met Gly Ala
            420                 425                 430

Glu Ala Leu Ala Gly Gly Ala Gly Asn Asp Thr Leu Phe Ser Gly Gly
        435                 440                 445

Gly Ser Asp Val Ile Phe Gly Gln Asp Gly Asn Asp Thr Ile Val Leu
    450                 455                 460

Ser Asp Thr Asp Val His Phe Val Asp Gly Gly Ala Gly Ile Asp Thr
465                 470                 475                 480

Leu Ser Trp Tyr Ser Pro Gly Pro Leu Asp Leu Thr Ala Leu Arg Asp
                485                 490                 495

Glu Leu Ile Gln Arg Val Glu Ile Leu Asp Ile Gly His Ala Ser Val
            500                 505                 510

Thr Leu Thr Ala Ala Asp Val Gln Ala Met Thr Glu Gly Thr Asn Gly
        515                 520                 525

Phe Thr Asn Thr Ala Asn Thr Leu Val Ile Asn Gly Asn Gly Gly Asn
```

530 535 540

Val Asp Phe Asp Asp Gly Ala Trp Thr Ser Gly Thr Asn Gln Thr Ile
545 550 555 560

Asn Gly Asp Ser Tyr Ala Val Tyr Ser Lys Asp Gly Val Ser Val Tyr
565 570 575

Val Glu

<210> 154
<211> 56
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 154

Gly Ser Leu Thr Val Ser Pro Ser Gly Gln Val Ser Tyr Ile Pro Asn
1 5 10 15

Ala Asn Phe Asn Gly Ile Asp Ser Phe Thr Val Ser Ile Thr Asp Asp
20 25 30

Gln Gly Ala Val Ser Thr Arg Val Val Ala Ile Lys Val Asn Ala Val
35 40 45

Asn Asp Leu Pro Thr Leu Thr Gly
50 55

<210> 155
<211> 56
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 155

Gly Thr Val Ser Leu Asn Ala Asn Gly Ser Tyr Thr Tyr Ser Pro Asp
1 5 10 15

Arg Asn Tyr Thr Gly Ala Asp Ser Phe Leu Tyr Ser Ile Thr Asp Ser
20 25 30

Gln Gly Leu Val Ser Thr Ala Ser Ala Ser Ile Asn Val Thr Ala Val
35 40 45

Asp Asp Ala Phe Thr Val Met Gly
50 55

<210> 156
<211> 71
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 156

Gly Val Val Met Pro His Asp Pro Asp Ser Asp Gly Ser Tyr Thr Phe
1 5 10 15

Thr Ala Thr Thr Ala Pro Thr Asn Gly Ser Leu Ser Leu His Ala Asp
20 25 30

Gly Thr Phe Val Tyr Val Pro Lys Tyr Gly Tyr Val Gly Ala Asp Ser
35 40 45

Phe Thr Val Gln Val Ala Asn Gly Val Asn Thr Pro Val Ser Lys Thr
50 55 60

Phe Ser Val Thr Val Ala Asp
65 70

<210> 157
<211> 271
<212> PRT
<213> Achromobacter piechaudii

<400> 157

Ala Thr Thr Thr Thr Glu Asp Thr Ala Val Asn Gly Gln Val Ser Ala
1 5 10 15

Val Asp Gly Asp Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro
20 25 30

Thr His Gly Thr Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr
35 40 45

Thr Pro Thr Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile
50 55 60

Asn Asp Gly Thr Gly Asn Ile Thr Leu Ser Thr Val Ser Val Thr Val
65 70 75 80

Ser Ala Val Val Asp Ile Ala Asn Asp Ser Val Thr Thr Asn Glu Asp
85 90 95

Thr Thr Val Asn Ile Asn Val Asn Ala Asn Asp Thr Phe Glu Asn Ala
100 105 110

Gly His Thr Ile Thr Ala Ile Asp Gly Asn Ala Ile Val Val Gly Thr
115 120 125

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

Leu Asp Phe Ala Pro Thr Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr
145 150 155 160

Tyr Thr Val Thr Ser Gly Gly Val Asp Glu Thr Ala Thr Val Ser Ile

165 170 175

Thr Val Thr Ala Val Pro Asp Ala Pro Met Val Val Asp Pro Ala Val
180 185 190

Pro Gly Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Val Ser Thr
195 200 205

Thr Glu Asp Val Ala Val Ser Gly Gln Val Ser Ala Val Asp Gly Asp
210 215 220

Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro Ala His Gly Thr
225 230 235 240

Ala Thr Val Asn Ala Ala Thr Gly Ala Tyr Ile Tyr Thr Pro Thr Ala
245 250 255

Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly
260 265 270

<210> 158
<211> 226
<212> PRT
<213> Achromobacter piechaudii

<400> 158

Tyr Thr Tyr Thr Pro Thr Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val
1 5 10 15

Val Ala Ile Asn Asp Gly Thr Gly Asn Ile Ser Leu Ser Thr Val Ser
20 25 30

Val Thr Val Ser Ala Val Val Asp Ile Ala Asn Asp Thr Val Thr Thr
35 40 45

Asn Glu Asp Thr Thr Val Asn Ile Asn Val Asn Ala Asn Asp Ser Phe
50 55 60

Glu Asn Ala Gly His Thr Ile Thr Ala Ile Asp Gly Asn Ala Ile Val
65 70 75 80

Val Gly Thr Pro Val Ala Val Ala Asn Gly Met Val Thr Leu Lys Ala
85 90 95

Asp Gly Thr Leu Asp Phe Ala Pro Ala Ala Asn Phe Asn Gly Ser Thr
100 105 110

Ser Phe Thr Tyr Thr Val Thr Ser Gly Gly Val Asp Glu Thr Ala Thr
115 120 125

Val Ser Val Thr Val Thr Ala Val Ala Asp Ala Pro Met Thr Val Asp
130 135 140

```
Pro Ala Val Pro Gly Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala
145                 150                 155                 160

Val Ser Thr Thr Glu Asp Ala Ala Val Ser Gly Gln Val Ser Ala Val
                165                 170                 175

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

His Gly Thr Val Thr Val Asn Ala Ala Thr Gly Ala Tyr Thr Tyr Thr
        195                 200                 205

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

Asp Gly
225
```

<210> 159
<211> 271
<212> PRT
<213> Achromobacter piechaudii

<400> 159

```
Ala Thr Thr Thr Asn Glu Asp Thr Ala Val Thr Gly Gln Val Ser Ala
1               5                   10                  15

Val Asp Gly Asp Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro
            20                  25                  30

Ala His Gly Thr Val Thr Val Asn Ala Ser Thr Gly Ala Tyr Thr Tyr
        35                  40                  45

Thr Pro Thr Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile
    50                  55                  60

Asn Asp Gly Thr Gly Asn Ile Thr Phe Ser Thr Val Ser Val Thr Val
65                  70                  75                  80

Ser Ala Val Val Asp Ile Ala Asn Asp Ser Val Thr Thr Asn Glu Asp
                85                  90                  95

Thr Ser Val Asn Ile Asn Val Asn Ala Asn Asp Ser Phe Glu Asn Ala
            100                 105                 110

Gly His Thr Ile Thr Ala Ile Asp Gly Asn Ala Ile Val Val Gly Thr
        115                 120                 125

Pro Val Ala Val Ala Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr
    130                 135                 140
```

```
Leu Asp Phe Ala Pro Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr
145                 150                 155                 160

Tyr Thr Val Thr Ser Gly Gly Ala Val Glu Thr Ala Thr Val Ser Ile
                165                 170                 175

Thr Val Thr Ala Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val
            180                 185                 190

Pro Gly Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr
        195                 200                 205

Asn Glu Asp Thr Ala Val Thr Gly Gln Val Ser Ala Val Asp Gly Asp
    210                 215                 220

Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro Thr His Gly Thr
225                 230                 235                 240

Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala
                245                 250                 255

Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asp Asp Gly
            260                 265                 270
```

<210> 160
<211> 271
<212> PRT
<213> Achromobacter piechaudii

<400> 160

```
Ala Thr Thr Thr Asn Glu Asp Thr Ala Val Thr Gly Gln Val Ser Ala
1               5                   10                  15

Val Asp Gly Asp Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro
            20                  25                  30

Ala His Gly Thr Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr
        35                  40                  45

Thr Pro Thr Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile
    50                  55                  60

Ser Asp Gly Thr Gly Gln Val Thr Leu Ser Thr Val Ser Val Thr Val
65                  70                  75                  80

Ser Ala Val Val Asp Ile Ala Asn Asp Ser Val Thr Thr Asn Glu Asp
                85                  90                  95

Thr Thr Val Asn Ile Asn Val Asn Ala Asn Asp Ser Phe Glu Asn Ala
            100                 105                 110
```

```
Gly His Ala Ile Thr Ala Ile Asp Gly Asn Ala Val Val Val Gly Thr
        115                 120                 125

Pro Val Ala Val Ala Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr
    130                 135                 140

Leu Asp Phe Ala Pro Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr
145                 150                 155                 160

Tyr Thr Val Thr Ser Gly Gly Ala Val Glu Thr Ala Thr Val Ser Ile
                165                 170                 175

Thr Val Thr Ala Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val
            180                 185                 190

Pro Gly Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Val Ser Thr
        195                 200                 205

Thr Glu Asp Ala Ala Val Ser Gly Gln Val Ser Ala Val Asp Gly Asp
    210                 215                 220

Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Pro Pro Ala His Gly Ser
225                 230                 235                 240

Val Thr Ile Asp Pro Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala
                245                 250                 255

Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly
            260                 265                 270
```

<210> 161
<211> 271
<212> PRT
<213> Achromobacter piechaudii

<400> 161

```
Ala Thr Thr Thr Asn Glu Asp Thr Ala Val Thr Gly Gln Val Ala Ala
1               5                   10                  15

Val Asp Gly Asp Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro
            20                  25                  30

Ala His Gly Thr Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr
        35                  40                  45

Thr Pro Thr Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Ile Val Ala Ile
    50                  55                  60

Asp Asp Gly Thr Gly Asn Ile Thr Leu Ser Thr Val Ser Val Thr Val
65                  70                  75                  80

Ser Ala Val Val Asp Ile Ala Asn Asp Thr Val Thr Thr Asn Glu Asp
```

85 90 95

Thr Pro Leu Asn Ile Asn Val Asn Ala Asn Asp Thr Phe Glu Asn Ala
100 105 110

Gly His Thr Ile Thr Ala Ile Asp Gly Asn Ala Ile Ile Val Gly Ala
115 120 125

Pro Leu Ala Val Ala Asn Gly Thr Val Leu Leu Arg Ala Asp Gly Thr
130 135 140

Leu Asp Phe Thr Pro Thr Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr
145 150 155 160

Tyr Thr Val Thr Ser Gly Gly Ala Val Glu Thr Ala Thr Val Thr Val
165 170 175

Met Val Ala Ser Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val
180 185 190

Pro Gly Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr
195 200 205

Thr Glu Asp Thr Ala Val Thr Gly Gln Val Ser Ala Thr Asp Gly Asp
210 215 220

Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro Thr His Gly Thr
225 230 235 240

Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala
245 250 255

Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ser Ile Asp Asp Gly
260 265 270

<210> 162
<211> 234
<212> PRT
<213> Achromobacter piechaudii

<400> 162

Thr Val Asn Ala Ala Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp
1 5 10 15

Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly Thr Gly
20 25 30

Asn Ile Thr Leu Ser Thr Val Ser Val Thr Val Ser Ala Val Val Asp
35 40 45

Ile Ala Asn Asp Ser Val Thr Thr Asn Glu Asp Thr Thr Val Asn Ile
50 55 60

```
Asn Val Asn Ala Asn Asp Ser Phe Glu Asn Ala Gly His Thr Ile Thr
65                  70                  75                  80

Ala Ile Asp Gly Asn Ala Ile Val Val Gly Thr Pro Val Ala Val Ala
                85                  90                  95

Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr Leu Asp Phe Ala Pro
            100                 105                 110

Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr Tyr Thr Val Thr Ser
        115                 120                 125

Gly Gly Ala Val Glu Thr Ala Thr Val Gly Ile Thr Val Met Ala Val
    130                 135                 140

Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val Pro Gly Gln Thr Phe
145                 150                 155                 160

Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr Asn Glu Asp Thr Ala
                165                 170                 175

Val Thr Gly Gln Val Ser Ala Val Asp Gly Asp Gly Asp Pro Leu Ala
            180                 185                 190

Tyr Ser Val Gly Thr Ala Pro Ala His Gly Thr Val Thr Val Asn Ala
        195                 200                 205

Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp Tyr Tyr Gly Ser
    210                 215                 220

Asp Ser Phe Val Val Ala Ile Asn Asp Gly
225                 230
```

<210> 163
<211> 252
<212> PRT
<213> Achromobacter piechaudii

<400> 163

```
Asp Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro Ala His Gly
1               5                   10                  15

Thr Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr
            20                  25                  30

Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly
        35                  40                  45

Thr Gly Asn Ile Thr Leu Ser Thr Val Ser Val Thr Val Ser Ala Val
    50                  55                  60
```

```
Val Asp Ile Ala Asn Asp Ser Val Thr Thr Asn Glu Asp Thr Ser Val
65                  70                  75                  80

Asn Ile Asn Val Asn Ala Asn Asp Thr Phe Glu Asn Ala Gly His Thr
                85                  90                  95

Ile Thr Ala Ile Asp Gly Asn Ala Ile Val Val Gly Thr Pro Val Ala
            100                 105                 110

Val Ala Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr Leu Asp Phe
        115                 120                 125

Ala Pro Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr Tyr Thr Val
    130                 135                 140

Thr Ser Gly Gly Ala Val Glu Thr Ala Thr Val Ser Ile Thr Val Thr
145                 150                 155                 160

Ala Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val Pro Gly Gln
                165                 170                 175

Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr Thr Glu Asp
            180                 185                 190

Thr Ala Val Thr Gly Gln Val Ser Ala Val Asp Gly Asp Gly Asp Pro
        195                 200                 205

Leu Ala Tyr Ser Val Gly Thr Ala Pro Ala His Gly Thr Val Thr Val
    210                 215                 220

Asn Ala Thr Thr Gly Ala Tyr Ile Tyr Thr Pro Thr Ala Asp Tyr Tyr
225                 230                 235                 240

Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly
                245                 250


<210>  164
<211>  234
<212>  PRT
<213>  Achromobacter piechaudii

<400>  164

Thr Val Asn Ala Ser Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp
1               5                   10                  15

Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asp Asp Gly Thr Gly
            20                  25                  30

Asn Ile Thr Phe Ser Thr Val Ser Val Thr Val Ser Ala Val Val Asp
        35                  40                  45
```

Ile Ala Asn Asp Thr Val Thr Thr Asn Glu Asp Thr Pro Val Asn Ile
50 55 60

Asn Val Asn Ala Asn Asp Thr Phe Glu Asn Ser Gly His Thr Ile Thr
65 70 75 80

Ala Ile Asp Gly Asn Ala Val Val Val Gly Thr Pro Val Ala Val Ala
85 90 95

Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr Leu Asp Phe Ala Pro
100 105 110

Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr Tyr Thr Val Thr Ser
115 120 125

Gly Gly Val Asp Glu Thr Ala Thr Val Thr Ile Ser Ile Thr Ala Val
130 135 140

Pro Asp Ala Pro Met Thr Val Asp Pro Ala Ile Pro Gly Gln Thr Phe
145 150 155 160

Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr Asn Glu Asp Thr Ala
165 170 175

Val Thr Gly Gln Val Ser Ala Val Asp Gly Asp Gly Asp Pro Leu Ala
180 185 190

Tyr Ser Val Gly Thr Ala Pro Ala His Gly Thr Val Thr Val Asn Ala
195 200 205

Ser Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp Tyr Tyr Gly Ser
210 215 220

Asp Ser Phe Val Val Ala Ile Asp Asp Gly
225 230

<210> 165
<211> 237
<212> PRT
<213> Achromobacter piechaudii

<400> 165

Gly Ser Val Thr Val Asp Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro
1 5 10 15

Thr Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp
20 25 30

Gly Thr Gly Asn Ile Thr Leu Ser Thr Val Ser Val Thr Val Ser Ala
35 40 45

Val Val Asp Ile Ala Asn Asp Thr Val Thr Thr Asn Glu Asp Thr Leu

50 55 60

Val Asn Ile Asn Val Asn Ala Asn Asp Thr Phe Glu Asn Ala Gly His
65 70 75 80

Ala Ile Thr Ala Ile Asp Gly Asn Ala Val Val Val Gly Thr Pro Phe
85 90 95

Ala Val Ala Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr Ile Asp
100 105 110

Phe Ala Pro Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr Tyr Thr
115 120 125

Val Thr Ser Gly Gly Val Asp Glu Thr Ala Thr Val Thr Val Ser Ile
130 135 140

Thr Ala Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val Pro Gly
145 150 155 160

Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr Thr Glu
165 170 175

Asp Thr Ala Val Thr Gly Gln Ile Ser Ala Val Asp Gly Asp Gly Asp
180 185 190

Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro Ala His Gly Thr Val Thr
195 200 205

Val Asn Ala Ser Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp Tyr
210 215 220

Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asp Asp Gly
225 230 235

<210> 166
<211> 252
<212> PRT
<213> Achromobacter piechaudii

<400> 166

Asp Gly Asp Pro Leu Ala Tyr Ser Val Gly Thr Ala Pro Thr His Gly
1 5 10 15

Thr Val Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr
20 25 30

Ala Asp Tyr Tyr Gly Ser Asp Ser Phe Val Val Ser Ile Asp Asp Gly
35 40 45

Thr Gly His Val Thr Ser Ser Thr Val Ser Val Thr Val Ser Ala Val
50 55 60

Val Asp Ile Ala Asn Asp Thr Ile Thr Thr Asn Glu Asp Thr Pro Val
65 70 75 80

Asn Ile Asn Val Asn Ala Asn Asp Ser Phe Glu Asn Ala Gly His Thr
85 90 95

Ile Thr Ala Ile Asp Gly Asn Ala Val Val Val Gly Thr Pro Val Ala
100 105 110

Val Ala Asn Gly Met Val Thr Leu Lys Ala Asp Gly Thr Leu Asp Phe
115 120 125

Ala Pro Ala Ala Asn Tyr Asn Gly Ser Thr Ser Phe Thr Tyr Thr Val
130 135 140

Ser Ser Gly Gly Val Asp Glu Thr Ala Thr Val Thr Val Ser Ile Thr
145 150 155 160

Ala Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val Pro Gly Gln
165 170 175

Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr Thr Glu Asp
180 185 190

Thr Ala Val Thr Gly Gln Val Leu Ala Thr Asp Gly Asp Gly Asp Pro
195 200 205

Leu Ala Tyr Ser Val Gly Thr Ala Pro Ala His Gly Thr Val Thr Val
210 215 220

Asn Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp Tyr Tyr
225 230 235 240

Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly
245 250

<210> 167
<211> 109
<212> PRT
<213> Achromobacter piechaudii

<400> 167

Val Thr Ser Gly Gly Val Asp Glu Thr Ala Thr Val Ser Val Ser Ile
1 5 10 15

Thr Pro Val Pro Asp Ala Pro Met Thr Val Asp Pro Ala Val Pro Gly
20 25 30

Gln Thr Phe Asp Ser Ala Thr Gly Asn Tyr Ala Thr Thr Thr Thr Glu
35 40 45

```
Asp Thr Ala Val Thr Gly Gln Val Ser Ala Val Asp Gly Asp Gly Asp
    50                  55                  60

Pro Leu Ala Tyr Ser Val Gly Thr Pro Pro Ala His Gly Ser Val Thr
65                  70                  75                  80

Val Asp Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Thr Ala Asp Tyr
                85                  90                  95

Tyr Gly Ser Asp Ser Phe Val Val Ala Ile Asn Asp Gly
            100                 105
```

<210> 168
<211> 253
<212> PRT
<213> Achromobacter piechaudii

<400> 168

```
Thr Ile Asn Ala Thr Thr Gly Ala Tyr Val Tyr Thr Pro Thr Gly Asp
1               5                   10                  15

Tyr Asn Gly Asn Asp Arg Phe Val Val Ser Ile Ala Asp Gly Ser Gly
            20                  25                  30

Gly Ser Val Gln Ala Val Val Asn Val Val Val Ser Ala Val Ala Asp
        35                  40                  45

Ile Thr Asn Asp Thr Val Ser Thr Asn Glu Asp Thr Thr Val Asn Ile
    50                  55                  60

Ala Val Asn Gly Asn Asp Thr Phe Glu Asn Ala Gly His Val Val Thr
65                  70                  75                  80

Ala Ile Asp Gly His Ala Ala Ala Val Gly Val Pro Val Leu Val Gly
                85                  90                  95

Asn Gly Ser Val Thr Leu Arg Ala Asp Gly Ser Leu Asp Phe Ser Pro
            100                 105                 110

Ala Ala Asn Tyr Asn Gly Thr Thr Ser Phe Thr Tyr Thr Val Ser Ser
        115                 120                 125

Gly Gly Val Asn Glu Thr Ala Thr Val Thr Val Asn Val Ala Ala Val
    130                 135                 140

Asn Asp Ser Pro Val Val Pro Gly Gly Ser Val Asp Leu Pro Leu Ala
145                 150                 155                 160

Asn Gly Val Asp Val Pro Ala Ser Gln Gly Leu Leu Val Gly Ala Thr
                165                 170                 175
```

Asp Ala Asp Gly Asp Pro Leu Arg Val Thr Gln Ile Ser Val Asp Gly
180 185 190

Val Ala Gly Ser Thr Pro Ala Gly Thr Pro Ile Val Val Pro Gly Arg
195 200 205

Gly Thr Leu Leu Val Arg Ala Asp Gly Ser Tyr Val Phe Thr Pro Ser
210 215 220

Ser Gly Phe Ala Gly Asp Leu Val Val His Tyr Thr Val Ser Asp Gly
225 230 235 240

Asn Gly Gly Leu Thr Glu Ala Thr Ile Arg Leu His Asn
245 250

<210> 169
<211> 216
<212> PRT
<213> Solitalea canadensis

<400> 169

Thr His Gly Thr Leu Thr Leu Asn Ala Asp Gly Ser Phe Thr Tyr Thr
1 5 10 15

Pro Thr Ala Asn Phe Ser Gly Ser Asp Ser Phe Thr Tyr Lys Ala Asn
20 25 30

Asp Gly Ser Ser Asp Ser Asn Val Ala Thr Val Ala Ile Thr Val Asn
35 40 45

Ser Val Asn Asp Ala Pro Val Ala Asn Asn Asp Ala Lys Thr Thr Asn
50 55 60

Glu Asp Val Ala Val Asn Gly Thr Val Thr Ala Thr Asp Val Asp Gly
65 70 75 80

Asp Ala Leu Thr Phe Thr Lys Gly Ser Asn Pro Thr Asn Gly Ser Val
85 90 95

Val Val Asn Ala Asp Gly Thr Tyr Thr Tyr Thr Pro Ser Ala Asn Phe
100 105 110

Asn Gly Thr Asp Ser Phe Thr Val Lys Ala Ser Asp Gly Lys Gly Gly
115 120 125

Glu Ser Thr Ala Thr Met Thr Ile Thr Val Thr Pro Val Asn Asp Ala
130 135 140

Pro Val Ala Asn Asn Asp Ala Lys Thr Thr Asn Glu Asp Val Thr Val
145 150 155 160

Asn Gly Thr Val Thr Ala Thr Asp Val Asp Gly Asp Ala Leu Thr Phe

165 170 175

Thr Lys Gly Ser Asn Pro Thr Asn Gly Ser Val Val Val Asn Ala Asp
180 185 190

Gly Thr Tyr Thr Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Ser
195 200 205

Phe Thr Val Lys Ala Ser Asp Gly
210 215

<210> 170
<211> 223
<212> PRT
<213> Solitalea canadensis

<400> 170

Ala Val Leu Val Ser Gly Pro Thr His Gly Thr Leu Thr Leu Asn Ala
1 5 10 15

Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Phe Ser Gly Ser Asp
20 25 30

Ser Phe Thr Tyr Lys Ala Asn Asp Gly Ser Ser Asp Ser Asn Val Ala
35 40 45

Thr Val Ala Ile Thr Val Asn Ser Val Asn Asp Ala Pro Val Ala Asn
50 55 60

Asn Asp Ala Lys Thr Thr Asn Glu Asp Val Ala Val Asn Gly Thr Val
65 70 75 80

Thr Ala Thr Asp Val Asp Gly Asp Ala Leu Thr Phe Thr Lys Gly Ser
85 90 95

Asn Pro Thr Asn Gly Ser Val Val Val Asn Ala Asp Gly Thr Tyr Thr
100 105 110

Tyr Met Pro Asn Ala Asn Phe Asn Gly Thr Asp Ser Phe Thr Val Lys
115 120 125

Ala Ser Asp Gly Lys Gly Gly Glu Ser Thr Ala Thr Val Thr Ile Thr
130 135 140

Val Thr Pro Val Lys Asp Ala Pro Val Ala Asn Asn Asp Ala Lys Thr
145 150 155 160

Thr Ser Glu Asp Val Ala Val Asn Gly Thr Val Thr Ala Thr Asp Val
165 170 175

Asp Gly Asp Thr Leu Thr Phe Thr Lys Gly Ser Asn Pro Thr Asn Gly
180 185 190

Thr Val Thr Val Asn Ala Asp Gly Thr Tyr Thr Tyr Thr Pro Asn Ala
195 200 205

Asn Phe Asn Gly Thr Asp Ser Phe Thr Val Lys Ala Ser Asp Gly
210 215 220

<210> 171
<211> 228
<212> PRT
<213> Solitalea canadensis

<400> 171

Ala Val Leu Val Ser Gly Pro Thr His Gly Thr Leu Thr Leu Asn Ala
1 5 10 15

Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Tyr Ser Gly Ser Asp
20 25 30

Ser Phe Thr Tyr Lys Ala Asn Asp Gly Ser Ser Asp Ser Asn Val Ala
35 40 45

Thr Val Thr Leu Thr Val Thr Pro Val Asn Asp Ala Pro Val Ala Val
50 55 60

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

Lys Gly Val Leu Thr Asn Asp Thr Asp Val Glu Asn Asn Thr Leu Thr
85 90 95

Ala Val Leu Val Ser Gly Pro Ala His Gly Thr Leu Thr Leu Asn Ala
100 105 110

Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Phe Asn Gly Ile Asp
115 120 125

Ser Phe Thr Tyr Lys Ala Asn Asp Gly Ser Ser Asp Ser Asn Val Ala
130 135 140

Thr Val Ala Ile Thr Val Asn Ser Val Asn Asp Ala Pro Val Ala Asn
145 150 155 160

Asn Asp Ala Lys Thr Thr Ser Glu Asp Val Ala Val Ser Gly Thr Val
165 170 175

Thr Ala Thr Asp Val Asp Gly Asp Ala Leu Thr Phe Thr Lys Gly Ser
180 185 190

Asn Pro Thr Asn Gly Thr Val Thr Val Asn Pro Asp Gly Ala Tyr Thr
195 200 205

```
Tyr Thr Pro Asn Thr Asn Phe Asn Gly Thr Asp Ser Phe Thr Val Lys
    210                 215                 220

Ala Ser Asp Gly
225
```

<210> 172
<211> 214
<212> PRT
<213> Solitalea canadensis

<400> 172

```
Gly Thr Leu Thr Leu Asn Ala Asp Gly Ser Phe Thr Tyr Thr Pro Thr
1               5                   10                  15

Ala Asn Phe Ser Gly Ser Asp Ser Phe Thr Tyr Lys Ala Asn Asp Gly
            20                  25                  30

Ser Ser Asp Ser Asn Val Ala Thr Val Val Ile Thr Val Asn Ser Val
        35                  40                  45

Asn Asp Ala Pro Val Ala Asn Asn Asp Ala Lys Thr Thr Asn Glu Asp
    50                  55                  60

Val Ala Val Asn Gly Thr Val Thr Ala Thr Asp Val Asp Gly Asp Ala
65                  70                  75                  80

Leu Thr Phe Thr Lys Gly Ser Asn Pro Thr Asn Gly Ser Val Val Val
                85                  90                  95

Asn Ala Asp Gly Thr Tyr Thr Tyr Thr Pro Asn Thr Asn Phe Asn Gly
            100                 105                 110

Thr Asp Ser Phe Thr Val Lys Ala Ser Asp Gly Lys Gly Gly Glu Ser
        115                 120                 125

Thr Ala Thr Val Thr Ile Thr Val Thr Pro Val Asn Asp Ser Pro Val
    130                 135                 140

Ala Asn Asn Asp Ala Lys Thr Thr Asn Glu Asp Val Ala Val Ser Gly
145                 150                 155                 160

Thr Val Pro Ala Thr Asp Val Asp Gly Asp Ala Leu Thr Phe Thr Lys
                165                 170                 175

Gly Ser Asn Pro Thr Asn Gly Thr Val Thr Val Asn Pro Asp Gly Ala
            180                 185                 190

Tyr Thr Tyr Thr Pro Asn Thr Asn Phe Asn Gly Thr Asp Ser Phe Thr
        195                 200                 205
```

Val Lys Ala Ser Asp Gly
210

<210> 173
<211> 228
<212> PRT
<213> Solitalea canadensis

<400> 173

Ala Val Leu Val Ser Gly Pro Thr His Gly Thr Leu Thr Leu Asn Ala
1 5 10 15

Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Tyr Ser Gly Ser Asp
20 25 30

Ser Phe Thr Tyr Lys Ala Asn Asp Gly Ser Ser Asp Ser Asn Val Ala
35 40 45

Thr Val Thr Leu Thr Val Thr Pro Val Asn Asp Ala Pro Val Ala Val
50 55 60

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

Lys Gly Val Leu Thr Asn Asp Thr Asp Val Glu Asn Asn Thr Leu Thr
85 90 95

Ala Val Leu Val Ser Gly Pro Ala His Gly Thr Leu Thr Leu Asn Ala
100 105 110

Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Phe Asn Gly Ile Asp
115 120 125

Ser Phe Thr Tyr Lys Ala Asn Asp Gly Ser Ser Asp Ser Asn Val Ala
130 135 140

Thr Val Val Ile Thr Val Asn Ser Val Asn Asp Ala Pro Val Ala Asn
145 150 155 160

Asn Asp Ala Lys Ala Thr Asn Glu Asp Val Ala Val Asn Gly Thr Val
165 170 175

Thr Ala Thr Asp Val Asp Gly Asp Ala Leu Thr Phe Thr Lys Gly Ser
180 185 190

Asn Pro Thr Asn Gly Ser Val Val Val Asn Ala Asp Gly Thr Tyr Thr
195 200 205

Tyr Thr Pro Asn Thr Asn Phe Asn Gly Thr Asp Ser Phe Thr Val Lys
210 215 220

Ala Ser Asp Gly

225

<210> 174
<211> 252
<212> PRT
<213> Solitalea canadensis

<400> 174

Thr Asn Gly Ser Val Val Val Asn Ile Asp Gly Thr Tyr Thr Tyr Thr
1 5 10 15

Pro Asn Ala Asp Phe Asn Gly Lys Asp Ser Phe Asp Phe Ile Ile Lys
20 25 30

Asp Gly Lys Gly Gly Glu Thr Lys Val Val Ile Asp Val Thr Val Thr
35 40 45

Pro Val Asn Asp Ala Pro Ile Val Thr Val Asp Pro Val Ser Thr Asp
50 55 60

Glu Asn Lys Pro Val Thr Gly Lys Val Thr Ala Lys Asp Ala Asp Gly
65 70 75 80

Asp Ala Pro Thr Ala Glu Lys Gly Thr Asp Pro Thr Asn Gly Thr Val
85 90 95

Val Val Asn Pro Asp Gly Thr Tyr Thr Tyr Thr Pro Lys Pro Gly Phe
100 105 110

Asn Gly Lys Asp Ser Phe Glu Ile Val Val Lys Asp Gly Lys Gly Gly
115 120 125

Glu Thr Lys Val Ile Val Asp Val Thr Val Ser Pro Val Asn Asp Ala
130 135 140

Pro Val Ala Ser Asn Asp Asn Lys Thr Thr Asn Glu Asp Thr Pro Val
145 150 155 160

Ser Gly Lys Ile Thr Ala Thr Asp Ala Asp Gly Asp Ala Met Thr Phe
165 170 175

Ile Lys Gly Ser Asn Pro Ser Asn Gly Thr Val Val Val Asn Ala Asp
180 185 190

Gly Thr Tyr Thr Tyr Thr Pro Asn Ala Asp Phe Asn Gly Thr Asp Ser
195 200 205

Phe Thr Val Lys Val Ser Asp Gly Lys Gly Gly Glu Thr Thr Ala Thr
210 215 220

Ile Thr Ile Thr Val Lys Ala Val Asn Asp Ala Pro Val Val Thr Ala
225 230 235 240

Gly Pro Val Thr Thr Thr Glu Asn Thr Pro Val Ser
245 250

<210> 175
<211> 221
<212> PRT
<213> Solitalea canadensis

<400> 175

Thr Asn Gly Ser Val Val Val Asn Ala Asp Gly Thr Tyr Thr Tyr Thr
1 5 10 15

Pro Asn Thr Asn Phe Asn Gly Thr Asp Ser Phe Thr Val Lys Ala Ser
20 25 30

Asp Gly Lys Gly Gly Glu Ser Thr Ala Thr Val Thr Ile Thr Val Thr
35 40 45

Pro Val Asn Asp Ser Pro Val Ala Asn Asn Asp Ala Lys Thr Thr Asn
50 55 60

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

Asp Ala Leu Thr Phe Thr Lys Gly Ser Asn Pro Thr Asn Gly Thr Val
85 90 95

Thr Val Asn Pro Asp Gly Ala Tyr Thr Tyr Thr Pro Asn Thr Asn Phe
100 105 110

Asn Gly Thr Asp Ser Phe Thr Val Lys Ala Ser Asp Gly Lys Gly Gly
115 120 125

Glu Ser Thr Ala Thr Val Thr Ile Thr Val Thr Pro Val Asn Asp Ala
130 135 140

Pro Val Ala Val Asn Asp Ala Tyr Ser Val Asn Glu Asp Ala Val Leu
145 150 155 160

Thr Ile Ala Ala Lys Gly Val Leu Thr Asn Asp Thr Asp Val Glu Asn
165 170 175

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

Thr Leu Asn Ala Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Tyr
195 200 205

Ser Gly Ser Asp Ser Phe Thr Tyr Lys Ala Asn Asp Gly
210 215 220

<210> 176
<211> 236
<212> PRT
<213> Solitalea canadensis

<400> 176

```
Lys Val Thr Ser Thr Asp Val Asp Gly Asp Thr Leu Ile Ala Glu Lys
1               5                   10                  15

Gly Thr Asp Pro Thr Asn Gly Thr Val Val Val Asn Pro Asp Gly Thr
            20                  25                  30

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

Ile Val Val Lys Asp Gly Lys Gly Gly Glu Thr Lys Val Val Val Asp
    50                  55                  60

Val Thr Val Thr Pro Val Asn Asp Ala Pro Val Ala Ser Asn Asp Ser
65                  70                  75                  80

Lys Thr Thr Asn Glu Asp Thr Pro Val Asn Gly Lys Val Ala Ala Thr
                85                  90                  95

Asp Pro Asp Gly Asp Thr Leu Ile Phe Thr Lys Gly Asn Asn Pro Ser
            100                 105                 110

Asn Gly Thr Val Val Val Asn Pro Asp Gly Thr Tyr Thr Tyr Thr Pro
        115                 120                 125

Asn Thr Asp Phe Asn Gly Lys Asp Ser Phe Glu Ile Val Ile Lys Asp
    130                 135                 140

Gly Lys Gly Gly Glu Thr Thr Val Val Ile Glu Val Thr Val Asn Pro
145                 150                 155                 160

Val Asn Asp Ala Pro Val Ala Ser Asn Asp Ser Lys Thr Thr Asn Glu
                165                 170                 175

Asp Thr Pro Val Asn Gly Lys Val Thr Ala Thr Asp Ala Glu Gly Asp
            180                 185                 190

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

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

Gly Lys Asp Ser Phe Asp Phe Ile Ile Lys Asp Gly
225                 230                 235
```

<210> 177
<211> 221
<212> PRT
<213> Solitalea canadensis

<400> 177

Thr Asn Gly Ser Val Val Val Asn Ala Asp Gly Thr Tyr Thr Tyr Thr
1 5 10 15

Pro Asn Thr Asn Phe Asn Gly Thr Asp Ser Phe Thr Val Lys Ala Ser
20 25 30

Asp Gly Lys Gly Gly Glu Ser Thr Ala Thr Val Thr Ile Thr Val Thr
35 40 45

Pro Val Asn Asp Ser Pro Val Ala Asn Asn Asp Ala Lys Thr Thr Ser
50 55 60

Glu Asp Val Ala Val Ser Gly Thr Val Thr Ala Thr Asp Val Asp Gly
65 70 75 80

Asp Ala Leu Thr Phe Thr Lys Gly Ser Asn Pro Thr Asn Gly Thr Val
85 90 95

Thr Val Asn Pro Asp Gly Ala Tyr Thr Tyr Thr Pro Asn Thr Asn Phe
100 105 110

Asn Gly Thr Asp Ser Phe Thr Val Lys Ala Ser Asp Gly Lys Gly Gly
115 120 125

Glu Ser Thr Ala Thr Val Thr Ile Thr Val Thr Pro Val Asn Asp Ala
130 135 140

Pro Val Ala Val Asn Asp Ala Tyr Ser Val Asn Glu Asp Ala Val Leu
145 150 155 160

Thr Ile Ala Ala Lys Gly Val Leu Thr Asn Asp Thr Asp Val Glu Asn
165 170 175

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

Thr Leu Asn Ala Asp Gly Ser Phe Thr Tyr Thr Pro Thr Ala Asn Tyr
195 200 205

Ser Gly Ser Asp Ser Phe Thr Tyr Lys Ala Asn Asp Gly
210 215 220

<210> 178
<211> 204
<212> PRT
<213> Solitalea canadensis

<400> 178

Tyr Thr Tyr Thr Pro Lys Pro Gly Phe Asn Gly Lys Asp Ser Phe Glu
1 5 10 15

Ile Val Val Lys Asp Gly Lys Gly Gly Glu Thr Lys Val Ile Val Asp
20 25 30

Val Thr Val Ser Pro Val Asn Asp Ala Pro Val Ala Ser Asn Asp Asn
35 40 45

Lys Thr Thr Asn Glu Asp Thr Pro Val Ser Gly Lys Ile Thr Ala Thr
50 55 60

Asp Ala Asp Gly Asp Ala Met Thr Phe Ile Lys Gly Ser Asn Pro Ser
65 70 75 80

Asn Gly Thr Val Val Val Asn Ala Asp Gly Thr Tyr Thr Tyr Thr Pro
85 90 95

Asn Ala Asp Phe Asn Gly Thr Asp Ser Phe Thr Val Lys Val Ser Asp
100 105 110

Gly Lys Gly Gly Glu Thr Thr Ala Thr Ile Thr Ile Thr Val Lys Ala
115 120 125

Val Asn Asp Ala Pro Val Val Thr Ala Gly Pro Val Thr Thr Thr Glu
130 135 140

Asn Thr Pro Val Ser Gly Lys Val Thr Ser Thr Asp Ala Asp Gly Asp
145 150 155 160

Pro Leu Thr Ala Glu Lys Gly Thr Asp Pro Ala Asn Gly Thr Val Val
165 170 175

Val Asn Pro Asp Gly Thr Tyr Thr Tyr Thr Pro Lys Pro Gly Phe Asn
180 185 190

Gly Lys Asp Ser Phe Glu Ile Val Val Lys Asp Gly
195 200

<210> 179
<211> 93
<212> PRT
<213> Solitalea canadensis

<400> 179

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

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

Thr Ile Ala Ala Lys Gly Val Leu Thr Asn Asp Thr Asp Val Glu Asn
35 40 45

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

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

Ser Gly Ser Asp Ser Phe Thr Tyr Lys Ala Asn Asp Gly
85 90

<210> 180
<211> 267
<212> PRT
<213> Pedobacter agri

<400> 180

Thr Ala Val Val Thr Ile Thr Ile Gln Asn Ser Ala Pro Val Val Thr
1 5 10 15

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

Thr Ala Thr Asp Ala Asp Gly Asp Pro Leu Thr Phe Thr Leu Val Thr
35 40 45

Pro Pro Ala His Gly Thr Leu Ile Leu Asn Pro Asp Gly Thr Tyr Thr
50 55 60

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

Val Ser Asp Gly Lys Gly Gly Thr Thr Thr Val Thr Ile Asn Val Thr
85 90 95

Val Thr Ala Val Asn Asp Val Pro Val Ala Thr Thr Pro Val Asn Val
100 105 110

Thr Thr Thr Lys Asn Thr Pro Val Thr Gly Lys Val Thr Ala Thr Asp
115 120 125

Val Asp Gly Asp Pro Leu Thr Tyr Ser Val Gly Thr Pro Pro Ala Asn
130 135 140

Gly Thr Val Val Val Asn Pro Asp Gly Thr Phe Thr Tyr Thr Pro Asn
145 150 155 160

Asn Asn Tyr Ser Gly Thr Asp Ser Phe Thr Ile Val Val Ser Asp Gly
165 170 175

Lys Gly Gly Thr Thr Thr Val Thr Val Asn Val Asn Ile Ala Pro Thr
180 185 190

Asn Val Ala Pro Val Val Thr Ala Pro Ala Ile Thr Thr Asn Glu Asp
195 200 205

Thr Pro Val Asn Gly Lys Ile Thr Ala Thr Asp Ala Asp Gly Asp Pro
210 215 220

Leu Thr Phe Thr Leu Val Thr Pro Pro Ala His Gly Thr Leu Val Leu
225 230 235 240

Asn Pro Asp Gly Thr Tyr Thr Tyr Thr Pro Asn Ala Asn Tyr Asn Gly
245 250 255

Thr Asp Ser Phe Val Val Thr Val Ser Asp Gly
260 265

<210> 181
<211> 68
<212> PRT
<213> Pedobacter agri

<400> 181

Ala Ile Thr Thr Asn Glu Asp Thr Pro Val Asn Gly Lys Ile Thr Ala
1 5 10 15

Thr Asp Ala Asp Gly Asp Pro Leu Thr Phe Thr Leu Val Thr Pro Pro
20 25 30

Ala His Gly Thr Leu Val Leu Asn Pro Asp Gly Thr Tyr Thr Tyr Thr
35 40 45

Pro Asn Ala Asn Tyr Asn Gly Thr Asp Ser Phe Val Val Thr Val Ser
50 55 60

Asp Gly Lys Gly
65

<210> 182
<211> 258
<212> PRT
<213> Acaryochloris marina

<400> 182

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

Asp Asn Asn Asp Gly Thr Tyr Thr Tyr Thr Pro Asp Ala Asn Tyr Thr
20 25 30

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

```
Asp Thr Ala Thr Val Asn Ile Thr Val Arg Ser Thr Asn Asp Pro Pro
    50                  55                  60

Val Ala Val Asp Asp Ala Val Thr Thr Asp Glu Asp Val Ala Ile Thr
65                  70                  75                  80

Gly Asn Val Leu Asp Gly Ser Ser Gly Gly Leu Asp Thr Asp Leu Asp
                85                  90                  95

Gly Asp Thr Leu Ser Val Ile Asp Asn Thr Asp Pro Ser Asn Gly Thr
            100                 105                 110

Val Ser Ile Ser Ala Asn Gly Asp Phe Thr Tyr Thr Pro Asn Pro Asp
        115                 120                 125

Phe Phe Gly Thr Asp Ser Phe Gly Tyr Thr Ile Ser Asp Gly Asn Gly
    130                 135                 140

Gly Thr Ser Val Ala Thr Val Asn Ile Thr Val Asn Pro Val Asn Asp
145                 150                 155                 160

Ala Pro Ile Ala Ala Asp Asp Thr Val Thr Thr Asp Glu Asp Val Ala
                165                 170                 175

Val Val Ile Asp Ala Ala Leu Leu Leu Gly Asn Asp Thr Asp Ile Asp
            180                 185                 190

Gly Asp Thr Leu Ser Ile Asp Ser Val Thr Thr Pro Ser Asn Gly Thr
        195                 200                 205

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

Tyr Thr Gly Ser Asp Ala Phe Thr Tyr Thr Ile Ser Asp Gly Asn Gly
225                 230                 235                 240

Gly Thr Asp Thr Ala Thr Val Asn Ile Thr Val Gly Ser Thr Asn Asp
                245                 250                 255

Ile Ala
```

<210> 183
<211> 252
<212> PRT
<213> Cellvibrio japonicus

<400> 183

```
Asp Gln Asn Leu Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile
1               5                   10                  15
```

```
Val Ala Ser Asp Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr
            20                  25                  30

Asn Pro Thr Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe
        35                  40                  45

Thr Tyr Thr Pro Asn Ala Asp Tyr His Gly Ser Asp Ser Phe Val Val
    50                  55                  60

Thr Ile Ser Asp Gly Asn Gly Asp Thr Thr Thr Ser Thr Val Thr Ile
65                  70                  75                  80

Gly Val Asn Pro Val Asn Asp Ala Pro Val Ser Ala Asp Gln Asn Leu
                85                  90                  95

Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile Val Ala Ser Asp
            100                 105                 110

Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr Gly Pro Thr Asn
        115                 120                 125

Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr Pro
    130                 135                 140

Asn Ala Asn Tyr Asn Gly Ser Asp Ser Phe Val Val Thr Ile Ser Asp
145                 150                 155                 160

Gly Asn Gly Gly Thr Thr Thr Ser Thr Val Thr Ile Gly Val Asn Pro
                165                 170                 175

Val Asn Asp Ala Pro Val Ser Ala Asp Gln Asn Leu Thr Thr Asp Glu
            180                 185                 190

Asp Thr Pro Val Asn Gly Ala Ile Val Ala Ser Asp Ala Asp Gly Asp
        195                 200                 205

Thr Leu Gly Tyr Ser Val Thr Thr Gly Pro Thr Asn Gly Thr Val Val
    210                 215                 220

Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr Pro Asn Ala Asp Tyr
225                 230                 235                 240

His Gly Ser Asp Ser Phe Val Val Thr Ile Ser Asp
                245                 250
```

<210> 184
<211> 206
<212> PRT
<213> Cellvibrio japonicus

<400> 184

```
Phe Thr Tyr Thr Pro Asn Ala Asn Tyr Asn Gly Ser Asp Ser Phe Val
1               5                   10                  15

Val Thr Ile Asp Asp Gly Asn Gly Gly Thr Thr Ala Ser Thr Ile Thr
            20                  25                  30

Ile Gly Val Thr Pro Val Asn Asp Ala Pro Val Ser Ser Asp Gln Asn
        35                  40                  45

Leu Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile Val Ala Ser
    50                  55                  60

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

Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr
                85                  90                  95

Pro Asn Ala Asp Tyr His Gly Ser Asp Ser Phe Val Val Thr Ile Ser
            100                 105                 110

Asp Gly Asn Gly Asp Thr Thr Thr Ser Thr Val Thr Ile Gly Val Asn
        115                 120                 125

Pro Val Asn Asp Ala Pro Val Ser Ala Asp Gln Asn Leu Thr Thr Asp
    130                 135                 140

Glu Asp Thr Pro Val Asn Gly Ala Ile Val Ala Ser Asp Ala Asp Gly
145                 150                 155                 160

Asp Thr Leu Gly Tyr Ser Val Thr Thr Gly Pro Thr Asn Gly Thr Val
                165                 170                 175

Val Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr Pro Asn Ala Asn
            180                 185                 190

Tyr Asn Gly Ser Asp Ser Phe Val Val Thr Ile Ser Asp Gly
        195                 200                 205
```

<210> 185
<211> 253
<212> PRT
<213> Cellvibrio japonicus

<400> 185

```
Asp Gln Asn Leu Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile
1               5                   10                  15

Val Ala Ser Asp Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr
            20                  25                  30

Gly Pro Thr Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe
```

35 40 45

Thr Tyr Thr Pro Asn Ala Asn Tyr Asn Gly Ser Asp Ser Phe Val Val
50 55 60

Thr Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Ser Thr Val Thr Ile
65 70 75 80

Gly Val Asn Pro Val Asn Asp Ala Pro Val Ser Ala Asp Gln Asn Leu
85 90 95

Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile Val Ala Ser Asp
100 105 110

Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr Gly Pro Thr Asn
115 120 125

Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr Pro
130 135 140

Asn Ala Asp Tyr His Gly Ser Asp Ser Phe Val Val Thr Ile Ser Asp
145 150 155 160

Gly Asn Gly Gly Thr Thr Thr Ser Thr Ile Thr Ile Gly Val Thr Pro
165 170 175

Val Asn Asp Ala Pro Val Ser Ala Asp Gln Asn Leu Thr Thr Pro Glu
180 185 190

Asp Thr Pro Val Asp Gly Thr Ile Ile Ala Thr Asp Ile Asp Gly Asp
195 200 205

Val Leu Ser Tyr Ser Val Ser Thr Leu Pro Val Asn Gly Thr Val Thr
210 215 220

Leu Asn Pro Ala Thr Gly Glu Phe Thr Tyr Thr Pro Asn Ala Asn Tyr
225 230 235 240

Asn Gly Ser Asp Ser Phe Val Val Thr Ile Asp Asp Gly
245 250

<210> 186
<211> 274
<212> PRT
<213> Cellvibrio japonicus

<400> 186

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

Asp Ala Pro Thr Thr Ser Asp Ile Ser Leu Thr Thr Asp Glu Asp Thr
20 25 30

```
Ser Val Ser Gly Gln Val Asn Ala Ser Asp Val Glu Gly Asp Thr Leu
        35                  40                  45

Gly Tyr Ser Val Thr Thr Asn Pro Thr Asn Gly Thr Val Val Leu Asn
    50                  55                  60

Ala Thr Thr Gly Thr Phe Thr Tyr Thr Pro Asn Ala Asp Tyr His Gly
65                  70                  75                  80

Ser Asp Ser Phe Val Val Thr Ile Ser Asp Gly Asn Gly Gly Thr Thr
                85                  90                  95

Thr Ser Thr Val Asn Ile Gly Val Thr Pro Val Asn Asp Ala Pro Val
            100                 105                 110

Ser Ser Asp Gln Asn Leu Thr Thr Ala Glu Asp Thr Pro Ile Asn Gly
        115                 120                 125

Thr Ile Thr Ala Thr Asp Val Asp Gly Asp Val Leu Ser Tyr Ile Val
    130                 135                 140

Ser Thr Leu Pro Ala Asn Gly Thr Val Thr Leu Asn Pro Ala Thr Gly
145                 150                 155                 160

Glu Phe Thr Tyr Thr Pro Asn Ala Asp Tyr His Gly Ser Asp Ser Phe
                165                 170                 175

Val Val Thr Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Ser Thr Val
            180                 185                 190

Ile Ile Gly Val Thr Pro Val Asn Asp Ala Pro Val Ser Ser Asp Gln
        195                 200                 205

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

Gly Asp Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr Asn Pro
225                 230                 235                 240

Thr Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr
                245                 250                 255

Thr Pro Asn Ala Asp Tyr His Gly Ser Asp Ser Phe Val Val Thr Ile
            260                 265                 270

Ser Asp
```

<210> 187
<211> 253

<212> PRT
<213> Cellvibrio japonicus

<400> 187

```
Asp Gln Asn Leu Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile
1               5                  10                  15

Val Ala Ser Asp Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr
            20                  25                  30

Gly Pro Thr Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe
        35                  40                  45

Thr Tyr Thr Pro Asn Ala Asp Tyr His Gly Ser Asp Ser Phe Val Val
    50                  55                  60

Thr Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Ser Thr Ile Thr Ile
65                  70                  75                  80

Gly Val Thr Pro Val Asn Asp Ala Pro Val Ser Ala Asp Gln Asn Leu
                85                  90                  95

Thr Thr Pro Glu Asp Thr Pro Val Asp Gly Thr Ile Ile Ala Thr Asp
            100                 105                 110

Ile Asp Gly Asp Val Leu Ser Tyr Ser Val Ser Thr Leu Pro Val Asn
        115                 120                 125

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

Asn Ala Asn Tyr Asn Gly Ser Asp Ser Phe Val Val Thr Ile Asp Asp
145                 150                 155                 160

Gly Asn Gly Gly Thr Thr Ala Ser Thr Ile Thr Ile Gly Val Thr Pro
                165                 170                 175

Val Asn Asp Ala Pro Val Ser Ser Asp Gln Asn Leu Thr Thr Asp Glu
            180                 185                 190

Asp Thr Pro Val Asn Gly Ala Ile Val Ala Ser Asp Ala Asp Gly Asp
        195                 200                 205

Thr Leu Gly Tyr Ser Val Thr Thr Asn Pro Thr Asn Gly Thr Val Val
    210                 215                 220

Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr Pro Asn Ala Asp Tyr
225                 230                 235                 240

His Gly Ser Asp Ser Phe Val Val Thr Ile Ser Asp Gly
                245                 250
```

<210> 188
<211> 206
<212> PRT
<213> Cellvibrio japonicus

<400> 188

```
Phe Ile Tyr Thr Pro Asn Pro Asp Phe Asn Gly Ser Asp Ser Phe Thr
1               5                   10                  15


Val Val Val Thr Asp Asn His Gly Asn Thr Ser Thr Ala Val Ile Thr
            20                  25                  30


Leu Asn Val Thr Pro Val Asn Asp Ala Pro Thr Thr Ser Asp Ile Ser
        35                  40                  45


Leu Thr Thr Asp Glu Asp Thr Ser Val Ser Gly Gln Val Asn Ala Ser
    50                  55                  60


Asp Val Glu Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr Asn Pro Thr
65                  70                  75                  80


Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe Thr Tyr Thr
                85                  90                  95


Pro Asn Ala Asp Tyr His Gly Ser Asp Ser Phe Val Val Thr Ile Ser
            100                 105                 110


Asp Gly Asn Gly Gly Thr Thr Thr Ser Thr Val Asn Ile Gly Val Thr
        115                 120                 125


Pro Val Asn Asp Ala Pro Val Ser Ser Asp Gln Asn Leu Thr Thr Ala
    130                 135                 140


Glu Asp Thr Pro Ile Asn Gly Thr Ile Thr Ala Thr Asp Val Asp Gly
145                 150                 155                 160


Asp Val Leu Ser Tyr Ile Val Ser Thr Leu Pro Ala Asn Gly Thr Val
                165                 170                 175


Thr Leu Asn Pro Ala Thr Gly Glu Phe Thr Tyr Thr Pro Asn Ala Asp
            180                 185                 190


Tyr His Gly Ser Asp Ser Phe Val Val Thr Ile Ser Asp Gly
        195                 200                 205
```

<210> 189
<211> 150
<212> PRT
<213> Cellvibrio japonicus

<400> 189

```
Asp Gln Asn Leu Thr Thr Asp Glu Asp Thr Pro Val Asn Gly Ala Ile
```

1 5 10 15

Val Ala Ser Asp Ala Asp Gly Asp Thr Leu Gly Tyr Ser Val Thr Thr
20 25 30

Gly Pro Thr Asn Gly Thr Val Val Leu Asn Ala Thr Thr Gly Thr Phe
35 40 45

Thr Tyr Thr Pro Asn Ala Asp Tyr His Gly Asn Asp Ser Phe Val Val
50 55 60

Thr Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Ser Thr Val Thr Ile
65 70 75 80

Gly Val Thr Pro Val Asn Asp Val Pro Val Ala Ala Asp Asp Tyr Phe
85 90 95

Val Ile Asp Glu Asp Thr Pro Leu Val Val Ser Pro Ser Gln Leu Leu
100 105 110

Ala Asn Asp Ser Asp Val Asp Gly Asp Thr Leu Thr Val Val Thr Ile
115 120 125

Gln Ser Ala Thr Asn Gly Thr Leu Ser Val Val Gly Gly Asn Ile Val
130 135 140

Phe Thr Pro Thr Pro Asp
145 150

<210> 190
<211> 237
<212> PRT
<213> Pseudomonas denitrificans

<400> 190

Tyr Thr Tyr Thr Pro Gly Gln Asn Phe Asn Gly Asn Asp Ser Phe Thr
1 5 10 15

Val Ile Val Asp Asp Gly Gln Gly Gly Arg Asp Thr Leu Thr Val Asn
20 25 30

Val Gly Val Asn Pro Val Asn Asp Ala Pro Val Ala Gln Asp Asp Gly
35 40 45

Pro Leu Pro Val Ala Glu Asp Thr Val Thr Thr Gly Asn Val Leu Ser
50 55 60

Asn Asp Ser Asp Val Asp Gly Asp Thr Leu Thr Val Thr Gly Phe Thr
65 70 75 80

Phe Gly Gly Asn Ser Tyr Gly Ala Gly Gln Thr Ala Thr Leu Asn Gly
85 90 95

Val Gly Ser Leu Val Ile Asn Ala Asp Gly Ser Phe Thr Phe Thr Pro
100 105 110

Ala Lys Asp Tyr Asn Gly Pro Val Pro Ser Ala Thr Tyr Thr Val Ser
115 120 125

Asp Gly Asn Ala Ser Asp Ser Ala Gln Leu Ser Phe Asp Asn Val Ser
130 135 140

Pro Val Asn Asp Ala Pro Val Thr Ala Asp Gln Ser Asn Thr Thr Ala
145 150 155 160

Glu Asp Thr Pro Val Ser Gly Arg Ile Ile Ala Thr Asp Ala Asp Gln
165 170 175

Asp Thr Leu Ser Tyr Thr Leu Lys Pro Gly Ala Glu Pro Thr His Gly
180 185 190

Thr Leu Val Leu Asn Pro Ala Thr Gly Glu Tyr Thr Tyr Thr Pro Asp
195 200 205

Thr Asp Tyr Asn Gly Gly Asp Ser Phe Thr Val Val Val Asn Asp Gly
210 215 220

Asn Gly Gly Thr Val Glu Ser Val Val Ser Ile Asp Val
225 230 235

<210> 191
<211> 103
<212> PRT
<213> Pseudomonas denitrificans

<400> 191

Val Asn Ala Thr Ala Thr Glu Ser Ser Asn Gly Asp Lys Ala Thr Thr
1 5 10 15

Ser Leu Pro Leu Glu Ile Gln Val His Pro Leu Asn Asp Val Pro Thr
20 25 30

Ala Thr Gln Gln Asn Ile Ala Ile Asn Glu Asp Asp Val Leu Asn Gly
35 40 45

Gln Ile Val Ala Asn Asp Val Asp His Asp Ser Leu Ser Tyr Thr Val
50 55 60

Lys Thr Gly Thr Thr His Gly Val Leu Met Leu Asp Gly Lys Thr Gly
65 70 75 80

Ala Tyr Thr Tyr Thr Pro Ala Ala Asn Tyr Ser Gly Pro Asp Ser Phe
85 90 95

Thr Val Thr Val Ser Asp Gly
100

<210> 192
<211> 177
<212> PRT
<213> Pseudomonas denitrificans

<400> 192

Asp Gln Ser Asn Thr Thr Ala Glu Asp Thr Pro Val Ser Gly Arg Ile
1 5 10 15

Ile Ala Thr Asp Ala Asp Gln Asp Thr Leu Ser Tyr Thr Leu Lys Pro
20 25 30

Gly Ala Glu Pro Thr His Gly Thr Leu Val Leu Asn Pro Ala Thr Gly
35 40 45

Glu Tyr Thr Tyr Thr Pro Asp Thr Asp Tyr Asn Gly Gly Asp Ser Phe
50 55 60

Thr Val Val Val Asn Asp Gly Asn Gly Gly Thr Val Glu Ser Val Val
65 70 75 80

Ser Ile Asp Val Thr Pro Val Asn Asp Ala Pro Glu Thr Ala Asp Gln
85 90 95

Ser Arg Thr Thr Ala Glu Asp Thr Pro Ile Thr Gly Gln Ile Val Ala
100 105 110

Thr Asp Ala Asp Arg Asp Thr Leu Ser Tyr Thr Leu Lys Pro Gly Ser
115 120 125

Glu Pro Ala His Gly Thr Leu Val Leu Asn Pro Ala Thr Gly Glu Tyr
130 135 140

Thr Tyr Thr Pro Gly Thr Asp Tyr Asn Gly Ser Asp Ser Phe Thr Val
145 150 155 160

Val Val Asn Asp Gly Asn Gly Gly Thr Val Glu Ser Val Val Ser Ile
165 170 175

Asp

<210> 193
<211> 188
<212> PRT
<213> Pseudomonas denitrificans

<400> 193

Gly Asn Gly Gly Thr Val Glu Ser Val Val Ser Ile Asp Val Thr Pro

1 5 10 15

Val Asn Asp Ala Pro Glu Thr Ala Asp Gln Ser Arg Thr Thr Ala Glu
20 25 30

Asp Thr Pro Ile Thr Gly Gln Ile Val Ala Thr Asp Ala Asp Arg Asp
35 40 45

Thr Leu Ser Tyr Thr Leu Lys Pro Gly Ser Glu Pro Ala His Gly Thr
50 55 60

Leu Val Leu Asn Pro Ala Thr Gly Glu Tyr Thr Tyr Thr Pro Gly Thr
65 70 75 80

Asp Tyr Asn Gly Ser Asp Ser Phe Thr Val Val Val Asn Asp Gly Asn
85 90 95

Gly Gly Thr Val Glu Ser Val Val Ser Ile Asp Val Thr Pro Val Asn
100 105 110

Asp Ala Pro Val Ala Gln Asp Asp Gly Pro Leu Ser Val Thr Glu Asp
115 120 125

Thr Ala Thr Thr Gly Asn Val Leu Gly Asn Asp Ser Asp Val Asp Gly
130 135 140

Asp Thr Leu Thr Val Thr Asp Phe Thr Phe Asp Gly Asn Ser Tyr Asn
145 150 155 160

Ala Gly Gln Thr Ala Thr Leu Asn Gly Val Gly Ser Leu Val Ile Asn
165 170 175

Ala Asp Gly Ser Phe Thr Phe Thr Pro Ala Lys Asp
180 185

<210> 194
<211> 55
<212> PRT
<213> Pseudomonas denitrificans

<400> 194

Gly Gln Leu Arg Ala Asp Asp Pro Asp Gly Asn Pro Leu Arg Phe Glu
1 5 10 15

Leu Asp Asp Gly Pro Arg Asn Gly Thr Val Val Val Asn Ala Asp Gly
20 25 30

Ser Tyr Thr Tyr Thr Pro Gly Gln Asn Phe Asn Gly Asn Asp Ser Phe
35 40 45

Thr Val Ile Val Asp Asp Gly
50 55

<210> 195
<211> 55
<212> PRT
<213> Pseudomonas denitrificans

<400> 195

Gly Gln Leu Arg Ala Asp Asp Pro Asp Gly Asn Pro Leu Arg Phe Glu
1 5 10 15

Leu Asp Asp Gly Pro Arg Asn Gly Thr Val Val Val Asn Ala Asp Gly
20 25 30

Ser Tyr Thr Tyr Thr Pro Gly Gln Asn Phe Asn Gly Asn Asp Ser Phe
35 40 45

Thr Val Ile Val Asp Asp Gly
50 55

<210> 196
<211> 257
<212> PRT
<213> Chlorobium luteolum

<400> 196

Thr Ile Asp Ala Thr Thr Gly Ala Trp Ser Tyr Ala Pro Thr Ala Asp
1 5 10 15

Tyr Asn Gly Ser Asp Ser Phe Thr Val Ser Val Thr Asp Gly Asp Gly
20 25 30

Asn Val Glu Thr Gln Val Ile Ser Val Thr Val Ala Ala Val Asn Asp
35 40 45

Ala Ala Thr Phe Ser Gly Asp Lys Thr Gly Ser Gly Asn Glu Asp Gly
50 55 60

Thr Ile Thr Gly Thr Leu Ala Val Ala Asp Ala Ala Asp Gly Leu Ala
65 70 75 80

Ser Pro Leu Asp Phe Ser Val Ser Thr Ala Ala Ser Asn Gly Thr Ala
85 90 95

Thr Ile Asp Ala Thr Thr Gly Ala Trp Ser Tyr Ala Pro Thr Ala Asp
100 105 110

Tyr Asn Gly Ser Asp Ser Phe Thr Val Ser Val Thr Asp Gly Asp Gly
115 120 125

Asn Val Glu Thr Gln Val Ile Ser Val Thr Val Ala Ala Val Asn Asp
130 135 140

```
Ala Ala Thr Phe Ser Gly Asp Lys Thr Gly Ser Gly Asn Glu Asp Gly
145                 150                 155                 160

Thr Ile Thr Gly Thr Leu Ala Val Ala Asp Ala Ala Asp Gly Leu Ala
                165                 170                 175

Ser Pro Leu Asp Phe Ser Val Ser Thr Ala Ala Ser Asn Gly Thr Ala
            180                 185                 190

Thr Ile Asp Ala Thr Thr Gly Ala Trp Ser Tyr Ala Pro Thr Ala Asp
        195                 200                 205

Tyr Asn Gly Ser Asp Ser Phe Thr Val Ser Val Thr Asp Gly Asp Gly
    210                 215                 220

Asn Val Glu Thr Gln Val Ile Ser Val Thr Val Ala Ala Val Asn Asp
225                 230                 235                 240

Ala Ala Thr Phe Ser Gly Asp Lys Thr Gly Ser Gly Asn Glu Asp Gly
                245                 250                 255

Thr
```

<210> 197
<211> 248
<212> PRT
<213> Chlorobium luteolum

<400> 197

```
Ser Tyr Gln Gly Ala Leu Asn Tyr Asn Gly Ser Asp Thr Leu Thr Met
1               5                   10                  15

Leu Thr Thr Asp Gly Ser Leu Leu Thr Asp Ser Asp Thr Val Ser Ile
            20                  25                  30

Thr Val Ala Ala Val Asn Asp Ala Ala Thr Phe Ser Gly Asp Lys Thr
        35                  40                  45

Gly Ser Gly Asn Glu Asp Gly Thr Ile Thr Gly Thr Leu Ala Val Ala
    50                  55                  60

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

Ala Ala Ser Asn Gly Thr Ala Thr Ile Asp Ala Thr Thr Gly Ala Trp
                85                  90                  95

Ser Tyr Ala Pro Thr Ala Asp Tyr Asn Gly Ser Asp Ser Phe Thr Val
            100                 105                 110

Ser Val Thr Asp Gly Asp Gly Asn Val Glu Thr Gln Val Ile Ser Val
```

115 120 125

Thr Val Ala Ala Val Asn Asp Ala Ala Thr Phe Ser Gly Asp Lys Thr
130 135 140

Gly Ser Gly Asn Glu Asp Gly Thr Ile Thr Gly Thr Leu Ala Val Ala
145 150 155 160

Asp Ala Ala Asp Gly Leu Ala Ser Pro Leu Asp Phe Ser Val Ser Thr
165 170 175

Ala Ala Ser Asn Gly Thr Ala Thr Ile Asp Ala Thr Thr Gly Ala Trp
180 185 190

Ser Tyr Ala Pro Thr Ala Asp Tyr Asn Gly Ser Asp Ser Phe Thr Val
195 200 205

Ser Val Thr Asp Gly Asp Gly Asn Val Glu Thr Gln Val Ile Ser Val
210 215 220

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

Gly Ser Gly Asn Glu Asp Gly Thr
245

<210> 198
<211> 209
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 198

Tyr Ser Phe Thr Pro Asp Arg Asn Phe Asn Gly Thr Asp Gln Phe Ser
1 5 10 15

Tyr Ser Val Ser Asp Gly Arg Ala Thr Val Val Tyr Arg Val Phe Val
20 25 30

Thr Val Thr Pro Val Asn Asp Ala Pro Val Gly Ser Asp Thr Ala Ile
35 40 45

Ser Leu Ala Glu Asp Thr Thr Phe Thr Gly Arg Leu Pro Thr Ala Ser
50 55 60

Asp Ala Asp Gly Asp Ala Ile Thr Tyr Gly Leu Ala Ala Ala Ala Gly
65 70 75 80

His Gly Thr Val Ser Ile Asn Ala Asp Gly Thr Tyr Ser Tyr Thr Pro
85 90 95

Asn Gly Asn Phe Asn Gly Thr Asp Ser Phe Ser Tyr Ser Val Ser Asp
100 105 110

Gly Thr Val Thr Asn Ile Tyr Arg Val Thr Val Thr Val Thr Ala Val
        115   120   125

Asn Asp Ala Pro Val Gly Ser Asp Thr Ser Ile Ser Val Gln Glu Gly
    130   135   140

Thr Val Ala Thr Gly Thr Leu Pro Pro Ala Phe Asp Val Glu Gly Ser
145   150   155   160

Pro Val Thr Tyr Gly Leu Gly Ala Asn Pro Val His Gly Thr Val Thr
                165   170   175

Ile Asp Leu Asn Gly Asn Tyr Thr Tyr Gln Pro Asp Ala Gly Phe Ser
            180   185   190

Gly Ala Asp Gln Phe Thr Tyr Thr Val Ser Asp Gly Thr Ala Thr Ser
        195   200   205

Val

<210> 199
<211> 204
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 199

Tyr Thr Tyr Arg Pro Asn Ala Asn Tyr Asn Gly Thr Asp Ser Phe Thr
1   5   10   15

Tyr Thr Val Ser Asp Gly Ile Asp Gln Ser Thr Tyr Thr Val Ser Ile
            20   25   30

Thr Val Thr Pro Val Asn Asp Ala Pro Val Gly Ser Asn Thr Ala Ile
        35   40   45

Thr Val Ser Glu Asp Val Pro Phe Asp Gly Val Leu Pro Ala Ala Ser
    50   55   60

Asp Val Asp Gly Asp Pro Val Arg Tyr Ala Val Gly Thr Gln Pro Met
65   70   75   80

His Gly Ser Val Thr Val Asn Pro Asp Gly Thr Tyr Arg Tyr Val Pro
                85   90   95

Ala Ala Asp Tyr Asn Gly Thr Asp Ser Phe Thr Tyr Gln Val Thr Asp
            100   105   110

Gly Gln Ala Val Ser Thr Tyr Thr Val Ala Ile Thr Val Thr Ala Val
        115   120   125

```
Asn Asp Ala Pro Val Gly Ser Asn Val Ser Ile Ser Val Asp Glu Asp
    130                 135                 140

Gly Ser Ala Ser Gly Thr Leu Pro Arg Ala Val Asp Ala Asp Gly Asp
145                 150                 155                 160

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

Val Gln Ser Asp Gly Arg Tyr Thr Tyr Val Pro Ala Ala Asn Phe Ser
            180                 185                 190

Gly Thr Asp Thr Phe Thr Tyr Ala Val Ser Asp Gly
        195                 200
```

<210> 200
<211> 283
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 200

```
Pro Thr Asn Gly Val Leu Ser Leu Gly Gly Thr Ala Val Thr Ala Gly
1               5                   10                  15

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

Ala Asn Ala Asn Gly Thr Ala Leu Ala Ser Phe Thr Phe Gln Val Arg
        35                  40                  45

Asp Asn Gly Gly Thr Ala Asn Gly Gly Gln Asp Thr Asp Gln Ser Pro
    50                  55                  60

Asn Ser Phe Thr Phe Asn Val Thr Ala Val Asn Asp Ala Pro Val Asn
65                  70                  75                  80

Thr Leu Pro Ala Ser Phe Gly Thr Asn Glu Asp Thr Ala Leu Ser Leu
                85                  90                  95

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

Val Thr Leu Arg Val Asn Ser Gly Thr Leu Ala Ala Thr Gly Gly Ser
        115                 120                 125

Gly Val Thr Val Ser Gly Ser Gly Ser Gly Thr Leu Val Leu Thr Gly
    130                 135                 140

Thr Leu Ser Asn Ile Asn Gly Phe Leu Ala Ala Ala Gly Thr Arg Pro
145                 150                 155                 160
```

```
Val Phe Asn Pro Ala Ala Asn Ala Asn Gly Ala Val Thr Leu Thr Met
                165                 170                 175

Val Thr Asn Asp Asn Gly Asn Thr Gly Ser Gly Gly Ala Leu Ser Asp
            180                 185                 190

Thr Asp Thr Ala Thr Ile Ser Val Ala Pro Val Asn Asp Ala Pro Val
        195                 200                 205

Gly Ser Asp Thr Ala Ile Thr Thr Asn Glu Asp Thr Ala Phe Ser Gly
    210                 215                 220

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

Ala Gly Ser Ile Ala Pro Ser His Gly Thr Val Val Val Asn Pro Asn
                245                 250                 255

Gly Thr Tyr Thr Tyr Thr Pro Ser Ala Asn Phe Asn Gly Ala Asp Ser
            260                 265                 270

Phe Thr Tyr Ser Val Thr Asp Gly Thr Val Thr
        275                 280
```

<210> 201
<211> 205
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 201

```
Tyr Ser Tyr Val Pro Ala Ala Asn Tyr Asn Gly Ser Asp Ser Phe Thr
1               5                   10                  15

Tyr Thr Val Ser Asp Gly Gln Ala Thr Ser Thr Tyr Thr Ile Ser Ile
            20                  25                  30

Thr Val Thr Ala Ile Asn Asp Ala Pro Val Ser Ser Gly Thr Ser Ile
        35                  40                  45

Ser Thr Glu Glu Asp Glu Thr Val Thr Gly Gln Leu Pro Ala Ala Thr
    50                  55                  60

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

Asn Gly Thr Val Val Ile Asn Pro Asp Gly Ser Tyr Ser Tyr Thr Pro
                85                  90                  95

Ala Pro Gly Tyr Asn Gly Ser Asp Ser Phe Ser Phe Ser Val Ser Asp
            100                 105                 110

Gly Arg Asp Ser Thr Thr Tyr Val Val Asn Val Thr Val Gly Ala Val
```

115 120 125

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

Gly Leu Ala Ser Gly Thr Leu Pro Leu Ala Thr Asp Pro Asp Gly Asp
145 150 155 160

Pro Leu Thr Tyr Gly Leu Gly Ala Pro Ala Ala His Gly Thr Val Thr
165 170 175

Val Asn Thr Asp Gly Ser Tyr Thr Tyr Arg Pro Asn Ala Asn Tyr Asn
180 185 190

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

<210> 202
<211> 219
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 202

Gly Thr Val Ser Ile Asn Ala Asp Gly Thr Tyr Ser Tyr Thr Pro Asn
1 5 10 15

Gly Asn Phe Asn Gly Thr Asp Ser Phe Ser Tyr Ser Val Ser Asp Gly
20 25 30

Thr Val Thr Asn Ile Tyr Arg Val Thr Val Thr Val Thr Ala Val Asn
35 40 45

Asp Ala Pro Val Gly Ser Asp Thr Ser Ile Ser Val Gln Glu Gly Thr
50 55 60

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

Val Thr Tyr Gly Leu Gly Ala Asn Pro Val His Gly Thr Val Thr Ile
85 90 95

Asp Leu Asn Gly Asn Tyr Thr Tyr Gln Pro Asp Ala Gly Phe Ser Gly
100 105 110

Ala Asp Gln Phe Thr Tyr Thr Val Ser Asp Gly Thr Ala Thr Ser Val
115 120 125

Tyr Thr Val Thr Val Ser Val Gly Val Ala Asn Gly Ala Pro Val Gly
130 135 140

Ser Asp Ala Thr Leu Thr Ile Ala Glu Asp Thr Thr Phe Thr Gly Thr
145 150 155 160

Leu Pro Ala Ala Thr Asp Pro Asp Gly Asp Pro Leu Ser Tyr Ala Val
165 170 175

Ala Ala Gly Pro Ala His Gly Val Val Thr Ile Thr Ala Asp Gly Arg
180 185 190

Tyr Val Phe Thr Pro Asn Gly Asn Phe Asn Gly Thr Asp Gln Phe Ser
195 200 205

Tyr Ser Val Ser Asp Gly Arg Ala Thr Val Val
210 215

<210> 203
<211> 219
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 203

Gly Thr Val Ser Ile Asn Ala Asn Gly Thr Tyr Ser Tyr Ile Pro Asp
1 5 10 15

Ser Asn Phe Asn Gly Thr Asp Ser Phe Ser Tyr Ser Val Ser Asp Gly
20 25 30

Thr Ala Thr Asn Val Tyr Arg Val Ser Val Thr Val Ser Ala Val Asn
35 40 45

Asp Ala Pro Ile Gly Ser Asp Thr Ser Ile Ser Ala Gln Gln Gly Thr
50 55 60

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

Val Thr Tyr Gly Leu Gly Ala Gln Ala Ala His Gly Thr Val Val Ile
85 90 95

Gly Ala Asn Gly Ser Tyr Ser Tyr Gln Pro Asn Ser Gly Phe Ser Gly
100 105 110

Ser Asp Gln Phe Thr Tyr Thr Val Ser Asp Gly Thr Ala Val Ser Ile
115 120 125

Tyr Thr Val Thr Val Ser Val Gly Ala Val Asn Ser Ala Pro Ser Gly
130 135 140

Gln Asp Thr Thr Leu Thr Val Ser Glu Asp Thr Pro Phe Thr Gly Gln
145 150 155 160

Leu Pro Val Ala Thr Asp Ala Asp Gly Asp Ala Leu Thr Tyr Gly Leu
165 170 175

```
Ala Ala Gly Pro Ala His Gly Val Val Thr Val Ser Ala Asn Gly Gln
            180                 185                 190


Tyr Ser Phe Thr Pro Asp Arg Asn Phe Asn Gly Thr Asp Gln Phe Ser
        195                 200                 205


Tyr Ser Val Ser Asp Gly Arg Ala Thr Val Val
    210                 215


<210>  204
<211>  217
<212>  PRT
<213>  Rhizobium sp. 2MFCol3.1

<400>  204

Thr Phe Thr Pro Ala Ala Asn Tyr Asn Gly Ser Pro Ser Phe Thr Tyr
1               5                   10                  15


Thr Val Ser Asp Gly Asn Gly Gly Thr Ala Thr Ala Thr Val Ser Gly
            20                  25                  30


Ser Val Thr Pro Val Asn Asp Ala Pro Val Ala Val Asn Asp Ser Phe
        35                  40                  45


Thr Thr Pro Glu Asp Thr Ala Val Thr Phe Asp Val Arg Gly Asn Asp
    50                  55                  60


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


Ala Ile Ala Ser Gly Gly Ser Val Ala Ile Thr Gly Gly Ser Val Arg
                85                  90                  95


Leu Asn Ala Asn Gly Thr Leu Thr Phe Thr Pro Ala Ala Asn Tyr Asn
            100                 105                 110


Gly Thr Pro Ser Phe Thr Tyr Thr Ile Ser Asp Gly Asn Gly Gly Thr
        115                 120                 125


Ala Thr Ala Thr Val Asn Gly Thr Val Thr Pro Val Asn Asp Ala Pro
    130                 135                 140


Val Ala Ser Asp Thr Thr Val Ser Val Asp Glu Asp Gly Val Ile Ser
145                 150                 155                 160


Ser Thr Leu Pro Thr Ala Thr Asp Val Asp Gly Asp Ala Ile Thr Tyr
                165                 170                 175


Ala Ala Gly Ser Thr Thr Pro Ala His Gly Thr Val Val Val Asn Pro
            180                 185                 190
```

Asn Gly Thr Tyr Ser Tyr Thr Pro Ser Ala Asn Phe Asn Gly Thr Asp
195 200 205

Arg Phe Thr Tyr Val Val Ser Asp Gly
210 215

<210> 205
<211> 219
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 205

Gly Thr Val Val Ile Gly Ala Asn Gly Ser Tyr Ser Tyr Gln Pro Asn
1 5 10 15

Ser Gly Phe Ser Gly Ser Asp Gln Phe Thr Tyr Thr Val Ser Asp Gly
20 25 30

Thr Ala Val Ser Ile Tyr Thr Val Thr Val Ser Val Gly Ala Val Asn
35 40 45

Ser Ala Pro Ser Gly Gln Asp Thr Thr Leu Thr Val Ser Glu Asp Thr
50 55 60

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

Leu Thr Tyr Gly Leu Ala Ala Gly Pro Ala His Gly Val Val Thr Val
85 90 95

Ser Ala Asn Gly Gln Tyr Ser Phe Thr Pro Asp Arg Asn Phe Asn Gly
100 105 110

Thr Asp Gln Phe Ser Tyr Ser Val Ser Asp Gly Arg Ala Thr Val Val
115 120 125

Tyr Arg Val Phe Val Thr Val Thr Pro Val Asn Asp Ala Pro Val Gly
130 135 140

Ser Asp Thr Ala Ile Ser Leu Ala Glu Asp Thr Thr Phe Thr Gly Arg
145 150 155 160

Leu Pro Thr Ala Ser Asp Ala Asp Gly Asp Ala Ile Thr Tyr Gly Leu
165 170 175

Ala Ala Ala Ala Gly His Gly Thr Val Ser Ile Asn Ala Asp Gly Thr
180 185 190

Tyr Ser Tyr Thr Pro Asn Gly Asn Phe Asn Gly Thr Asp Ser Phe Ser
195 200 205

Tyr Ser Val Ser Asp Gly Thr Val Thr Asn Ile

210 215

<210> 206
<211> 138
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 206

Ser Ile Ala Gly Ser Ala Gly Gly Arg Phe Val Ile Gly Thr Asp Gly
1 5 10 15

Ser Tyr Thr Phe Val Pro Gly Ala Asp Phe Asp Asn Leu Lys Ala Gly
20 25 30

Glu Gln Arg Thr Thr Ser Ile Thr Tyr Thr Ile Ser Asp Gly Gln Gly
35 40 45

Gly Thr Ser Thr Ala Thr Phe Thr Val Thr Val Ser Gly Ala Asn Asp
50 55 60

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

Leu Ser Gly Gln Leu Pro Ala Ala Thr Asp Val Asp Gly Asp Pro Leu
85 90 95

Thr Tyr Gly Val Gly Ser Gln Pro Ala His Gly Ser Val Thr Ile Asp
100 105 110

Pro Thr Gly Ala Tyr Val Tyr Thr Pro Thr Ala Asp Phe Asn Gly Ala
115 120 125

Asp Ser Phe Thr Tyr Thr Ile Ser Asp Gly
130 135

<210> 207
<211> 283
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 207

Val Thr Val Asn Asp Gly Ala Ala Asn Ser Asn Val Ala Val Ala Thr
1 5 10 15

Val Asn Val Ile Ala Val Asn Asp Ala Pro Val Asn Thr Val Pro Thr
20 25 30

Ser Val Thr Leu Ser Glu Asp Val Gln Thr Ala Ile Ser Gly Ile Ser
35 40 45

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

```
Asn Gly Thr Leu Ser Pro Ser Val Ile Ala Gly Thr Val Thr Gly Asn
65                  70                  75                  80

Gly Thr Ala Ser Val Thr Val Ser Gly Thr Leu Ala Gln Val Asn Ser
                85                  90                  95

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

Asp Thr Leu Val Val Ser Thr Ser Asp Gly Ser Leu Thr Asp Thr Asp
        115                 120                 125

Asn Val Ala Ile Thr Val Thr Pro Val Ala Asp Ile Thr Pro Asp Thr
    130                 135                 140

Val Ala Thr Ala Glu Asp Thr Ala Ile Thr Phe Asn Val Ile Thr Gly
145                 150                 155                 160

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

Thr Ser Val Thr Gln Pro Pro Ala Gly Gln Gly Ser Val Thr Phe Ala
            180                 185                 190

Ala Asp Gly Thr Leu Val Tyr Thr Pro Ser Ala Asn Phe Asn Gly Gln
        195                 200                 205

Thr Ala Phe Thr Tyr Thr Val Thr Ala Gly Gly Val Thr Glu Thr Ala
    210                 215                 220

Thr Val Thr Val Asn Val Ser Ala Val Asn Asp Ala Pro Val Asn Ser
225                 230                 235                 240

Leu Pro Ala Ser Gly Trp Ser Thr Ser Glu Asp Thr Ser Ile Ala Leu
                245                 250                 255

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

Val Thr Leu Ala Val Ser Gly Gly Thr Val Ser
        275                 280
```

<210> 208
<211> 237
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 208

```
Ile Gln Thr Arg Glu Asp Val Pro Val Ser Gly Val Val Ala Ala Thr
1               5                   10                  15
```

Asp Pro Asp Gly Asp Pro Leu Thr Tyr Ala Val Ala Thr Gly Pro Arg
20 25 30

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

Asn Thr Asp Phe Asn Gly Thr Asp Ser Phe Asp Ile Ser Val Ser Asp
50 55 60

Gly Gln Gly Gly Val Thr Thr Val Thr Ile Ala Val Thr Val Thr Pro
65 70 75 80

Val Asn Asp Ala Pro Val Gly Ser Asp Ala Thr Ala Thr Val Ala Glu
85 90 95

Asp Gln Thr Leu Asn Gly Gln Leu Pro Val Ala Thr Asp Val Asp Ser
100 105 110

Pro Ser Leu Thr Tyr Gly Leu Gly Gly Gln Ala Ala His Gly Thr Val
115 120 125

Thr Val Asn Pro Asn Gly Thr Tyr Ser Tyr Val Pro Ala Ala Asn Tyr
130 135 140

Asn Gly Ser Asp Ser Phe Thr Tyr Thr Val Ser Asp Gly Gln Ala Thr
145 150 155 160

Ser Thr Tyr Thr Ile Ser Ile Thr Val Thr Ala Ile Asn Asp Ala Pro
165 170 175

Val Ser Ser Gly Thr Ser Ile Ser Thr Glu Glu Asp Glu Thr Val Thr
180 185 190

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

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

Gly Ser Tyr Ser Tyr Thr Pro Ala Pro Gly Tyr Asn Gly
225 230 235

<210> 209
<211> 262
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 209

Thr Ala Ile Asn Gly Ser Ala Ile Val Ala Asn Gly Val Val Asn Val
1 5 10 15

Thr Ser Gly Thr Val Arg Leu Asn Ala Asp Gly Thr Leu Thr Phe Thr

20 25 30

Pro Ser Ala Asn Val Asn Gly Ser Thr Ser Phe Thr Tyr Thr Val Thr
35 40 45

Ser Gly Gly Val Thr Glu Thr Ala Thr Val Asn Val Thr Ile Val Pro
50 55 60

Val Asn Asp Ala Pro Val Asn Thr Val Pro Gly Ala Gln Thr Val Ala
65 70 75 80

Glu Asp Thr Pro Leu Ala Val Ser Gly Val Ser Val Ala Asp Val Asp
85 90 95

Gly Asp Val Leu Thr Thr Thr Val Thr Val Thr Asn Gly Ile Ala Asn
100 105 110

Val Thr Thr Gly Thr Gly Ala Thr Ile Ala Asn Asn Gly Thr Ser Ser
115 120 125

Val Arg Leu Ser Gly Thr Ala Ala Gln Ile Asn Ala Ala Leu Ala Gly
130 135 140

Leu Thr Tyr Thr Ala Thr Ala Asp Tyr Asn Gly Ala Ala Gln Leu Thr
145 150 155 160

Val Val Thr Thr Asp Gly Ser Leu Thr Asp Thr Asp Thr Val Ala Ile
165 170 175

Thr Ile Thr Pro Val Ala Asp Ile Val Ala Asp Asn Leu Thr Thr Asn
180 185 190

Glu Asp Thr Ala Ile Thr Phe Asn Ala Ile Thr Gly Thr Asn Gly Ala
195 200 205

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

Gln Pro Pro Ala Gly Gln Gly Thr Val Thr Phe Ala Ala Asp Gly Thr
225 230 235 240

Ile Thr Tyr Thr Pro Ala Ala Asn Phe Asn Gly Thr Thr Ser Phe Thr
245 250 255

Tyr Thr Val Thr Ser Gly
260

<210> 210
<211> 209
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 210

Tyr Thr Tyr Val Pro Ala Ala Asn Phe Ser Gly Thr Asp Thr Phe Thr
1 5 10 15

Tyr Ala Val Ser Asp Gly Thr Val Leu Ser Val Tyr Thr Val Thr Val
20 25 30

Asn Val Gly Ala Glu Asn Asp Ala Pro Thr Gly Ser Asp Leu Ala Ile
35 40 45

Ser Ile Ser Glu Asp Thr Ser Phe Thr Gly Ser Leu Pro Ser Ala Ser
50 55 60

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

His Gly Ala Val Thr Val Asn Pro Asp Gly Thr Phe Ser Tyr Val Pro
85 90 95

Gln Ala Asn Tyr Ala Gly Pro Asp Gln Phe Thr Tyr Thr Leu Phe Asp
100 105 110

Gly Thr Val Thr Val Thr Tyr Thr Val Thr Ile Asp Val Gln Gly Val
115 120 125

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

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

Pro Val Thr Tyr Ala Leu Ala Gly Ala Ala Ser His Gly Thr Val Ser
165 170 175

Ile Asn Ala Asn Gly Thr Tyr Ser Tyr Ile Pro Asp Ser Asn Phe Asn
180 185 190

Gly Thr Asp Ser Phe Ser Tyr Ser Val Ser Asp Gly Thr Ala Thr Asn
195 200 205

Val

<210> 211
<211> 89
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 211

Thr Ala Asn Ala Thr Leu Ser Val Thr Val Val Gly Val Asn Asp Ala
1 5 10 15

Pro Ile Gly Ser Asp Gly Ser Phe Gln Thr Ala Glu Asp Thr Val Ala
            20   25   30

Thr Gly Phe Leu Pro Thr Ala Ser Asp Pro Asp Gly Asp Ala Leu Thr
        35   40   45

Tyr Ala Ile Ala Thr Pro Pro Ala Asn Gly Val Val Thr Ile Ser Ala
    50   55   60

Asp Gly Ser Tyr Arg Tyr Thr Pro Pro Ala Asn Phe Asn Gly Ser Asp
65   70   75   80

Ser Phe Thr Tyr Ser Val Ser Asp Gly
                85

<210> 212
<211> 122
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 212

Phe Thr Tyr Thr Pro Thr Ala Gly Phe Asn Gly Thr Asp Ser Phe Val
1   5   10   15

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

Ile Thr Ile Asn Pro Val Asn Asp Ala Pro Val Val Val Asn Asp Asn
        35   40   45

Phe Thr Val Ala Glu Asp Gly Gln Val Val Ile Pro Val Leu Ala Asn
    50   55   60

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

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

Thr Leu Asn Ser Asp Gly Thr Leu Thr Phe Ala Ala Ala Pro Asp Phe
            100   105   110

Ala Gly Asn Ala Ser Phe Thr Tyr Thr Leu
        115   120

<210> 213
<211> 239
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 213

Thr Tyr Ala Ala Gly Ser Thr Thr Pro Ala His Gly Thr Val Val Val

1 5 10 15

Asn Pro Asn Gly Thr Tyr Ser Tyr Thr Pro Ser Ala Asn Phe Asn Gly
20 25 30

Thr Asp Arg Phe Thr Tyr Val Val Ser Asp Gly Lys Gly Gly Ser Asn
35 40 45

Glu Tyr Thr Val Thr Val Asn Val Ala Ser Val Asn Asp Val Pro Val
50 55 60

Gly Thr Pro Leu Pro Ala Arg Ser Gly Ala Asp Gly Ala Ala Val Thr
65 70 75 80

Phe Asp Val Ser Gly Phe Phe Thr Asp Ala Asp Asn Asp Thr Leu Thr
85 90 95

Tyr Ser Ala Ser Gly Leu Pro Val Gly Leu Ser Ile Asn Ala Ala Gly
100 105 110

Val Val Thr Gly Thr Ile Asp Arg Gln Ala Ser Val Gly Gly Pro Thr
115 120 125

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

Gly Thr Ala Ser Gln Ser Phe Ser Phe Ser Val Ser Asn Pro Pro Pro
145 150 155 160

Ile Ala Val Asn Asp Ala Val Thr Ala Thr Glu Asp Thr Pro Leu Thr
165 170 175

Phe Asn Val Leu Asp Gly Ser Ala Ser Gly Gly Val Pro Asp Ser Asp
180 185 190

Pro Asp Gly Asp Pro Leu Thr Val Thr Ala Ala Ser Ala Ala Asn Gly
195 200 205

Thr Val Thr Leu Gly Ser Gly Gly Gln Ile Thr Tyr Gln Pro Asn Ala
210 215 220

Asn Phe Asn Gly Thr Asp Thr Ile Thr Tyr Thr Ile Ser Asp Gly
225 230 235

<210> 214
<211> 61
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 214

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

Tyr Gly Leu Gly Gly Gln Ala Ala His Gly Thr Val Thr Val Asn Pro
20 25 30

Asn Gly Thr Tyr Ser Tyr Val Pro Ala Ala Asn Tyr Asn Gly Ser Asp
35 40 45

Ser Phe Thr Tyr Thr Val Ser Asp Gly Gln Ala Thr Ser
50 55 60

<210> 215
<211> 58
<212> PRT
<213> Rhizobium sp. 2MFCol3.1

<400> 215

Val Ala Asn Gly Asn Gly Pro Asp Thr Asp Pro Asp Asn Asp Pro Leu
1 5 10 15

Thr Val Ser Leu Val Thr Asn Thr Ala His Gly Ala Leu Val Leu Asn
20 25 30

Pro Asp Gly Thr Phe Thr Tyr Thr Pro Thr Ala Gly Phe Asn Gly Thr
35 40 45

Asp Ser Phe Val Tyr Arg Ile Asp Asp Gly
50 55

<210> 216
<211> 236
<212> PRT
<213> Dickeya dadantii

<400> 216

Ser Thr Leu Thr Tyr Thr Pro Asn Ala Gly Tyr Phe Gly Val Asp Thr
1 5 10 15

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

Gly Thr Val Ala Val Thr Val Asn Ser Leu Pro Thr Leu Ser Leu Pro
35 40 45

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

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

Arg Ile Ser Leu Ser Val Pro Leu Gly Ser Leu Thr Leu Ser Gln Thr
85 90 95

```
Ala Asn Leu Ser Phe Ser Gln Gly Asp Gly Ile Asn Asp Ser Asn Ile
            100                 105                 110

Thr Met Gln Gly Asn Ile Ala Asp Ile Asn Ala Ala Leu Asn Gly Leu
        115                 120                 125

Ile Tyr Thr Pro Asp Ala Asp Tyr Asn Gly Pro Val Thr Ile Thr Ile
    130                 135                 140

Gly Leu Thr Asp Thr Leu Leu Ala Ile Pro Ile Thr Ala Thr Leu Pro
145                 150                 155                 160

Ile Gly Ile Ala Pro Val Ala Asp Ile Val Ser Asp Ser Val Ile Thr
                165                 170                 175

Asn Val Ser Ser Pro Val Ser Phe Asn Val Met Ala Asn Asp Thr Phe
            180                 185                 190

Glu Asn Ile Asn Ala Arg Val Thr Ser Tyr Ser Thr Pro Ser His Gly
        195                 200                 205

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

Gly Tyr Leu Gly Asn Asp Ser Phe Thr Tyr Thr Val
225                 230                 235


<210>  217
<211>  205
<212>  PRT
<213>  Dickeya dadantii

<400>  217

Thr Tyr Thr Pro Ala Ala Asn Tyr Asn Gly Ser Asp Thr Ile Thr Tyr
1               5                   10                  15

Lys Ile Ser Asp Gly Leu Gly Ala Ser Ala Thr Gly Thr Val Thr Val
            20                  25                  30

Thr Ile Thr Pro Val Asn Asp Ala Pro Val Ala Val Asn Asp Thr Ala
        35                  40                  45

Thr Thr Leu Glu Asp Thr Ser Val Thr Val Asn Val Leu Ala Asn Asp
    50                  55                  60

Ser Asp Val Asp Gly Asp Ser Leu Thr Val Thr Ala Ala Thr Ala Gly
65                  70                  75                  80

His Gly Thr Val Val Ile Asn Ala Asn Gly Thr Leu Thr Tyr Thr Ser
                85                  90                  95

Ala Ala Asn Tyr Asn Gly Ser Asp Thr Ile Ser Tyr Thr Val Ser Asp
```

100 105 110

Gly His Gly Gly Thr Ala Thr Ala Thr Val Ala Val Thr Ile Thr Pro
115 120 125

Val Asn Asp Ala Pro Val Ala Ala Asn Asp Thr Ala Thr Thr Leu Glu
130 135 140

Asp Thr Pro Val Thr Val Asn Val Leu Ala Asn Asp Ser Asp Val Asp
145 150 155 160

Gly Asp Ser Leu Thr Val Thr Ala Ala Thr Ala Gly His Gly Thr Val
165 170 175

Val Ile Asn Ala Asn Gly Thr Leu Thr Tyr Thr Pro Asn Ala Asn Phe
180 185 190

Asn Gly Ser Asp Thr Ile Ser Tyr Thr Val Ser Asp Gly
195 200 205

<210> 218
<211> 205
<212> PRT
<213> Dickeya dadantii

<400> 218

Thr Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr
1 5 10 15

Thr Val Ser Asp Gly Ala Gly Gly Val Val Thr Gly Thr Leu Thr Ile
20 25 30

Thr Val Thr Ala Val Asn Asp Ala Pro Val Val Ser Ala Asp Thr Ala
35 40 45

Thr Thr Ala Glu Asp Thr Pro Val Thr Val Asp Val Leu Ala Asn Asp
50 55 60

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

Asn Gly Thr Val Val Ile Asn Ala Asp Gly Thr Leu Thr Tyr Thr Pro
85 90 95

Asn Ser Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr Thr Val Ser Asp
100 105 110

Gly His Gly Gly Thr Ala Thr Ala Thr Val Val Ile Thr Val Thr Pro
115 120 125

Val Asn Asp Ala Pro Val Ala Ala Asn Asp Ser Ala Thr Thr Ala Glu
130 135 140

Asp Thr Pro Val Thr Val Asp Val Leu Ala Asn Asp Ser Asp Val Asp
145 150 155 160

Gly Asn Pro Leu Thr Ile Thr Ala Ala Thr Ala Gly Asn Gly Thr Val
165 170 175

Val Ile Asn Ala Asp Gly Thr Leu Thr Tyr Thr Pro Asn Ser Asn Phe
180 185 190

Asn Gly Thr Asp Thr Val Thr Tyr Thr Val Ser Asp Gly
195 200 205

<210> 219
<211> 205
<212> PRT
<213> Dickeya dadantii

<400> 219

Thr Tyr Thr Pro Ala Ala Asn Tyr Asn Gly Ser Asp Thr Ile Ser Tyr
1 5 10 15

Thr Val Ser Asp Gly His Gly Gly Thr Ala Thr Ala Thr Val Ala Val
20 25 30

Thr Ile Thr Pro Val Asn Asp Ala Pro Val Ala Ala Asn Asp Thr Ala
35 40 45

Thr Thr Gln Glu Asp Thr Pro Val Ile Val Asn Val Leu Ser Asn Asp
50 55 60

Ser Asp Val Asp Gly Asp Ser Leu Thr Val Thr Ala Ala Thr Ala Gly
65 70 75 80

His Gly Thr Val Val Ile Asn Ala Asn Gly Thr Leu Thr Tyr Thr Pro
85 90 95

Ala Ala Asn Tyr Asn Gly Ser Asp Thr Ile Ser Tyr Thr Val Ser Asp
100 105 110

Gly His Gly Gly Thr Ala Thr Ala Thr Val Val Ile Thr Val Thr Pro
115 120 125

Val Asn Asp Ala Pro Val Ala Ala Asn Asp Ser Ala Thr Thr Ala Glu
130 135 140

Asp Thr Pro Val Thr Val Asn Val Leu Ser Asn Asp Ser Asp Val Asp
145 150 155 160

Gly Asp Ser Leu Thr Val Thr Ala Ala Thr Ala Gly His Gly Thr Val
165 170 175

```
Val Ile Asn Ala Asn Gly Thr Leu Thr Tyr Thr Pro Ala Ala Asn Tyr
            180                 185                 190

Asn Gly Ser Asp Thr Leu Ser Tyr Thr Val Ser Asp Gly
        195                 200                 205
```

<210> 220
<211> 219
<212> PRT
<213> Dickeya dadantii

<400> 220

```
Thr Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr
1               5                   10                  15

Thr Val Ser Asp Gly Ala Gly Gly Val Val Thr Gly Thr Leu Thr Ile
            20                  25                  30

Thr Val Thr Ala Val Asn Asp Ala Pro Val Ala Gly Ala Asp Thr Ala
        35                  40                  45

Thr Thr Ala Glu Asp Thr Pro Val Thr Val Asp Val Leu Ala Asn Asp
    50                  55                  60

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

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

Asn Ser Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr Thr Val Ser Asp
            100                 105                 110

Gly Gln Gly Gly Val Val Thr Gly Thr Leu Thr Ile Thr Val Thr Ala
        115                 120                 125

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

Val Asn Thr Pro Val Ser Val Asn Val Leu Asp Asn Ser Arg Asp Val
145                 150                 155                 160

Asp Gly Asp Pro Leu Thr Val Thr Ser Ile Ser Val Thr Asn Gly Arg
                165                 170                 175

Val Leu Val Asn Ala Gly Gly Met Met Thr Tyr Ile Pro Asn Pro Gly
            180                 185                 190

Phe Ser Gly Thr Asp Val Val Ser Tyr Thr Leu Ser Asp Pro Glu Gly
        195                 200                 205
```

Ser Thr Val Arg Gly Thr Leu Thr Val Val Val
210 215

<210> 221
<211> 205
<212> PRT
<213> Dickeya dadantii

<400> 221

Thr Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr
1 5 10 15

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

Thr Val Thr Ala Val Asn Asp Ala Pro Val Ala Gly Ala Asp Thr Ala
35 40 45

Thr Thr Ala Glu Asp Thr Pro Val Thr Val Asp Val Leu Ala Asn Asp
50 55 60

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

Asn Gly Thr Val Val Ile Asn Ala Asp Gly Thr Leu Thr Tyr Thr Pro
85 90 95

Ala Ala Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr Thr Val Ser Asp
100 105 110

Gly Ala Gly Gly Val Val Thr Gly Thr Leu Thr Ile Thr Val Thr Ala
115 120 125

Val Asn Asp Ala Pro Val Ala Gly Ala Asp Thr Ala Thr Thr Ala Glu
130 135 140

Asp Thr Pro Val Thr Val Asp Val Leu Ala Asn Asp Ser Asp Val Asp
145 150 155 160

Gly Asn Pro Leu Thr Val Thr Ala Ala Thr Ala Gly Asn Gly Ala Val
165 170 175

Val Ile Asn Pro Asp Gly Thr Leu Thr Tyr Lys Pro Asn Ser Asn Phe
180 185 190

Asn Gly Thr Asp Thr Val Thr Tyr Thr Val Ser Asp Gly
195 200 205

<210> 222
<211> 205
<212> PRT
<213> Dickeya dadantii

<400> 222

Thr Tyr Thr Pro Ala Ala Asn Tyr Asn Gly Ser Asp Thr Leu Ser Tyr
1 5 10 15

Thr Val Ser Asp Gly His Gly Gly Thr Ala Thr Ala Thr Val Thr Val
20 25 30

Thr Val Thr Ala Val Asn Asp Ala Pro Val Ala Val Asn Asp Thr Ala
35 40 45

Thr Thr Leu Glu Asp Thr Pro Val Thr Val Asn Val Leu Ala Asn Asp
50 55 60

Thr Asp Val Asp Gly Asp Ser Leu Thr Val Thr Ala Ala Ser Ala Gly
65 70 75 80

His Gly Ser Val Thr Ile Asn Ala Asp Gly Thr Leu Thr Tyr Thr Pro
85 90 95

Asn Ala Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr Ser Val Ser Asp
100 105 110

Gly Ala Gly Gly Val Ala Thr Gly Met Leu Thr Val Thr Val Thr Ala
115 120 125

Val Asn Asp Ala Pro Val Thr Gly Ala Asp Met Ala Ala Thr Ser Gln
130 135 140

Asn Thr Pro Val Thr Val Asn Val Leu Ser Asn Asp Ser Asp Val Asp
145 150 155 160

Gly Asp Ser Leu Thr Val Thr Ala Ala Ser Ala Gly His Gly Ser Val
165 170 175

Val Ile Asn Ala Asp Gly Thr Leu Thr Tyr Thr Pro Asn Thr Asn Tyr
180 185 190

Ser Gly Ser Asp Thr Val Thr Tyr Thr Val Ser Asp Gly
195 200 205

<210> 223
<211> 86
<212> PRT
<213> Dickeya dadantii

<400> 223

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

Ser Asn Phe Asn Gly Thr Asp Thr Val Thr Tyr Thr Val Ser Asp Gly
20 25 30

Gln Gly Gly Val Val Thr Gly Thr Leu Thr Ile Thr Val Thr Ala Val
35 40 45

Asn Asp Ala Pro Glu Val Ile Gly Glu Thr Thr Leu Asn Thr Ser Val
50 55 60

Asn Thr Pro Val Ser Val Asn Val Leu Asp Asn Ser Arg Asp Val Asp
65 70 75 80

Gly Asp Pro Leu Thr Val
85

<210> 224
<211> 350
<212> PRT
<213> Novispirillum itersonii

<400> 224

Asn Ser Asn Ser Thr Leu Thr Leu Lys Gly Asn Asn Phe Ala Leu Ser
1 5 10 15

Pro Gly Asp Ser Glu Leu Ser Pro Gly Arg Val Thr Gly Asn Gly Thr
20 25 30

Leu Asp Gly Ser Gln Leu Ser Ser Phe Val Leu Ser Gly Ile Leu Arg
35 40 45

Pro Gly Asp Tyr Val Asn Thr Glu Ala Phe Pro Ser Ile Val Asn Gly
50 55 60

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

Val Val Ile Ala Arg Ala Gly Ser Thr Gly Ala Asp Gly Leu Ala Phe
85 90 95

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

Ala Pro Leu Ser Pro Ile Ser Phe Ile Ser Ala Thr Pro Asn Gly Leu
115 120 125

Thr Asp Thr Leu Ser Gly Thr Phe Asn Arg Leu Asp Phe Arg Gly Ile
130 135 140

Gly Ser Gly Leu Leu Ile Asp Pro Ala Tyr Asn Thr Thr Thr Lys Thr
145 150 155 160

Leu Thr Leu Thr Ala Ile Thr Thr Gly Ile Thr Thr Thr Thr Ile Gly
165 170 175

```
Gly Glu Val Ala Asp Tyr Val Trp Asn Asp Glu Gly Asn Gly Asp Phe
            180                 185                 190

Ser Ile Ser Gly Ala Asp Val Val Tyr Gly Asn Ala Gly Asp Asp Ile
        195                 200                 205

Phe Arg Ile Ser Thr Ser Asp Thr Ser Phe His Leu Leu Asp Gly Gly
    210                 215                 220

Glu Gly Val Asp Thr Leu Lys Ile Asn Ala Gly Gly Thr Thr Ile Asp
225                 230                 235                 240

Leu Ser Asn Leu Ile Gly Arg Val Gln Ala Met Asp Val Ile Asp Ile
                245                 250                 255

Ser Asp Thr Asn Thr Gly Lys Leu Thr Ile Leu Asp Ala Ala Thr Val
            260                 265                 270

Arg Ser Phe Asn Ala Gly Val Asp Ile Thr Asp Gly Thr Pro Val His
        275                 280                 285

Ser Asn Tyr Asn Pro Ile Ser Gly Gln His Asn Thr Leu Phe Ile Thr
    290                 295                 300

Gly Asn Gly Asp Asp Thr Leu His Leu Lys Asp Pro Ser Ser Trp Val
305                 310                 315                 320

Ser Lys Gly Ser Ile Ala Tyr Glu Val Asn Gly Ser Ala Gln Thr Phe
                325                 330                 335

Arg His Tyr Thr Ala Asp Asn Gly Glu Thr His Leu Tyr Val
            340                 345                 350
```

<210> 225
<211> 233
<212> PRT
<213> Novispirillum itersonii

<400> 225

```
Asn Ser Gly Ala Leu Thr Leu Ile Asp Ala Thr Gly Thr Leu Ser Pro
1               5                   10                  15

Leu Trp Asn Asp Ile His Tyr Ser Gly Val Asp Ala Thr Gln Met Phe
            20                  25                  30

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

Gly Ile Thr Thr Gly Ser Leu Leu Ser Asp Asp Gly Asn Ala Asn Tyr
    50                  55                  60

Val Tyr Ala Glu Ala Gly Ala Asp Asn Phe Leu Val His Gly Ala Asp
```

65 70 75 80

Val Ile Phe Gly Asn Asp Gly Asp Asp Val Phe Gln Val Leu Asp His
85 90 95

Asp Ala Ala Thr Gly Arg Pro Ala Phe Ser Phe Leu Asp Gly Gly Ser
100 105 110

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

Asp Leu Tyr Ala Pro Trp Ile Gln Asn Phe Asp Val Ile Ser Leu Leu
130 135 140

Asn Asp Asn Asn Ser Asp Ser Ala Phe Ile Ser Ala Asp Ala Val Arg
145 150 155 160

Ser Ile Leu Gly Asp Lys Thr Thr Ser Asp Leu Ala Gly Val Gly Asn
165 170 175

Ala Leu Ile Ile Lys Gly Glu Thr Gly Asp His Leu Ser Leu Val Ser
180 185 190

Ala Thr Gly Thr Gly Trp Ala Ala Asp Ser Asn Val Pro Glu Ile Ala
195 200 205

Gly Tyr Thr Gly Tyr Thr Ser Thr Asn Thr Ala Gly Asp Glu Val His
210 215 220

Leu Tyr Ile Gln Asn Asn Ile Ser Val
225 230

<210> 226
<211> 101
<212> PRT
<213> Asticcacaulis biprosthecium

<400> 226

Thr Asp Thr Val Ser Gly Val Glu Asn Ile Glu Phe Ala Asp Gly Thr
1 5 10 15

Phe Ala Ile Ala Ala Ile Leu Gln Val Ala Pro Val Ala Ala Ser Gln
20 25 30

Ala Ile Gly Asn Gly Val Glu Gly Glu Val Ile Thr Gly Ala Ile Ala
35 40 45

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

Pro Ala His Gly Thr Ile Thr Ala Phe Asp Ala Ala Thr Gly Ala Phe
65 70 75 80

```
Thr Tyr Thr Pro Asp Ala Gly Tyr Tyr Gly Pro Asp Ser Phe Thr Phe
                85                  90                  95

Arg Ala Asn Asp Gly
            100
```

<210> 227
<211> 318
<212> PRT
<213> Chitinophaga pinensis

<400> 227

```
Thr Tyr Ala Ile Gly Thr Thr Thr Pro Ala Asn Gly Ser Val Thr Val
1               5                   10                  15

Asn Ala Asp Gly Thr Phe Ala Tyr Thr Pro Asn Ala Asp Tyr Val Gly
            20                  25                  30

Thr Asp Ala Phe Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Thr
        35                  40                  45

Thr Val Thr Val Asn Ile Thr Val Thr Ala Val Asn Asp Ala Pro Thr
    50                  55                  60

Gly Thr Asn Gln Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly
65                  70                  75                  80

Ala Val Val Gly Ala Asp Ala Asp Gly Asp Pro Leu Thr Tyr Ala Ile
                85                  90                  95

Gly Thr Thr Ile Pro Ala Asn Gly Ser Val Thr Val Asn Ala Asp Gly
            100                 105                 110

Thr Phe Val Tyr Thr Pro Asn Ala Asp Tyr Val Gly Ala Asp Ala Phe
        115                 120                 125

Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Val Thr Val
    130                 135                 140

Asn Ile Thr Val Thr Ala Val Asn Asp Ala Pro Thr Gly Thr Asp Leu
145                 150                 155                 160

Asn Leu Thr Met Ala Glu Asp Asn Pro Leu Asn Gly Thr Val Val Gly
                165                 170                 175

Val Asp Ala Asp Asn Asp Pro Leu Thr Tyr Val Ile Gly Ala Thr Asn
            180                 185                 190

Pro Ala Asn Gly Ile Val Thr Val Asn Thr Asp Gly Thr Phe Val Tyr
        195                 200                 205
```

```
Ile Pro Asn Pro Asn Phe Asn Gly Ile Asp Ala Phe Thr Val Val Ile
    210                 215                 220

Ser Asp Gly Asn Gly Gly Thr Ala Thr Val Thr Val Asn Ile Thr Val
225                 230                 235                 240

Thr Pro Val Asn Asp Ala Pro Thr Gly Thr Gly Asp Thr Arg Thr Thr
                245                 250                 255

Pro Arg Asn Thr Pro Val Asn Gly Ala Val Ser Gly Thr Asp Val Asp
            260                 265                 270

Gly Asp Val Leu Thr Tyr Thr Leu Gly Thr Pro Pro Ala Asn Gly Thr
        275                 280                 285

Ala Val Val Asn Thr Asp Gly Thr Tyr Thr Tyr Thr Pro Asn Ala Gly
    290                 295                 300

Tyr Ser Gly Pro Asp Ser Phe Thr Ile Ile Ile Ser Asp Gly
305                 310                 315
```

<210> 228
<211> 285
<212> PRT
<213> Chitinophaga pinensis

<400> 228

```
Asn Tyr Ser Asp Pro Asp Gly Ala Pro Leu Asn Ser Ile Arg Ile Thr
1               5                   10                  15

Ser Leu Pro Leu Asn Gly Ser Phe Arg Leu Asn Gly Thr Val Ile Thr
            20                  25                  30

Val Gly Gln Asp Ile Pro Ala Ala Gln Leu Gly Asn Ile Thr Phe Ile
        35                  40                  45

Pro Thr Ala Asn Trp Ser Gly Thr Thr Gly Phe Asp Trp Arg Ala Tyr
    50                  55                  60

Asp Gly Thr Ser Phe Ser Ala Gly Thr Ser His Val Thr Ile Asn Ile
65                  70                  75                  80

Gln Pro Ala Asn Asp Ala Pro Gln Ile Thr Thr Pro Thr Ser Ile Ala
                85                  90                  95

Val Thr Glu Asp Ile Pro Ala Ser Leu Lys Asp Ile Ser Phe Ser Asp
            100                 105                 110

Ile Asp Ala Gly Thr Gly Val Val Thr Val Thr Phe Ser Val Pro Asn
        115                 120                 125
```

Gly Thr Leu Asn Ala Thr Ser Gly Ala Gly Val Thr Val Ser Gly Thr
130 135 140

Pro Ala Ala Leu Ile Leu Thr Gly Thr Ile Ala Asp Ile Asn Ala Phe
145 150 155 160

Leu Val Ala Asn Arg Val Asn Tyr Ser Ser Thr Gln Asn Pro Pro Pro
165 170 175

Thr Val Ile Leu Thr Val Asn Ile Ser Asp Asn Gly Asn Thr Gly Ala
180 185 190

Gly Gly Ala Gln Gln Ala Thr Ala Thr Val Pro Leu Gly Ile Thr Ala
195 200 205

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

Asp Thr Pro Val Asn Gly Ala Val Thr Gly Asn Asp Val Asp Gly Asp
225 230 235 240

Val Leu Thr Tyr Thr Leu Gly Thr Pro Pro Thr Asn Gly Thr Ala Thr
245 250 255

Val Asn Ala Ser Thr Gly Ala Tyr Thr Tyr Thr Pro Asn Pro Asn Tyr
260 265 270

Asn Gly Pro Asp Met Phe Thr Val Val Ile Ser Asp Gly
275 280 285

<210> 229
<211> 214
<212> PRT
<213> Chitinophaga pinensis

<400> 229

Thr Val Asn Ala Ser Thr Gly Ala Tyr Thr Tyr Thr Pro Asn Pro Asn
1 5 10 15

Tyr Asn Gly Pro Asp Met Phe Thr Val Val Ile Ser Asp Gly His Gly
20 25 30

Ser Ser Val Thr Val Thr Val Asn Ile Thr Val Thr Ala Val Asn Asp
35 40 45

Ala Pro Thr Gly Thr Gly Asp Thr Arg Thr Thr Leu Glu Asp Thr Pro
50 55 60

Val Asn Gly Ala Val Ser Gly Ala Asp Val Asp Gly Asp Ala Leu Thr
65 70 75 80

Tyr Thr Leu Gly Thr Ala Pro Thr Asn Gly Leu Ala Thr Val Asn Ala

85 90 95

Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Asn Pro Asn Tyr Asn Gly Pro
100 105 110

Asp Val Phe Thr Val Val Ile Ser Asp Gly His Gly Gly Ser Val Thr
115 120 125

Val Thr Val Asn Ile Thr Val Thr Ala Val Asn Asp Ala Pro Thr Gly
130 135 140

Thr Gly Asp Thr Arg Thr Thr Leu Glu Asp Thr Pro Val Asn Gly Ala
145 150 155 160

Val Ser Gly Ala Asp Ala Asp Gly Asp Ala Leu Thr Tyr Thr Leu Gly
165 170 175

Thr Ala Pro Thr Asn Gly Leu Ala Thr Val Asn Ala Thr Thr Gly Ala
180 185 190

Tyr Thr Tyr Thr Pro Asn Pro Asn Tyr Asn Gly Pro Asp Ala Phe Thr
195 200 205

Val Val Ile Ser Asp Gly
210

<210> 230
<211> 227
<212> PRT
<213> Chitinophaga pinensis

<400> 230

Thr Tyr Ala Ile Gly Thr Thr Thr Pro Ala Asn Gly Ser Val Thr Val
1 5 10 15

Asn Ala Asp Gly Thr Phe Ile Tyr Thr Pro Asn Ala Asp Tyr Val Gly
20 25 30

Thr Asp Val Phe Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Ala
35 40 45

Thr Val Thr Ile Asn Ile Asn Val Thr Ala Val Asn Asp Ala Pro Thr
50 55 60

Gly Ala Asn Gln Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly
65 70 75 80

Ala Val Val Gly Ala Asp Ala Asp Gly Asp Ala Leu Thr Tyr Ala Ile
85 90 95

Gly Thr Thr Thr Pro Thr Asn Gly Ser Val Thr Val Asn Ala Asp Gly
100 105 110

```
Thr Phe Ile Tyr Thr Pro Asn Ala Asp Phe Asn Gly Ala Asp Ala Phe
        115                 120                 125

Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Val Thr Val
    130                 135                 140

Asn Ile Thr Val Thr Ala Val Asn Asp Ala Pro Thr Gly Thr Asn Gln
145                 150                 155                 160

Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly Ala Val Val Gly
                165                 170                 175

Ala Asp Ala Asp Gly Asp Ala Leu Thr Tyr Ala Ile Gly Thr Thr Thr
            180                 185                 190

Pro Ala Asn Gly Ser Val Thr Val Asn Ala Asp Gly Thr Phe Ala Tyr
        195                 200                 205

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

Ser Asp Gly
225
```

<210> 231
<211> 227
<212> PRT
<213> Chitinophaga pinensis

<400> 231

```
Thr Tyr Ala Thr Gly Thr Thr Thr Pro Ala Asn Gly Ser Val Thr Val
1               5                   10                  15

Asn Ala Asp Gly Thr Phe Ile Tyr Thr Pro Asn Ala Asp Tyr Val Gly
            20                  25                  30

Thr Asp Ala Phe Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Ala
        35                  40                  45

Thr Val Thr Ile Asn Ile Asn Val Thr Ala Val Asn Asp Ala Pro Thr
    50                  55                  60

Gly Ala Asn Gln Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly
65                  70                  75                  80

Ala Val Val Gly Ala Asp Ala Asp Gly Asp Pro Leu Thr Tyr Ala Ile
                85                  90                  95

Gly Thr Thr Thr Pro Thr Asn Gly Ser Val Thr Val Asn Ala Asp Gly
            100                 105                 110
```

```
Thr Phe Val Tyr Thr Pro Asn Ala Asp Phe Asn Gly Thr Asp Ala Phe
        115                 120                 125

Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Thr Thr Val Thr Val
    130                 135                 140

Asn Ile Thr Val Thr Ala Val Asn Asp Ala Pro Thr Gly Ala Asn Gln
145                 150                 155                 160

Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly Ala Val Val Gly
                165                 170                 175

Ala Asp Ala Asp Gly Asp Ala Leu Thr Tyr Ala Ile Gly Thr Thr Thr
            180                 185                 190

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

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

Ser Asp Gly
225
```

<210> 232
<211> 214
<212> PRT
<213> Chitinophaga pinensis

<400> 232

```
Thr Val Asn Ala Thr Thr Gly Ala Tyr Thr Tyr Thr Pro Asn Pro Asn
1               5                   10                  15

Tyr Asn Gly Pro Asp Ala Phe Thr Val Val Ile Ser Asp Gly Asn Gly
            20                  25                  30

Gly Ser Val Thr Val Thr Val Asn Ile Thr Val Thr Ala Val Asn Asp
        35                  40                  45

Val Pro Thr Gly Ala Asp Gln Asn Leu Thr Thr Pro Glu Asp Thr Pro
    50                  55                  60

Leu Asn Gly Ala Val Val Gly Ala Asp Ala Asp Gly Asp Ala Leu Thr
65                  70                  75                  80

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

Thr Asp Gly Thr Phe Ile Tyr Thr Pro Asn Ala Asp Tyr Val Gly Thr
            100                 105                 110
```

```
Asp Ala Phe Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Ala Thr
        115                 120                 125

Val Thr Ile Asn Ile Asn Val Thr Ala Val Asn Asp Ala Pro Thr Gly
    130                 135                 140

Thr Asn Gln Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly Ala
145                 150                 155                 160

Val Leu Gly Val Asp Ala Asp Gly Asp Ala Leu Thr Tyr Ala Ile Gly
                165                 170                 175

Thr Thr Thr Pro Thr Asn Gly Ser Val Ile Val Asn Thr Asp Gly Thr
            180                 185                 190

Phe Ile Tyr Thr Pro Asn Ala Asp Tyr Val Gly Thr Asp Ala Phe Thr
        195                 200                 205

Val Val Ile Ser Asp Gly
    210
```

<210> 233
<211> 227
<212> PRT
<213> Chitinophaga pinensis

<400> 233

```
Thr Tyr Ala Ile Gly Thr Thr Thr Pro Thr Asn Gly Ser Val Thr Val
1               5                   10                  15

Asn Ala Asn Gly Thr Phe Val Tyr Thr Pro Asn Ala Asp Phe Asn Gly
            20                  25                  30

Thr Asp Ala Phe Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Thr
        35                  40                  45

Thr Val Thr Val Asn Ile Thr Val Thr Ala Val Asn Asp Ala Pro Thr
    50                  55                  60

Gly Ala Asn Gln Asn Leu Ser Thr Pro Glu Asp Thr Pro Leu Asn Gly
65                  70                  75                  80

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

Gly Thr Thr Thr Pro Ala Asn Gly Ser Val Thr Val Asn Ala Asp Gly
            100                 105                 110

Thr Phe Ile Tyr Thr Pro Asn Ala Asp Tyr Val Gly Thr Asp Ala Phe
        115                 120                 125

Thr Val Val Ile Ser Asp Gly Asn Gly Gly Thr Ala Thr Val Thr Ile
```

130 135 140

Asn Ile Asn Val Thr Ala Val Asn Asp Ala Pro Thr Gly Ala Asn Gln
145 150 155 160

Asn Leu Thr Thr Pro Glu Asp Thr Pro Leu Asn Gly Ala Val Val Gly
165 170 175

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

Pro Thr Asn Gly Ser Val Thr Val Asn Ala Asp Gly Thr Phe Val Tyr
195 200 205

Thr Pro Asn Ala Asp Phe Asn Gly Thr Asp Ala Phe Thr Val Val Ile
210 215 220

Ser Asp Gly
225

<210> 234
<211> 180
<212> PRT
<213> Chitinophaga pinensis

<400> 234

Tyr Thr Tyr Thr Pro Asn Thr Gly Tyr Ala Gly Pro Asp Ser Phe Thr
1 5 10 15

Ile Ile Ile Ser Asp Gly Asn Gly Gly Thr Val Thr Val Thr Val Asp
20 25 30

Ile Met Met Ile Thr Val Val Pro Asn Pro Ala Ile Ala Leu Val Lys
35 40 45

Val Gly Ala Arg Asp Lys Asn Asp Ile Thr Tyr Ile Thr Ala Thr Val
50 55 60

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

Ser Leu Asn Asn Asp Thr Pro Thr Glu Thr Thr Val Pro Ala Pro Pro
85 90 95

Gln Ala Asn Asp Asp Gln Ala Glu Thr Arg Ala Ser Ile Ala Val Val
100 105 110

Ile Pro Val Leu Asp Asn Asp Asp Pro Val Glu Ser Thr Phe Ser Ile
115 120 125

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

```
Asn Glu Asp Gly Ser Ile Arg Tyr Met Pro Asp Asn Gly Tyr Thr Gly
145                 150                 155                 160


Glu Asp Asp Phe Ser Tyr Gln Val Ser Asp Val Asp Gly Tyr Ile Thr
                165                 170                 175


Asn Ile Ala Val
            180


<210>  235
<211>  318
<212>  PRT
<213>  Unknown

<220>
<223>  uncultured bacterium - accession no. emb|CAX84233.1|

<400>  235

Gln Phe Gly Leu Leu Thr Leu Ala Gly Arg Glu Gly Leu Thr Phe Val
1               5                   10                  15


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


Ala Val Val Gln Lys Ala Leu Ala Gly Leu Ser Tyr Gln Gly Ala Gly
        35                  40                  45


Asp Phe Asn Gly Ser Asp Arg Leu Thr Leu Ser Thr Asp Asp Gln Gly
    50                  55                  60


Ala Thr Gly Thr Gly Gly Ala Leu Val Thr Thr Asp Ala Val Ala Ile
65                  70                  75                  80


Thr Val Gly Ala Val Asn Asp Ala Pro Val Asn Thr Val Pro Ala Ala
                85                  90                  95


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


Thr Asp Gly Asp Asp Gly Gly Gly Thr Leu Gln Val Thr Leu Ser Val
        115                 120                 125


Gly Gln Gly Val Leu Thr Leu Ala Gln Thr Ser Gly Leu Thr Phe Thr
    130                 135                 140


Thr Gly Asp Gly Thr Ser Asp Ala Thr Leu Val Phe Thr Gly Thr Lys
145                 150                 155                 160


Ser Asn Ile Asn Ser Ala Ile Gly Thr Val Thr Tyr Leu Gly Ala Ser
                165                 170                 175
```

```
Asn Tyr Asn Gly Ser Asp Thr Leu Thr Leu Thr Thr Ser Asp Gln Gly
            180                 185                 190

Asn Ala Gly Ser Gly Gly Thr Leu Thr Asp Thr Asp Thr Val Ala Ile
        195                 200                 205

Thr Val Ser Ala Val Asn Asp Ala Pro Val Asn Thr Val Pro Ala Ala
    210                 215                 220

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

Thr Asp Gly Asp Asp Gly Gly Gly Thr Leu Gln Val Thr Leu Ser Val
                245                 250                 255

Gly Gln Gly Val Leu Thr Leu Ala Gln Thr Ser Gly Leu Thr Phe Thr
            260                 265                 270

Thr Gly Asp Gly Thr Ser Asp Ala Thr Leu Val Phe Thr Gly Thr Lys
        275                 280                 285

Ser Asn Ile Asn Ser Ala Ile Gly Thr Val Thr Tyr Leu Gly Ala Ser
    290                 295                 300

Asn Tyr Asn Gly Ser Asp Thr Leu Thr Leu Thr Thr Ser Asp
305                 310                 315
```

<210> 236
<211> 210
<212> PRT
<213> Unknown

<220>
<223> uncultured bacteriium - accession no. emb|CAX84233.1|

<400> 236

```
Thr Leu Ala Ile Thr Asp Val Asp Asp Gly Gly Gly Thr Met Gln Val
1               5                   10                  15

Thr Leu Ser Val Gly Gln Gly Val Leu Thr Leu Ala Gln Thr Thr Gly
            20                  25                  30

Leu Thr Phe Thr Thr Gly Asp Gly Thr Ser Asp Ala Thr Leu Val Phe
        35                  40                  45

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

Leu Gly Ser Thr Asn Tyr Asn Gly Ser Asp Thr Leu Thr Leu Thr Thr
65                  70                  75                  80

Ser Asp Gln Gly Asn Ala Gly Ser Gly Ser Thr Leu Thr Asp Thr Asp
                85                  90                  95
```

Thr Val Ala Ile Thr Ile Ser Ala Val Asn Asp Ala Pro Val Asn Thr
100 105 110

Val Pro Ala Ala Gln Thr Val Asn Glu Asp Thr Asn Leu Thr Leu Thr
115 120 125

Gly Leu Ala Ile Thr Asp Val Asp Asp Gly Gly Gly Thr Met Gln Val
130 135 140

Thr Leu Ser Val Gly Gln Gly Val Leu Thr Leu Ala Gln Thr Thr Gly
145 150 155 160

Leu Thr Phe Thr Thr Gly Asp Gly Thr Ser Asp Ala Thr Leu Val Phe
165 170 175

Thr Gly Thr Lys Ser Ala Ile Asn Ser Ala Ile Gly Thr Val Thr Tyr
180 185 190

Leu Gly Ser Thr Asn Tyr Asn Gly Ser Asp Thr Leu Thr Met Thr Thr
195 200 205

Ser Asp
210

<210> 237
<211> 173
<212> PRT
<213> Cyanothece sp. PCC 7822

<400> 237

Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Ser Phe Thr Tyr Arg
1 5 10 15

Ile Ser Asp Gly Asn Gly Gly Thr Ser Thr Ala Thr Val Asn Val Thr
20 25 30

Val Asn Pro Val Asn Asp Ala Pro Val Ala Val Asn Asn Ser Ala Thr
35 40 45

Thr Asn Glu Val Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Ser
50 55 60

Phe Thr Tyr Arg Ile Ser Asp Gly Asn Gly Gly Thr Ser Thr Ala Thr
65 70 75 80

Val Asn Val Thr Val Asn Pro Val Asn Asp Ala Pro Val Ala Val Asn
85 90 95

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

```
Ser Asn Asp Thr Asp Val Glu Gly Asn Pro Leu Ser Ile Asp Ser Phe
        115                 120                 125


Thr Gln Gly Asn Ser Gly Thr Val Thr Leu Asn Asn Asn Gly Thr Pro
    130                 135                 140


Gly Asp Thr Thr Asp Asp Leu Leu Val Tyr Thr Pro Asn Ala Asn Phe
145                 150                 155                 160


Asn Gly Thr Asp Ser Phe Ser Tyr Thr Ile Ser Asp Gly
                165                 170


<210>  238
<211>  222
<212>  PRT
<213>  Cyanothece sp. PCC 7822

<400>  238

Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp Ser Phe Ser Tyr Thr
1               5                   10                  15


Ile Ser Asp Gly Asn Gly Gly Thr Ser Thr Ala Thr Val Asn Val Thr
            20                  25                  30


Val Asn Pro Val Asn Asp Ala Pro Val Ala Val Asn Asn Ser Ala Thr
        35                  40                  45


Thr Asn Glu Asp Ala Ala Val Ser Ile Gly Val Leu Ser Asn Asp Thr
    50                  55                  60


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


Ser Gly Thr Val Thr Leu Asn Asp Asn Gly Thr Pro Gly Asp Thr Thr
                85                  90                  95


Asp Asp Leu Leu Val Tyr Thr Pro Asn Ala Asn Phe Asn Gly Thr Asp
            100                 105                 110


Ser Phe Thr Tyr Arg Ile Ser Asp Gly Asn Gly Gly Thr Ser Thr Ala
        115                 120                 125


Thr Val Asn Val Thr Val Asn Pro Val Asn Asp Ala Pro Val Ala Val
    130                 135                 140


Asn Asn Ser Ala Thr Thr Asn Glu Asp Thr Ala Val Ser Ile Gly Val
145                 150                 155                 160


Leu Ser Asn Asp Thr Asp Val Asp Gly Asn Pro Leu Ser Ile Asp Ser
                165                 170                 175
```

Phe Thr Gln Gly Asn Ser Gly Thr Val Thr Leu Asn Asn Asn Gly Thr
180 185 190

Pro Gly Asn Thr Thr Asp Asp Leu Leu Val Tyr Thr Pro Asn Ala Asn
195 200 205

Phe Asn Gly Thr Asp Ser Phe Thr Tyr Arg Ile Ser Asp Gly
210 215 220

<210> 239
<211> 329
<212> PRT
<213> Methyloversatilis universalis

<400> 239

Ala Gly Ser Arg Ile Ala Gly Ala Val Leu Ser Ser Asn Gly Gly Ser
1 5 10 15

Leu Arg Ala Asp Ser Gly Thr Leu Leu Leu Asn Ala Gly Glu Ser Ala
20 25 30

Gln Ile Ala Ser Gly Thr Phe Glu Leu Ser Gly Ala Thr Leu Thr Ala
35 40 45

Thr Gly Asn Ser Ser Leu Asp Gly Ala Gly Thr Phe Ser Phe Thr Ser
50 55 60

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

Trp Ser Gly Gly Asn Met Ala Gly Ser Gly Ile Thr Arg Leu Ala Gly
85 90 95

Ala Ala Arg Ile Leu Ser Gly Ser Thr Arg Gly Leu Gly Arg Thr Leu
100 105 110

Glu Ile Ala Gly Ser Thr Val Ala Ser Asn Leu Ser Gly Ala Val Gln
115 120 125

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

Leu Asn Asn Ser Ala Val Phe Ser His Leu Gly Ser Gly Arg Ile Asp
145 150 155 160

Asn Ala Gly Leu Leu Leu Lys Thr Gly Ser Asp Ser Ala Ser Leu Ala
165 170 175

Met Pro Val Gly Asn Thr Gly Thr Leu Arg Val Ala Glu Gly Ser Leu
180 185 190

Ser Ala Asn Gly Phe Thr Thr Asn Ala Gly Thr Leu Asp Leu Arg Ala

195 200 205

Gly Ser Met Leu Thr Thr Gly Ser Leu Gln Asn Asn Gly Val Ile Gln
210 215 220

Gly Ser Gly Thr Ile Asn Leu Gly Ala Gly Thr Leu Thr Asn Ala Gly
225 230 235 240

Ile Val Arg Pro Gly Asp Ala Ser Gly Thr Gly Thr Leu Thr Val Thr
245 250 255

Gly Gln Phe Val Gln Thr Ala Gly Gly Arg Ile Glu Ala Asp Val Leu
260 265 270

Gly Ala Thr Ala Ala Gln Gln Asp His Leu Val Val Ser Gly Ser Ala
275 280 285

Gln Leu Asp Gly Ala Leu Val Leu Thr Pro Ala Asn Gly Leu Thr Phe
290 295 300

Gly Ala Ser Asp Arg Tyr Thr Val Leu Ser Cys Gly Ala Asp Gly Cys
305 310 315 320

Leu Ser Gly Ala Phe Ala Ser Val Asn
325

<210> 240
<211> 247
<212> PRT
<213> Methyloversatilis universalis

<400> 240

Leu Ala Gly Thr Gln Thr Ile Ala Ala Gly Ala Arg Ile Asp Ile Asp
1 5 10 15

Gly Gly Arg Thr Arg Leu Ala Ser Ser Ala Val Val Ser Gly Ala Gly
20 25 30

Pro Leu Arg Leu Thr Gly Gly Val Leu Ala Met Asp Asp Gly Met Thr
35 40 45

Thr Gly Ile Thr Leu Arg His Thr Asn Ala Ala Gly Ser Ser Ser Ile
50 55 60

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

Asn Ala Ala Gly Ala Ala Leu Tyr Ile Asp Thr Ala Gly Gly Asn Ser
85 90 95

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

```
Leu Val Lys Gln Gly Asn Gly Thr Phe Asn Phe Trp Asn Pro Val Arg
        115                 120                 125

Leu Ser Asn Thr Gly Thr Leu Thr Val Ala Gln Gly Thr Leu Phe Ala
    130                 135                 140

Asp Asn Phe Thr Ser Asn Ser Gly Thr Leu His Thr Leu Ser Gly Ala
145                 150                 155                 160

Val Leu Asn Thr Gly Asn Thr Ala Leu Thr Asn Thr Gly Thr Val Ser
                165                 170                 175

Gly His Gly Thr Leu Val Ile Gly Gly Thr Gly Leu Leu Asn Arg Gly
            180                 185                 190

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

Gly His Tyr Thr Gln Ala Ala Asp Gly Thr Leu Gln Ile Glu Arg Gly
    210                 215                 220

Thr Pro Gly Thr Asp Ala Leu Val Val Ser Gly Thr Ala Thr Leu Gly
225                 230                 235                 240

Gly Thr Leu Thr Val Ser Ser
                245
```

<210> 241
<211> 305
<212> PRT
<213> Roseovarius sp. TM1035

<400> 241

```
Gly Tyr Thr Tyr Thr Pro Asp Ala Asp Phe Asn Gly Thr Asp Ala Phe
1               5                   10                  15

Thr Val Ser Val Thr Asp Gly Asn Gly Gly Thr Asp Thr Val Val Val
            20                  25                  30

Asn Val Thr Val Asn Ala Val Asn Asp Ala Pro Val Ala Gln Ala Asp
        35                  40                  45

Ala Ala Ile Ser Thr Gly Glu Asp Gln Ala Ile Ser Gly Thr Val Thr
    50                  55                  60

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

Gly Ala Pro Ala Asn Gly Ser Val Thr Ile Ser Ala Asn Gly Gly Tyr
                85                  90                  95
```

```
Thr Tyr Thr Pro Asp Ala Asp Phe Asn Gly Thr Asp Ala Phe Thr Val
            100                 105                 110

Ser Val Thr Asp Gly Asn Gly Gly Thr Asp Thr Val Val Val Asn Val
        115                 120                 125

Thr Val Asn Ala Val Asn Asp Ala Pro Val Ala Gln Ala Asp Ala Ala
    130                 135                 140

Ile Ser Thr Gly Glu Asp Gln Ala Ile Ser Gly Thr Val Thr Ala Thr
145                 150                 155                 160

Asp Val Asp Gly Asp Ser Leu Ser Phe Ala Leu Ala Ser Gly Gly Ala
                165                 170                 175

Pro Ala Asn Gly Ser Val Thr Ile Ser Ala Asn Gly Gly Tyr Thr Tyr
            180                 185                 190

Thr Pro Asp Ala Asp Phe Asn Gly Thr Asp Ala Phe Thr Val Ser Val
        195                 200                 205

Thr Asp Gly Asn Gly Gly Thr Asp Thr Val Val Val Asn Val Thr Val
    210                 215                 220

Asn Ala Val Asn Asp Ala Pro Val Ala Gln Ala Asp Ala Ala Ile Ser
225                 230                 235                 240

Thr Gly Glu Asp Gln Ala Ile Ser Gly Thr Val Thr Ala Thr Asp Val
                245                 250                 255

Asp Gly Asp Ser Leu Ser Phe Ala Leu Ala Thr Gly Gly Ala Pro Ala
            260                 265                 270

Asn Gly Ser Val Thr Val Ser Ala Asn Gly Gly Tyr Thr Tyr Thr Pro
        275                 280                 285

Asp Ala Asp Phe Asn Gly Thr Asp Ala Phe Thr Val Ser Val Thr Asp
    290                 295                 300

Gly
305
```

<210> 242
<211> 97
<212> PRT
<213> Roseovarius sp. TM1035

<400> 242

```
Val Ser Asp Gly Leu Leu Thr Ala Thr Ala Ser Ala Thr Leu Asp Leu
1               5                   10                  15
```

Leu Pro Val Asn Asp Ala Pro Val Ala Gln Ala Asp Ala Ala Ile Ser
20 25 30

Thr Gly Glu Asp Gln Ala Ile Ser Gly Thr Val Thr Ala Thr Asp Val
35 40 45

Asp Gly Asp Ser Leu Ser Phe Ala Leu Ala Ser Gly Gly Ala Pro Ala
50 55 60

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

Asp Ala Asp Phe Asn Gly Thr Asp Ala Phe Thr Val Ser Val Thr Asp
85 90 95

Gly

<210> 243
<211> 120
<212> PRT
<213> Roseovarius sp. TM1035

<400> 243

Gln Phe Asp Phe Leu Ala Ala Gly Glu Val Leu Ser Ile Thr Tyr Thr
1 5 10 15

Val Thr Val Glu Asp Asn Asn Gly Gly Thr Asp Thr Gln Asp Ile Thr
20 25 30

Phe Thr Ile Thr Gly Thr Asn Asp Leu Pro Val Ile Asp Val Ala Glu
35 40 45

Ser Asp Val Glu Ile Ser Gly Asp Glu Asp Ala Val Gly Ile Ser Gly
50 55 60

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

Ala Asp Gly Gly Ser Pro Glu Asn Gly Ser Val Thr Val Asn Thr Asp
85 90 95

Gly Thr Tyr Thr Tyr Val Pro Asn Ala Asp Phe Asn Gly Thr Asp Ala
100 105 110

Phe Thr Val Ala Val Ser Asp Gly
115 120

<210> 244
<211> 287
<212> PRT
<213> Methylobacterium sp. GXF4

<400> 244

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

Gly Ser Leu Ala Gly Ala Gly Arg Val Ser Leu Gly Ala Gly Thr Leu
            20                  25                  30

Thr Ala Gly Ala Asp Asn Ser Ser Thr Ala Phe Ser Gly Thr Ile Thr
        35                  40                  45

Gly Ser Gly Gly Leu Ala Lys Ala Gly Thr Gly Thr Leu Thr Leu Ser
    50                  55                  60

Gly Ser Asn Ser Tyr Ser Gly Gly Thr Ala Leu Leu Gly Gly Thr Leu
65                  70                  75                  80

Ala Ile Ala Ala Asp Ala Ser Leu Gly Ala Ser Ala Gly Gly Leu Arg
                85                  90                  95

Phe Asp Gly Gly Thr Leu Val Thr Thr Ala Ser Leu Ala Met Ala Arg
            100                 105                 110

Pro Val Thr Leu Ala Gly Asp Ala Arg Leu Arg Pro Ala Ser Gly Thr
        115                 120                 125

Ser Leu Thr Leu Asn Gly Ser Val Thr Gly Pro Gly Gly Leu Val Gln
    130                 135                 140

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

Ala Thr Thr Val Ala Gly Gly Thr Leu Gln Ile Asp Gly Val Leu Ser
                165                 170                 175

Ala Ser Glu Val Thr Val Arg Arg Gly Gly Thr Leu Ala Gly Ser Gly
            180                 185                 190

Lys Ile Gly Asp Pro Leu Ile Glu Ala Gly Gly Arg Leu Ala Pro Gly
        195                 200                 205

Ser Ala Ala Ala Ile Gly Thr Leu Ser Ile His Gly Pro Leu Thr Phe
    210                 215                 220

Ala Ala Gly Ser Phe Tyr Thr Val Lys Leu Thr Pro Ala Ala Asn Asp
225                 230                 235                 240

Arg Thr Asp Val Thr Gly Pro Val Ala Leu Gln Gly Gly Thr Val Gln
                245                 250                 255

Val Leu Ala Gly Ala Gly Thr Tyr Thr Pro Ala Leu Arg Tyr Thr Leu
            260                 265                 270
```

```
Leu Thr Ala Thr Asp Gly Val Thr Gly Arg Phe Ser Ala Leu Gln
        275                 280                 285


<210>  245
<211>  134
<212>  PRT
<213>  Rhodopirellula baltica

<400>  245

Thr Pro Glu Thr Ile Tyr Leu Thr Val Thr Asp Val Asn Asp Ala Pro
1               5                   10                  15


Glu Val Thr Gly Pro Ala Thr Ala Thr Val Ala Glu Gly Gly Ser Leu
            20                  25                  30


Thr Phe Asp Leu Gly Asp Ala Gly Val Ile Asp Thr Thr Asp Val Asp
        35                  40                  45


Gly Asp Ile Leu Thr Val Thr Leu Thr Ala Asn His Ala Ser Ile Ala
    50                  55                  60


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


Gly Thr Leu Gln Phe Ser Gly Ser Val Ala Asp Ile Asp Ala Ala Leu
                85                  90                  95


Tyr Gly Leu Asp Tyr Asp Ser Gln Ala Gly Tyr Asn Gly Ser Ala Ser
            100                 105                 110


Leu Val Val Leu Val Asp Asp Gly Asn Leu Thr Asp Ser Thr Thr Val
        115                 120                 125


Ala Ile Thr Val Asn Pro
    130


<210>  246
<211>  300
<212>  PRT
<213>  Sphingomonas sp. MM-1

<400>  246

Gly Gly Phe Asn Leu Ala Gly Gly Thr Ile Ala Ile Ser Thr Asn Ala
1               5                   10                  15


Ala Leu Gly Asn Gly Ile Leu His Val Thr Gly Asp Ala Ser Leu Ser
            20                  25                  30


Gly Ser Leu Ala Asp Leu Tyr Val Val Asn Ala Ile Asn Leu Asp Ala
        35                  40                  45
```

```
Gly Lys Thr Leu Asp Leu Asn Gly Gly Asn Asp Leu Thr Ile Thr Gly
    50                  55                  60

Met Ile Ser Gly Gly Gly Asn Leu Arg Ile Ser Asn Ala Ser Val Thr
65                  70                  75                  80

Leu Leu Gly Ala Asn Ser His Ala Gly Ala Thr Thr Ile Ser Ser Gly
                85                  90                  95

Ser Thr Leu Tyr Ala Asn Ala Thr Gly Ala Leu Ser Asn Leu Ser Ala
            100                 105                 110

Ile Thr Val Asp Thr Gly Gly Arg Leu Asp Leu Gly Asn Asp Asp Gln
        115                 120                 125

Thr Ile Gly Ala Leu Ala Gly Ala Gly Ser Val Thr Ser Gly Gly Pro
    130                 135                 140

Gly Arg Val Leu Thr Thr Gly Gly Asp Asn Ser Ser Thr Ile Phe Ala
145                 150                 155                 160

Gly Asp Leu Gln Asn Gly Ala Gly Thr Leu Gly Ile Thr Lys Ile Gly
                165                 170                 175

Ser Gly Thr Met Thr Leu Ser Gly Thr Ala Asn Ser Tyr Thr Gly Ala
            180                 185                 190

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

Ser Ser Leu Leu Thr Val Ala Ser Gly Ala Arg Leu Ala Gly Ser Gly
    210                 215                 220

Thr Val Gly Ser Thr Thr Val Gln Ser Gly Gly Arg Ile Ala Pro Gly
225                 230                 235                 240

Asn Ser Ile Gly Thr Leu Asn Val Ala Gly Asp Leu Thr Leu Ala Ser
                245                 250                 255

Gly Ser Ile Leu Asp Phe Glu Leu Gly Ser Pro Gly Ala Ala Ala Asn
            260                 265                 270

Pro Ala Ala Gly Thr Ser Asp Arg Ile Ala Val Ser Gly Asn Leu Val
        275                 280                 285

Leu Asp Gly Ile Ile Asn Leu Gly Gln Ser Gly Thr
    290                 295                 300
```

<210> 247
<211> 326
<212> PRT
<213> Methyloversatilis universalis

<400> 247

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

Gly Gly Thr Thr Arg Leu Ala Ser Gly Ala Thr Val Ser Gly Ala Gly
            20                  25                  30

Pro Leu Arg Leu Thr Gly Gly Val Leu Ala Met Asp Asp Gly Met Ser
        35                  40                  45

Thr Gly Ile Thr Leu Gln Gln Ser Gly Gly Thr Leu Ser Gly Ala Gly
    50                  55                  60

Ser Asn Thr Leu Ser Gly Arg Tyr Glu Trp Thr Gly Gly Thr Val Gly
65                  70                  75                  80

Gly Ser Gly Thr Leu Thr Val Ser Gly Ala Leu Gln Ile Ser Gly Ser
                85                  90                  95

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

Gly Ser Ser Ala Leu Tyr Lys Thr Gly Gly Tyr Leu Tyr Val Ser Asn
        115                 120                 125

Gly Ala Thr Phe Thr Asn Ala Ala Gly Ala Ala Leu Tyr Ile Asp Thr
    130                 135                 140

Ala Gly Gly Asn Ser Gly Val Trp Tyr Gly Gly Thr Ala Gly Ser Phe
145                 150                 155                 160

Val Asn Asp Gly Leu Leu Val Lys Gln Gly Asn Gly Thr Phe Asn Phe
                165                 170                 175

Trp Asn Pro Val Arg Leu Ser Asn Thr Gly Thr Leu Thr Val Ala Gln
            180                 185                 190

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

Thr Leu Ser Gly Ala Val Leu Asn Thr Gly Asn Thr Ala Leu Thr Asn
    210                 215                 220

Thr Gly Thr Val Ser Gly His Gly Thr Leu Val Ile Gly Gly Thr Gly
225                 230                 235                 240

Leu Leu Asn Arg Gly Ile Val Ala Pro Gly Gly Ser Asn Glu Asp Gly
                245                 250                 255

Thr Leu Arg Ile Thr Gly His Tyr Thr Gln Ala Ala Asp Gly Thr Leu
```

260 265 270

Gln Ile Glu Arg Gly Thr Pro Gly Thr Asp Ala Leu Val Val Ser Gly
275 280 285

Thr Ala Thr Leu Gly Gly Thr Leu Thr Val Ser Ser Leu Ser Gly Tyr
290 295 300

Thr Pro Thr Ala Val Gln Ser Asp Ile Val Ser Ala Gly Thr Leu Thr
305 310 315 320

Gly Ser Phe Ala Thr Val
325

<210> 248
<211> 105
<212> PRT
<213> Azospirillum sp. B510

<400> 248

Val Thr Leu Gly Val Leu His Gly Thr Leu Thr Leu Ser Gly Thr Thr
1 5 10 15

Gly Leu Ser Phe Thr Thr Gly Thr Gly Thr Ala Asn Ala Ser Met Val
20 25 30

Phe Thr Gly Thr Ile Ser Ala Ile Asn Thr Ala Leu Ala Gly Leu Ser
35 40 45

Tyr Ala Pro Thr Ala Asn Tyr His Gly Ser Asp Thr Leu Thr Ile Thr
50 55 60

Thr Asn Asp Arg Gly Asn Thr Gly Ala Asp Pro Gly Thr Thr Gly Asp
65 70 75 80

Gly Ser Ser Glu Gln Asp Gln Asp Thr Val Ala Ile Thr Val Asn Pro
85 90 95

Val Ala Asp Thr Pro Ser Val Thr Gly
100 105

<210> 249
<211> 359
<212> PRT
<213> Burkholderia ambifaria MC40-6

<400> 249

Val Ile Asn Asn Gly Thr Phe Asp Ile Ser Gly Thr Thr Ser Gly Ala
1 5 10 15

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

```
Thr Leu Thr Leu Ala Asn Ala Ala Gly Thr Phe Ser Gly Ala Ile Gly
        35                  40                  45

Gly Thr Gly Gly Leu Thr Val Ala Gly Gly Thr Gln Thr Leu Ser Val
    50                  55                  60

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

Leu Ser Gly Ala Gly Ser Ile Ala Ala Ser Ser Gly Val Ile Asn Asn
                85                  90                  95

Gly Thr Leu Asp Ile Ser Gly Thr Thr Ser Gly Ala Thr Val Asn Ala
            100                 105                 110

Leu Thr Gly Thr Gly Thr Val Ala Leu Gly Gly Arg Thr Leu Thr Leu
        115                 120                 125

Ala Asn Ala Ala Gly Thr Phe Ser Gly Ala Ile Gly Gly Thr Gly Gly
    130                 135                 140

Leu Thr Val Ala Gly Gly Thr Gln Thr Leu Ser Gly Val Asn Thr Tyr
145                 150                 155                 160

Thr Gly Ala Thr Met Val His Ala Gly Thr Leu Ala Leu Ser Gly Ala
                165                 170                 175

Gly Arg Leu Ala Ser Ser Thr Ser Val Thr Leu Ala Gly Ala Thr Ala
            180                 185                 190

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

Gly Val Ala Gly Ser Arg Val Val Leu Gly Gly Ser Ala Leu Thr Leu
    210                 215                 220

Ser Asp Asp Ser Ser Gln Thr Phe Gly Gly Ser Leu Gly Gly Thr Gly
225                 230                 235                 240

Gly Leu Val Lys Gln Gly Ala Gly Thr Leu Thr Leu Asn Gly Val Ser
                245                 250                 255

Ser Ala Phe Ser Gly Thr Thr Thr Val Ala Gly Gly Thr Leu Ala Val
            260                 265                 270

Gly Asp Ala Ala Asn Ala Gly Ala Val Leu Gly Gly Asn Val Leu Val
        275                 280                 285

Ser Ser Leu Gly Thr Leu Arg Gly His Gly Thr Val Ser Gly Asp Val
    290                 295                 300
```

Ser Ser Ser Gly Val Val Ala Pro Gly Gly Ser Ile Gly Thr Leu Ser
305 310 315 320

Val Gly Gly Asn Tyr Thr Gln Ala Ala Gly Gly Thr Leu Ser Ile Glu
325 330 335

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

Leu Asn Gly Ser Leu Ala Val
355

<210> 250
<211> 232
<212> PRT
<213> Nostoc punctiforme PCC 73102

<400> 250

Val Asn Asp Gly Ala Ala Asn Ser Thr Ala Val Thr Arg Asn Ile Asn
1 5 10 15

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

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

Val Ser Asp Val Asp Ser Ala Asn Leu Ser Ser Ala Thr Val Asn Ile
50 55 60

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

Asn Gly Ile Thr Gly Ser Tyr Asn Ser Ser Thr Gly Ile Leu Thr Leu
85 90 95

Ser Gly Ser Ser Ser Val Ala Asn Tyr Gln Thr Ala Leu Arg Ser Ile
100 105 110

Thr Tyr Thr Asn Ser Ser Asp Asn Pro Thr Leu Thr Pro Arg Thr Ile
115 120 125

Ser Phe Ile Val Asn Asp Gly Thr Ala Asn Ser Thr Ala Val Thr Arg
130 135 140

Asn Ile Asn Ile Thr Ala Val Asn Asp Ala Pro Val Ala Val Asn Asp
145 150 155 160

Ser Ile Thr Thr Asn Lys Asn Thr Pro Ile Ile Ile Asn Ala Thr Thr
165 170 175

Leu Leu Ser Asn Asp Thr Asp Val Asp Val Ser Asp Val Leu Ser Ile
180 185 190

Thr Gly Phe Thr Gln Pro Ser Gln Gly Ser Leu Val Asn Asn Asn Asn
195 200 205

Gly Thr Tyr Thr Tyr Thr Pro Val Gln Asn Tyr Tyr Gly Ser Asp Ser
210 215 220

Phe Thr Tyr Thr Ile Ser Asp Gly
225 230

<210> 251
<211> 55
<212> PRT
<213> Pseudomonas chlororaphis

<400> 251

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

Thr Val Ala Asn Gly Ala Ala Leu Ser Gly Asn Gly Ser Val Gly Ser
20 25 30

Leu Asp Asn His Gly Leu Thr Gln Ser Gly Gly Thr Ala Gly Thr Leu
35 40 45

Ser Val Ala Gly Asn Leu Ser
50 55

<210> 252
<211> 179
<212> PRT
<213> Bradyrhizobium sp. WSM471

<400> 252

Gly Asn Val Thr Val Asp Ala Asn Gly Lys Leu Thr Val Asn Gly Ala
1 5 10 15

Thr Ile Ser Gly Gly Thr Ile Asp Gly Leu Gly Thr Ile Asp Val Thr
20 25 30

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

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

Thr Ile Thr Asp Asn Gly Gly Ile Glu Leu Asp Asn Thr Val Lys Leu
65 70 75 80

Lys Asp Gly Ala Ser Ile Gln Gly Gly Ala Val Ala Asn Thr Gly Thr
85 90 95

```
Leu Lys Ile Thr Gly Ala Ala Thr Leu Leu Asn Asp Val Val Thr Asn
            100                 105                 110

Thr Gly Thr Val Ser Val Asp Gly Gly Gln Thr Leu Thr Leu Ser Gly
        115                 120                 125

Thr Glu Ile Ser Gly Gly Ala Val Asn Gly Ala Gly Ala Ile Asp Val
    130                 135                 140

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

Val Thr Val Glu Ser Gly Val Ile Leu Thr Leu Asp Asp Val Thr Val
                165                 170                 175

Ala Gly Thr
```

<210> 253
<211> 308
<212> PRT
<213> Burkholderia ambifaria AMMD

<400> 253

```
Gly Leu Thr Val Ala Gly Gly Thr Gln Asn Leu Ser Gly Ala Asn Gly
1               5                   10                  15

Tyr Thr Gly Ala Thr Ser Ile Ser Ala Gly Thr Leu Ala Leu Ser Gly
            20                  25                  30

Ala Gly Ser Ile Ala Asn Ser Ser Gly Val Ile Asn Asn Gly Thr Phe
        35                  40                  45

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

Thr Gly Thr Val Ala Leu Gly Gly Arg Thr Leu Thr Leu Ala Asn Ala
65                  70                  75                  80

Ser Gly Thr Phe Ser Gly Ala Ile Gly Gly Thr Gly Gly Leu Thr Val
                85                  90                  95

Ala Gly Gly Thr Gln Thr Leu Ser Gly Val Asn Thr Tyr Thr Gly Ala
            100                 105                 110

Thr Met Val Asn Ala Gly Thr Leu Ala Leu Ser Gly Ala Gly Arg Leu
        115                 120                 125

Ala Ser Ser Thr Ser Val Thr Leu Ala Gly Ala Thr Ala Ala Leu Asp
    130                 135                 140
```

```
Leu Ser Ala Gly Gly Ser Gln Thr Val Ala His Leu Ser Gly Val Ala
145                 150                 155                 160

Gly Ser Arg Val Val Leu Gly Gly Asn Ala Leu Thr Leu Ser Asp Asp
                165                 170                 175

Ser Ser Gln Thr Phe Ser Gly Ser Leu Ser Gly Thr Gly Gly Leu Val
            180                 185                 190

Lys Gln Gly Ala Gly Thr Leu Thr Leu Asn Gly Val Ser Ser Ala Phe
        195                 200                 205

Ser Gly Thr Thr Thr Val Ala Gly Gly Thr Leu Ala Val Gly Asp Ala
    210                 215                 220

Ala Asn Ala Gly Ala Val Leu Gly Gly Asn Val Val Val Asn Ser Leu
225                 230                 235                 240

Gly Thr Leu Arg Gly His Gly Thr Val Ser Gly Asp Val Ser Ser Ser
                245                 250                 255

Gly Val Val Ala Pro Gly Gly Ser Ile Gly Thr Leu Ser Val Gly Gly
            260                 265                 270

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

Thr Glu Ala Ser Gln Leu Arg Val Gly Gly Ala Ala Thr Leu Asn Gly
    290                 295                 300

Ser Leu Ala Val
305
```

<210> 254
<211> 606
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 254

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

Arg Pro Val Met Arg Glu Leu Leu Ala Ala Ser Leu Phe Ile Asn Leu
            20                  25                  30

Met Ala Leu Ala Val Pro Ile Phe Val Met Gln Val Tyr Asp Arg Val
        35                  40                  45

Ile Gly His Asn Gly Thr Ala Thr Leu Lys Gly Leu Val Ile Gly Val
    50                  55                  60
```

```
Gly Val Leu Met Ala Phe Asp Trp Ile Ile Arg Thr Ser Arg Gly Arg
65                  70                  75                  80

Ile Met Gln Thr Ala Ala Leu Arg Ile Asp Val Glu Ile Gly Thr Lys
                85                  90                  95

Leu Phe Asp Lys Ile Met His Leu Pro Leu Arg Thr Leu Glu Ser Arg
            100                 105                 110

Pro Ala Ser Phe Trp Gln Thr Leu Phe Arg Asp Val Asp Ser Ile Arg
        115                 120                 125

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

Val Leu Ile Phe Leu Gly Val Ile Phe Ile Ile Gly Arg Pro Leu Ala
145                 150                 155                 160

Leu Val Phe Val Val Leu Phe Val Ala Phe Leu Val Leu Ala Trp Arg
                165                 170                 175

Ser Gly Gly Ala Met Lys Glu Ser Thr Gly Lys Glu Lys Asn Val Gln
            180                 185                 190

Gln Ala Arg Asp Gly Leu Val Ala Glu Ile Ile Ala Gly Arg Ala Thr
        195                 200                 205

Val Lys Ala Val Ala Leu Asp Arg Ala Ile Arg Pro Ile Trp Glu Glu
    210                 215                 220

Lys Gln Ala Gly Ala Ile Glu Gln Ser Ile Gln Arg Gly Ala Val Asn
225                 230                 235                 240

Asp Glu Tyr Val Asn Leu Gly Gln Met Leu Thr Met Leu Gly Ser Val
                245                 250                 255

Ala Leu Thr Thr Val Gly Ala Val Phe Ile Met Asp His Asp Leu Thr
            260                 265                 270

Met Gly Ala Leu Val Ala Cys Asn Met Leu Ser Ser Arg Leu Tyr Gly
        275                 280                 285

Pro Ile Asn Gln Leu Val Gly Ala Trp Lys Ser Phe Ser Ser Phe Arg
    290                 295                 300

Gln Ser Val Asp Arg Leu Gly Glu Val Phe Ala Glu Ser Glu Glu Arg
305                 310                 315                 320

Arg His Ser Ala Ile Glu Arg Glu Arg Pro Ser Gly Leu Ile Thr Leu
                325                 330                 335
```

```
Glu Asp Ile Ser Phe Ala Tyr Asp Gln Lys Ser Gln Ala Ala Ala Ser
            340                 345                 350

Ile Asp Arg Leu Glu Ile His Pro Gly Gly Ile Thr Ala Val Leu Gly
        355                 360                 365

Arg Asn Gly Ser Gly Lys Thr Thr Leu Leu Lys Ile Ile Leu Gly Leu
    370                 375                 380

Tyr His Pro Ala Lys Gly Arg Val Leu Leu Asp Gly Ala Asp Ile Ala
385                 390                 395                 400

Gln Phe Thr Arg Ala Glu Leu Ala Gly Trp Met Gly Tyr Val Pro Gln
                405                 410                 415

Glu Cys Val Leu Phe Asn Ala Ser Ile Arg Asp Asn Ile Val Tyr Gly
            420                 425                 430

Ala Pro Gly Ala Ser Asp Glu Asp Ile Leu Glu Ala Ala Lys Val Ala
        435                 440                 445

Gly Val His Gln Tyr Ile Ile Asp Leu Pro Asp Gly Tyr Gly Thr Ser
    450                 455                 460

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

Ala Ile Ala Arg Ala Leu Leu Gly Asn Pro Pro Val Leu Leu Leu Asp
                485                 490                 495

Glu Pro Ser Ala Ser Leu Asp Arg Gln Ala Glu Glu Asp Leu Arg Thr
            500                 505                 510

Thr Leu Ala Glu Leu Gly Lys Thr Arg Thr Val Ile Ile Val Thr His
        515                 520                 525

Ser Pro Val Leu Leu Pro Ile Cys Arg Asp Val Val Val Leu Asp Lys
    530                 535                 540

Gly Cys Val Ala Ala Ala Gly Pro Ala Ala Glu Thr Leu Gln Arg Leu
545                 550                 555                 560

Phe Gly Ala Arg Pro Pro Gln Gln Pro Pro Ala Gln Pro Pro His Pro
                565                 570                 575

Gln Ser Ala Pro Gln Pro Ala Pro His Val Val Ser Gln Pro Ala Ala
            580                 585                 590

Pro Leu Gly Gly Gly Val Arg Ile Gly Val Gly Gly Val Ser
        595                 600                 605
```

<210> 255
<211> 564
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 255

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

Arg Thr Val Met Arg Glu Leu Leu Ala Ala Ser Leu Phe Ile Asn Leu
            20                  25                  30

Met Ala Leu Ala Val Pro Ile Phe Val Met Gln Val Tyr Asp Arg Val
        35                  40                  45

Ile Gly His Asn Gly Thr Ala Thr Leu Lys Gly Leu Val Ile Gly Val
    50                  55                  60

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

Ile Met Gln Thr Ala Ala Leu Arg Ile Asp Val Glu Ile Gly Thr Lys
                85                  90                  95

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

Pro Ala Ser Phe Trp Gln Thr Leu Phe Arg Asp Val Asp Thr Ile Arg
        115                 120                 125

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

Val Leu Ile Phe Leu Gly Val Ile Phe Val Ile Gly Arg Pro Leu Ala
145                 150                 155                 160

Leu Val Phe Val Leu Leu Phe Val Ala Phe Leu Val Leu Ala Trp Arg
                165                 170                 175

Ser Gly Gly Ala Met Lys Glu Ser Thr Gly Lys Glu Lys Asn Val Gln
            180                 185                 190

Gln Ser Arg Asp Gly Leu Val Ala Glu Ile Ile Ala Gly Arg Ala Thr
        195                 200                 205

Val Lys Ala Val Ala Leu Asp Arg Ala Ile Arg Pro Ile Trp Glu Glu
    210                 215                 220

Arg Gln Ala Gly Ala Ile Glu Gln Ser Ile Gln Arg Gly Ala Val Asn
225                 230                 235                 240

Asp Glu Tyr Val Asn Leu Gly Gln Met Leu Thr Met Leu Gly Ser Val
```

245 250 255

Leu Leu Thr Thr Val Gly Ala Val Phe Ile Met Asp His Asp Leu Thr
260 265 270

Met Gly Ala Leu Val Ala Cys Asn Met Leu Ser Ser Arg Leu Tyr Gly
275 280 285

Pro Ile Asn Gln Leu Val Gly Ala Trp Lys Ser Phe Ser Ser Phe Arg
290 295 300

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

Arg His Ser Ala Ile Ala Arg Glu Arg Pro Thr Gly Leu Ile Thr Leu
325 330 335

Glu Asp Ile Ser Phe Ala Tyr Asp Gln Lys Ser Gln Ala Ala Ala Ser
340 345 350

Ile Asp Arg Leu Glu Ile His Pro Gly Gly Ile Thr Ala Val Leu Gly
355 360 365

Arg Asn Gly Ser Gly Lys Thr Thr Leu Leu Lys Ile Ile Leu Gly Leu
370 375 380

Tyr His Pro Ala Lys Gly Arg Val Leu Leu Asp Gln Ala Asp Ile Ala
385 390 395 400

Gln Phe Thr Arg Ser Glu Leu Ala Gly Trp Met Gly Tyr Val Pro Gln
405 410 415

Glu Cys Val Leu Phe Asn Ala Ser Ile Arg Asp Asn Ile Val Tyr Gly
420 425 430

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

Gly Val His Gln Tyr Ile Val Asp Leu Pro Asp Gly Tyr Gly Thr Ser
450 455 460

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

Ala Ile Ala Arg Ala Leu Leu Gly Asp Pro Pro Val Leu Leu Leu Asp
485 490 495

Glu Pro Ser Ala Ser Leu Asp Arg Gln Ala Glu Glu Asp Leu Arg Asn
500 505 510

Thr Leu Ala Glu Leu Gly Lys Thr His Thr Val Ile Ile Val Thr His

515 520 525

Ser Pro Val Leu Leu Pro Ile Cys Arg Asp Val Val Val Leu Asp Lys
530 535 540

Gly Ser Val Ala Ala Ala Gly Pro Ala Ala Glu Thr Leu Gln Arg Leu
545 550 555 560

Phe Gly Ala Arg

<210> 256
<211> 588
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 256

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

Arg Pro Val Met Arg Glu Leu Leu Ala Ala Ser Leu Phe Ile Asn Leu
20 25 30

Met Ala Leu Ala Val Pro Ile Phe Val Met Gln Val Tyr Asp Arg Val
35 40 45

Ile Gly His Asn Gly Val Ala Thr Leu Lys Gly Leu Val Ile Gly Val
50 55 60

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

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

Leu Phe Asp Lys Ile Met His Leu Pro Leu Arg Thr Leu Glu Ser Arg
100 105 110

Pro Ala Ser Phe Trp Gln Thr Leu Phe Arg Asp Val Asp Ser Ile Arg
115 120 125

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

Val Leu Ile Phe Leu Gly Val Ile Phe Val Ile Gly Arg Pro Leu Ala
145 150 155 160

Met Val Phe Ile Leu Leu Phe Val Ala Phe Leu Val Leu Ala Trp Arg
165 170 175

Ser Gly Gly Ala Met Lys Glu Thr Gly Asp Lys Glu Lys Asn Val Gln
180 185 190

```
Gln Ala Arg Asp Ser Leu Val Ala Glu Ile Ile Ala Gly Arg Ala Thr
        195                 200                 205

Val Lys Ala Val Ala Leu Asp Arg Ala Ile Arg Pro Ile Trp Glu Glu
    210                 215                 220

Lys Gln Ala Gly Ala Ile Glu Gln Ser Ile Gln Arg Gly Ala Thr Asn
225                 230                 235                 240

Asp Glu Tyr Val Asn Met Gly Gln Met Leu Thr Met Leu Gly Ser Val
                245                 250                 255

Leu Leu Thr Thr Val Gly Ala Val Tyr Ile Met Asp Gln Gln Leu Thr
            260                 265                 270

Met Gly Ala Leu Val Ala Cys Asn Met Leu Ser Ser Arg Leu Tyr Gly
        275                 280                 285

Pro Ile Asn Gln Leu Val Gly Ala Trp Lys Ser Phe Ala Ser Phe Arg
    290                 295                 300

Gln Ser Val Asp Arg Leu Gly Glu Ile Phe Asn Glu Ala Glu Glu Arg
305                 310                 315                 320

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

Glu Asp Ile Ser Phe Ala Tyr Asp Gln Lys Ser Gln Ala Ala Ser Ser
            340                 345                 350

Ile Asp Arg Leu Glu Ile Arg Pro Gly Gly Ile Thr Ala Val Leu Gly
        355                 360                 365

Arg Asn Gly Ser Gly Lys Thr Thr Leu Leu Lys Ile Ile Leu Gly Leu
    370                 375                 380

Tyr His Pro Ala Lys Gly Arg Val Leu Leu Asp Gly Ala Asp Ile Ala
385                 390                 395                 400

Gln Phe Thr Arg Ser Glu Leu Ala Gly Trp Met Gly Tyr Val Pro Gln
                405                 410                 415

Glu Cys Val Leu Phe Asn Ala Ser Ile Arg Asp Asn Ile Val Tyr Gly
            420                 425                 430

Cys Pro Gly Ala Gly Asp Glu Gln Ile Leu Ala Ala Ala Lys Val Ala
        435                 440                 445

Gly Val His Gln Tyr Ile Val Asp Leu Pro Asp Gly Tyr Gly Thr Ser
    450                 455                 460
```

```
Ile Gly Glu Ala Gly Ser Arg Leu Ser Ala Gly Gln Arg Gln Arg Ile
465                 470                 475                 480

Ala Ile Ala Arg Ala Leu Leu Gly Asp Pro Pro Val Leu Leu Leu Asp
                485                 490                 495

Glu Pro Ser Ala Ser Leu Asp Arg Gln Ala Glu Glu Asp Leu Arg Thr
            500                 505                 510

Thr Leu Ala Glu Leu Gly Lys Thr Arg Thr Val Ile Ile Val Thr His
        515                 520                 525

Ser Pro Val Leu Leu Pro Ile Cys Arg Asp Val Val Val Leu Asp Lys
    530                 535                 540

Gly Ile Val Ala Ala Ala Gly Pro Ala Ala Glu Thr Leu Gln Arg Leu
545                 550                 555                 560

Phe Gly Ala Arg Pro Gln Gln Pro Pro Pro Gln Gln Gln Pro His His
                565                 570                 575

Pro Pro His Val Val Thr Gln Pro Ala Gln Pro Leu
            580                 585
```

<210> 257
<211> 569
<212> PRT
<213> Phaeospirillum fulvum MGU-K5

<400> 257

```
Met Thr Glu Gln His Glu Asn Trp Leu Lys Pro Ile Leu Asp Pro Leu
1               5                   10                  15

Arg Ser Val Met Arg Glu Leu Leu Ile Ala Ser Leu Phe Ile Asn Leu
            20                  25                  30

Met Ala Leu Ala Val Pro Ile Phe Val Met Gln Val Tyr Asp Arg Val
        35                  40                  45

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

Ala Leu Leu Leu Ala Phe Asp Trp Ile Ile Arg Thr Ser Arg Gly Arg
65                  70                  75                  80

Ile Leu Gln Thr Met Ala Leu Arg Ile Asp Val Asp Val Gly Thr Arg
                85                  90                  95

Leu Phe Asp Lys Ile Thr Arg Leu Pro Leu Arg Thr Leu Glu Ser Arg
            100                 105                 110
```

```
Pro Thr Ser Phe Trp Gln Thr Leu Phe Arg Asp Val Asp Thr Leu Arg
        115                 120                 125

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

Val Phe Ile Phe Leu Gly Val Ile Phe Val Ile Gly Gln Pro Leu Ala
145                 150                 155                 160

Leu Val Phe Val Leu Leu Leu Ala Ala Phe Ala Ile Leu Ala Trp Ala
                165                 170                 175

Ser Gly Arg Ser Val Ser Glu Ala Ser Gly Gln Glu Lys Asn Ala Gln
            180                 185                 190

Ala Gly Arg Asp Ala Leu Val Ala Glu Ile Ile Ala Gly Arg Ala Thr
        195                 200                 205

Val Lys Ala Val Ala Leu Asp Gly Ala Leu Arg Pro Leu Trp Glu Glu
    210                 215                 220

Arg Gln Ala Ala Ala Ile Glu Gln Ser Ile Arg Arg Gly Ala Ala Ala
225                 230                 235                 240

Asp Gly Phe Val Asn Leu Gly Gln Thr Leu Thr Met Leu Gly Ser Val
                245                 250                 255

Gly Leu Thr Thr Val Gly Ala Leu Tyr Ile Ile Asp His Gln Leu Ser
            260                 265                 270

Met Gly Ala Leu Ile Ala Cys Asn Met Leu Ser Gly Arg Leu Tyr Gly
        275                 280                 285

Pro Ile Asn Gln Leu Val Gly Ala Trp Lys Ser Phe Ser Ala Phe Arg
    290                 295                 300

Gln Ser Val Asp Arg Leu Gly Asp Ile Phe Ala Glu Thr Glu Glu Arg
305                 310                 315                 320

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

Glu Ser Val Ser Phe Ala Tyr Asp Pro Lys Leu Pro Pro Ala Thr Arg
            340                 345                 350

Ile Glu Arg Leu Glu Ile Arg Pro Gly Gly Leu Thr Ala Ile Leu Gly
        355                 360                 365

Arg Asn Gly Ser Gly Lys Thr Thr Leu Leu Lys Ile Leu Leu Gly Leu
    370                 375                 380
```

```
Tyr Pro Pro Ala Glu Gly Arg Val Leu Leu Asp Gly Ala Asp Ile Ala
385                 390                 395                 400

Gln Phe Thr Arg Ala Glu Leu Ala Gly Trp Ile Gly Tyr Val Pro Gln
                405                 410                 415

Glu Cys Val Leu Phe Asn Ala Thr Ile Arg Asp Asn Ile Ala Tyr Gly
            420                 425                 430

Ala Pro Gly Cys Asp Asp Glu Ala Ile Leu Ala Ala Ala Arg Thr Ala
        435                 440                 445

Gly Val His His Tyr Ile Val Asp Leu Pro Asp Gly Tyr Ala Thr Pro
    450                 455                 460

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

Ala Ile Ala Arg Ala Leu Ile Gly Asp Pro Pro Val Leu Leu Leu Asp
                485                 490                 495

Glu Pro Ser Ala Ser Leu Asp Arg Gln Ala Glu Glu Glu Leu Arg Ala
            500                 505                 510

Thr Leu Ala Glu Leu Gly Arg Ser Arg Thr Val Val Ile Val Thr His
        515                 520                 525

Ser Pro Val Leu Leu Pro Val Cys Arg Asp Val Val Val Leu Asp Lys
    530                 535                 540

Gly Thr Val Thr Ala Ala Gly Pro Ala Ala Glu Thr Leu Asn Arg Leu
545                 550                 555                 560

Phe Gly Pro Arg Pro Thr Ala Ala Pro
                565


<210>  258
<211>  553
<212>  PRT
<213>  Novispirillum itersonii

<400>  258

Trp Phe Asp Thr Val Leu Arg Pro Leu Leu Pro Val Thr Arg Asp Leu
1               5                   10                  15

Leu Ser Ala Ser Leu Phe Ile Asn Ile Leu Ala Leu Ala Gly Pro Val
            20                  25                  30

Phe Val Met Gln Val Tyr Asp Arg Val Val Ala Gln Ala Gly Leu Ser
        35                  40                  45
```

```
Thr Leu Thr Gly Leu Val Ile Gly Met Gly Leu Val Val Ile Phe Asp
    50                  55                  60

Phe Thr Leu Arg Gln Met Arg Ala Arg Val Met Gln Gly Val Ala Val
65                  70                  75                  80

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

Leu Pro Leu Arg Thr Leu Glu Ser Arg Pro Thr Ala Ala Trp Gln Gln
            100                 105                 110

Thr Phe Gln Asp Ile Glu Val Leu Arg Asn Cys Leu Ser Gly Pro Thr
        115                 120                 125

Val Val Leu Leu Phe Asp Leu Pro Phe Thr Leu Leu Phe Leu Ala Leu
    130                 135                 140

Ile Phe Val Ile Ala Met Pro Val Ala Trp Val Leu Val Gly Ala Leu
145                 150                 155                 160

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

Ala Ala Val Lys Glu Arg Gly Arg Lys Val Ser Arg Asp Val Met Met
            180                 185                 190

Ala Glu Thr Val Met Gly Arg Thr Thr Val Lys Ala Leu Ala Leu Glu
        195                 200                 205

Arg Gly Ile Leu Pro Leu Trp Glu Glu Arg Gln Ala Glu Ser Ile Glu
    210                 215                 220

Arg Ser Leu Glu Arg Gly Gln Ser Ser Asp Arg Phe Val Asn Met Ala
225                 230                 235                 240

Leu Ala Val Thr Thr Leu Thr Thr Val Leu Met Thr Thr Val Gly Ala
                245                 250                 255

Leu Ala Ile Val Asp Gln Lys Met Ser Met Gly Ala Leu Val Ala Ala
            260                 265                 270

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

Ala Trp Arg Thr Leu Gln Gly Phe Arg Gln Ser Ala Arg Arg Leu Gly
    290                 295                 300

Asp Leu Phe Ser Gln Pro Glu Asp Arg Gln Thr Ser Ser Leu Ser Leu
305                 310                 315                 320
```

```
Pro Arg Pro Ser Gly Ala Leu Thr Ala Asp Ser Ile Thr Phe Arg Tyr
                325                 330                 335

Gly Ala Glu Thr Val Pro Thr Ile Asn Ala Val Lys Tyr Ser Phe Arg
            340                 345                 350

Pro Gly Gly Ile Thr Ala Ile Met Gly Arg Asn Gly Cys Gly Lys Thr
        355                 360                 365

Thr Leu Leu Lys Leu Leu Leu Gly Leu Tyr Thr Pro Glu Asp Gly Arg
    370                 375                 380

Val Leu Leu Asp Gly Ala Asp Leu Ser Gln Phe Thr Arg Ala Glu Leu
385                 390                 395                 400

Ala Gly Trp Ile Gly Tyr Val Pro Gln Asp Cys Val Leu Phe Ser Gly
                405                 410                 415

Ser Ile Arg Asp Asn Leu Thr Arg Ala His Pro Gly Ile Ser Asp Ala
            420                 425                 430

Asp Ile Leu Glu Ala Ser Thr Leu Ala Gly Ala His Gln Tyr Ile Val
        435                 440                 445

Asn Leu Pro Asp Gly Tyr Ala Thr Asp Val Gly Glu Met Gly Ser Leu
    450                 455                 460

Leu Ser Gly Gly Ile Arg Gln Arg Leu Ala Ile Ala Arg Ala Leu Met
465                 470                 475                 480

Gly Lys Pro Ser Val Leu Ile Leu Asp Glu Pro Ser Gly Ser Leu Asp
                485                 490                 495

Arg Gln Ala Glu Glu His Leu Arg Asp Val Leu Val Arg Leu Ser Gln
            500                 505                 510

Asp Arg Thr Val Ile Val Val Thr His Ser Pro Thr Leu Leu Ser Ala
        515                 520                 525

Cys Arg Ser Ile Ile Val Met Asp Gln Gly Lys Ile Ala Val Ser Gly
    530                 535                 540

Pro Ser Ala Asp Val Met Gly Tyr Leu
545                 550
```

<210> 259
<211> 577
<212> PRT
<213> Caenispirillum salinarum

<400> 259

```
Ser Trp Leu Arg Pro Val Leu Lys Pro Leu Arg Pro Ala Phe Leu Glu
```

```
1               5                  10                  15

Val Leu Thr Leu Ser Phe Phe Ala Asn Leu Leu Ala Thr Ala Val Pro
            20                  25                  30

Ile Phe Thr Leu Gln Val Tyr Asp Arg Val Val Phe His Asn Gly Leu
        35                  40                  45

Ser Thr Leu Gln Gly Leu Val Ala Gly Met Val Leu Val Leu Ala Phe
    50                  55                  60

Asp Phe Val Leu Arg Gln Thr Arg Ser Arg Val Leu Gln Arg Val Ala
65                  70                  75                  80

Leu Thr Ile Asp Ala Lys Val Gly Arg Arg Leu Phe Asp Lys Ile Thr
                85                  90                  95

Ala Leu Pro Leu Arg Thr Leu Glu Ser Arg Arg Thr Ala Phe Trp Gln
            100                 105                 110

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

Thr Val Val Leu Leu Val Asp Leu Pro Phe Val Val Leu Phe Val Gly
    130                 135                 140

Leu Val Tyr Val Ile Ala Ala Pro Val Ala Trp Val Leu Leu Ile Ala
145                 150                 155                 160

Phe Gly Ala Phe Val Leu Leu Ala Ala Trp Ser Ala Ala Thr Met Ala
                165                 170                 175

Lys Ala Ala Lys Ala Glu Lys Asp Lys Ala Ala Arg Arg Asp Leu Leu
            180                 185                 190

Val Ala Glu Thr Ile Gln Gly Arg Ala Thr Val Lys Ala Leu Ala Leu
        195                 200                 205

His Arg His Leu Arg Pro Arg Trp Glu Asp Leu Gln Ala Asp Thr Ile
    210                 215                 220

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

Ala His Val Met Thr Met Ala Thr Thr Val Ala Met Thr Thr Val Gly
                245                 250                 255

Ala Leu Ala Ile Met Glu Gln Glu Met Thr Ile Gly Ala Leu Ile Ala
            260                 265                 270

Ala Asn Met Leu Ser Gly Arg Met Met Gly Pro Met Asn Gln Val Val
```

275 280 285

Gly Ala Trp Arg Ser Tyr Ala Gly Phe Arg Gln Ser Ala Ala Arg Leu
290 295 300

Gly Lys Leu Phe Gly Glu Ala Glu Glu Arg Met Thr Ala Ala Ile Thr
305 310 315 320

His Asp Arg Pro Ala Gly Arg Leu Ser Leu Asp Gly Val Gly Phe Arg
325 330 335

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

Pro Pro Gly Gly Ile Thr Cys Leu Met Gly Arg Asn Gly Ser Gly Lys
355 360 365

Thr Thr Leu Ala Lys Leu Leu Thr Gly Leu Tyr Arg Pro Gly Glu Gly
370 375 380

Arg Val Leu Leu Asp Gly Ala Asp Met Ala Gln Phe Ser Arg Glu Glu
385 390 395 400

Leu Ala Thr Trp Ile Gly Tyr Val Pro Gln Glu Thr Val Leu Leu Ser
405 410 415

Gly Ser Ile Arg Asp Ala Ile Ser Gln Gly Thr Val Ala Gly Glu Ala
420 425 430

Gly Asp Glu Ala Ile Ile Thr Ala Ala Lys Arg Ala Cys Val His Asp
435 440 445

Ile Ile Met Asp Met Pro Asp Gly Tyr Asp Thr Asp Val Gly Glu Ala
450 455 460

Gly Ala Leu Leu Ala Gly Gly Val Arg Gln Arg Ile Ala Ile Ala Arg
465 470 475 480

Ala Leu Val Thr Asp Pro Pro Val Ile Ile Met Asp Glu Pro Ser Ser
485 490 495

His Leu Asp Thr Gln Ala Glu Gln Thr Leu Ala Gln Ser Leu Ala Ala
500 505 510

Leu Ala Ala Asp Arg Asn Val Ile Leu Val Thr His Ser Pro Val Leu
515 520 525

Leu Asn Ala Ala Arg Ser Ile Ile Val Leu Glu Arg Gly Arg Ile Ala
530 535 540

Ala Gly Gly Pro Ala Gly Gln Val Met Thr Trp Leu Gln Gly Arg Gly

545 550 555 560

Ala Ala Pro Gly Gln Gln Gly Gly Ala Lys Ala Pro Glu Thr Arg Glu
565 570 575

Ala

<210> 260
<211> 560
<212> PRT
<213> Rhodospirillum photometricum DSM 122

<400> 260

Lys Pro Ser Trp Leu Arg Asp Leu Leu Ala Pro Leu Phe Pro Ser Phe
1 5 10 15

Arg Glu Val Leu Ala Leu Ser Leu Phe Val Asn Ile Ala Ala Leu Ala
20 25 30

Thr Pro Val Phe Ser Leu Gln Ile Tyr Asp Arg Val Val Tyr His Asn
35 40 45

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

Val Phe Asp Phe Ile Met Arg Gln Ala Arg Ala Arg Ile Leu Gln Thr
65 70 75 80

Val Ala Leu Arg Leu Glu Ala Gln Val Gly Gln Arg Leu Phe Asp Lys
85 90 95

Met Thr Ala Leu Pro Leu Arg Val Leu Glu Ser Arg Pro Ala Glu Glu
100 105 110

Trp Leu Arg Leu Phe Arg Asp Val Asp Val Val Arg Asn Thr Leu Ser
115 120 125

Gly Ala Ser Ala Leu Leu Val Cys Asp Leu Pro Phe Thr Val Leu Phe
130 135 140

Leu Gly Thr Val Phe Leu Leu Ala Pro Pro Val Gly Trp Val Val Val
145 150 155 160

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

Ile Asp Gln Ala Ala Leu Arg Glu Arg Glu Thr Leu Gly Gly Arg Asp
180 185 190

Gly Leu Leu Ala Glu Ile Val Arg Gly Arg Ala Thr Val Lys Ala Leu
195 200 205

```
Ala Leu Glu Thr Thr Leu Ala Asp Val Tyr Arg Gln His Leu Ala Ala
    210                 215                 220

Gln Val Gln Gly Ser Val Arg Arg Gly Gly Leu Val Asp His Phe Thr
225                 230                 235                 240

Asn Leu Gly Met Val Leu Ser Met Thr Thr Thr Val Ala Met Thr Thr
                245                 250                 255

Val Gly Ala Leu Ala Ile Leu Asp His Ser Leu Thr Val Gly Gly Leu
            260                 265                 270

Ile Ala Ala Asn Met Leu Gly Gly Arg Leu Met Ser Pro Leu Asn Gln
        275                 280                 285

Leu Met Gly Thr Trp Arg Gly Phe Ala Gly Phe Arg Gln Ser Ala Gln
    290                 295                 300

Arg Leu Gly Gln Val Leu Ala Leu Pro Glu Asp Arg Arg Val Ser Ala
305                 310                 315                 320

Leu Arg Leu Pro Pro Pro Ser Gly Arg Leu Thr Val Val Lys Ala Ser
                325                 330                 335

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

Asp Leu Gln Pro Gly Gly Ile Thr Ala Leu Val Gly Pro Asn Gly Ser
        355                 360                 365

Gly Lys Thr Thr Leu Leu Lys Leu Leu Val Gly Leu Tyr Pro Pro Ala
    370                 375                 380

Ser Gly Arg Val Leu Leu Asp Gly Ala Asp Leu Ala Gln Phe Thr Arg
385                 390                 395                 400

Ala Glu Leu Ala Gly Trp Ile Gly Thr Leu Pro Gln Asp Ile Thr Leu
                405                 410                 415

Phe Asp Gly Thr Val Arg Glu Ala Ile Ala Met Gly His Pro Gly Leu
            420                 425                 430

Asp Asp Glu Ala Val Arg Glu Ala Ala Gln Thr Ala Gly Val His Glu
        435                 440                 445

Met Ile Leu Asp Leu Pro Gln Gly Tyr Ala Thr Arg Val Gly Glu Gly
    450                 455                 460

Gly Gly Leu Leu Ser Gly Gly Met Arg Gln Arg Leu Ala Leu Ala Arg
465                 470                 475                 480
```

```
Ala Leu Ala Gly Lys Pro Pro Val Leu Leu Leu Asp Glu Pro Ser Ser
                485                 490                 495

Ser Leu Asp Arg Ala Ala Glu Glu Ala Leu Val Glu Thr Leu Ala Arg
            500                 505                 510

Leu Ala Thr Gln Arg Ser Val Ile Val Val Thr His Ser Pro Leu Leu
        515                 520                 525

Leu Ala Arg Cys Gln Arg Val Val Val Leu Asn Lys Gly Arg Val Leu
    530                 535                 540

Ala His Gly Pro Ala Gly Glu Ile Leu Pro Arg Leu Phe Pro Ala Arg
545                 550                 555                 560
```

<210> 261
<211> 362
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 261

```
Met Ile Ala Gly Arg Gly Thr Val Lys Ala Val Ala Leu Asp Gln Ala
1               5                   10                  15

Leu Arg Pro Leu Trp Glu Glu Arg Gln Ala Gly Ala Ile Glu His Ser
            20                  25                  30

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

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

Ile Ile Asp His Gln Leu Ser Met Gly Ala Leu Ile Ala Cys Asn Met
65                  70                  75                  80

Leu Ser Ala Arg Leu Tyr Gly Pro Ile Asn Gln Leu Val Gly Ala Trp
                85                  90                  95

Arg Gly Phe Gly Ser Phe Arg Gln Ala Val Ala Arg Leu Gly Glu Thr
            100                 105                 110

Phe Asp Met Ala Glu Asp Arg Ser Val Ser Val Ile Ala Arg Asp Arg
        115                 120                 125

Pro His Gly Asn Leu Arg Val Glu Asn Val Thr Phe Thr Tyr Gly Thr
    130                 135                 140

Glu Pro His Ala Pro Ala Thr Ile Asp Ile Pro Ser Leu Glu Phe Lys
145                 150                 155                 160
```

```
Pro Gly Gly Met Thr Ala Ile Leu Gly Lys Asn Gly Ser Gly Lys Thr
                165                 170                 175

Thr Leu Leu Lys Leu Leu Met Gly Leu Tyr Pro Pro Thr Gly Gly Arg
            180                 185                 190

Val Leu Leu Asp Asp Ala Asp Met Ala Gln Phe Thr Arg His Glu Leu
        195                 200                 205

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

Thr Ile Arg Asp Asn Ile Ala Tyr Gly Ala Pro Gly Cys Ser Asp Gln
225                 230                 235                 240

Asp Ile Leu Glu Ala Ala Thr Ala Ala Gly Val His Ser Thr Ile Ile
                245                 250                 255

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

Leu Ser Ala Gly Gln Arg Gln Arg Ile Ala Ile Ala Arg Ala Leu Val
        275                 280                 285

Gly Asn Pro Ala Val Leu Leu Leu Asp Glu Pro Ser Ala Ser Leu Asp
    290                 295                 300

Arg His Ala Glu Glu Asp Leu Arg Ala Ala Leu Gln Ala Met Ala Ala
305                 310                 315                 320

Thr Arg Thr Val Val Val Val Thr His Ser Ala Val Leu Leu Pro Ala
                325                 330                 335

Cys Arg Asp Val Val Val Leu Asp Lys Gly Lys Leu Ala Ala Arg Gly
            340                 345                 350

Pro Ala Ala Glu Val Leu Pro Arg Leu Phe
        355                 360


<210>  262
<211>  557
<212>  PRT
<213>  Glaciecola sp. HTCC2999

<400>  262

Gln Ala Gln Thr Trp Phe Asp Ala Ile Phe Glu Pro Leu Arg Pro Ala
1               5                   10                  15

Tyr Lys Gln Thr Leu Leu Met Ala Phe Gly Ile Asn Ile Ile Gly Leu
            20                  25                  30
```

```
Phe Ala Ser Ile Phe Ala Leu Gln Val Tyr Asp Arg Val Ile Ala Lys
        35                  40                  45

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

Ile Leu Val Glu Phe Ile Leu Arg Gly Gly Arg Ser Ala Leu Met Arg
65                  70                  75                  80

Arg Ile Gly Ser Arg Ile Glu Ile Ser Ile Ala Arg Thr Val Tyr Lys
                85                  90                  95

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

Phe Trp Gln Ala Met Phe Arg Asp Ile Glu Leu Val Arg Ser Val Met
        115                 120                 125

Ala Gly Ala Pro Ala Leu Leu Leu Ile Asp Leu Pro Phe Ile Val Leu
    130                 135                 140

Thr Leu Ile Leu Leu Ser Ile Ile Ala Pro Pro Leu Leu Val Leu Ala
145                 150                 155                 160

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

Val Met Arg Asn Ala Ala Ala Asp Glu Lys Ala Leu Met Ile Asn Arg
            180                 185                 190

Asp Ala Val Leu Ser Asp Leu Thr Ala Ser Arg Arg His Leu Lys Ala
        195                 200                 205

Val Gly Pro Ser Ala Ser Leu Asn Leu Lys Trp Glu Thr Gln Tyr Ala
    210                 215                 220

Gln Trp Met Glu Asn Ser Val Asp Arg Ser Glu Glu Ser Asp Arg Tyr
225                 230                 235                 240

Arg Asp Met Ser Gln Ser Leu Met Val Ser Ser Thr Val Leu Met Thr
                245                 250                 255

Ser Phe Gly Ala Ile Ala Ile Met Asn Gln Leu Met Thr Met Gly Ala
            260                 265                 270

Leu Ile Ala Ala Asn Ile Leu Thr Gly Lys Leu Thr Ser Pro Met Val
        275                 280                 285

Gln Leu Val Ser Gln Trp Arg Thr Phe Gly Gln Phe Asn Leu Ala Arg
    290                 295                 300
```

```
Asp Arg Leu Asn Glu Leu Phe Ser Val Pro Leu Asp Arg Thr Val Ser
305                 310                 315                 320

Pro Val Ala Met Ala Arg Pro Glu Gly Gln Leu Thr Leu Asp Lys Val
                325                 330                 335

Ser Phe Ala Tyr Pro Gln Ser Glu Ser Asn Gln Ile Asn Glu Val Ser
            340                 345                 350

Gly Arg Leu Gly Ala Thr Gly Leu His Val Ile Val Gly Asn Asn Gly
        355                 360                 365

Ser Gly Lys Thr Thr Leu Leu Lys Leu Met Arg Gly Leu Tyr Ala Pro
    370                 375                 380

Ser Ala Gly Arg Ile Leu Ile Asp Gly Ser Asp Ile Lys Gln Phe Gly
385                 390                 395                 400

Gln Gln Asp Leu Ala Lys Trp Ile Gly Tyr Leu Pro Gln Gln Pro Arg
                405                 410                 415

Leu Val Gln Gly Thr Ile Lys Glu Asn Leu Leu Leu Ala Ser Thr Asp
            420                 425                 430

Ile Thr Asp Glu Glu Leu Val Thr Ile Cys Lys Leu Ala Gly Ala Phe
        435                 440                 445

Glu Phe Ile Thr Ser Leu Pro Asp Gly Phe Asp Thr Glu Val Gly Glu
    450                 455                 460

Ala Gly Ser Arg Phe Ser Ser Gly Gln Arg Lys Arg Ile Ala Ile Ala
465                 470                 475                 480

Gln Thr Leu Met Gln Ser Pro Pro Ile Ile Leu Phe Asp Glu Pro Thr
                485                 490                 495

Ser Asp Leu Asp Arg Glu Ala Glu Gln Ala Phe Ile Ala Gln Met Lys
            500                 505                 510

Leu Leu Ala Arg Asp Arg Thr Val Ile Val Val Ser His Ser Pro Val
        515                 520                 525

Leu Leu Gln Gln Ala Asp Gly Ile Val Val Leu Gln Asn Gly Arg Val
    530                 535                 540

Ala Ala Ala Gly Leu Ala Lys Asp Val Leu Pro Lys Leu
545                 550                 555
```

<210> 263
<211> 573
<212> PRT
<213> Limnobacter sp. MED105

<400> 263

Val Ile Arg Ser Ala Leu Pro Leu Leu Lys Arg Ala Ala Leu Leu Ser
1 5 10 15

Ile Phe Val Asn Leu Val Ala Leu Phe Pro Ala Val Phe Ser Leu Gln
20 25 30

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

Leu Leu Ile Gly Met Gly Ile Leu Leu Ala Ala Asp Leu Ile Leu Arg
50 55 60

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

Gln Ile Ala Ser Lys Leu Met Asn Lys Ile Leu Ser Ile Pro Leu Arg
85 90 95

Gln Leu Glu Ala Arg Ser Thr Ala Ala Trp Tyr Ser Leu Phe Lys Asp
100 105 110

Val Asp Thr Val Arg Val Val Trp Ser Gly Ala Val Ala Met Thr Ile
115 120 125

Leu Asp Leu Pro Phe Ala Ile Leu Ala Ile Gly Leu Ile Ala Thr Ile
130 135 140

Ala Leu Pro Val Leu Pro Val Val Leu Ile Gly Leu Val Cys Leu Ala
145 150 155 160

Ala Leu Ser Trp Tyr Ser Ser Gly Glu Phe Arg Lys Arg Arg Val Glu
165 170 175

Glu Phe Ser Arg Ala Arg Arg Arg Asp Glu Val Leu Ala Glu Val Cys
180 185 190

Arg Gly Arg Glu Ala Ile Lys Ser Leu Val Gln Asp Asp Ser Ala Lys
195 200 205

Arg Ala Trp Val Ser Ser Tyr Asn Ser Trp Val Gln Glu Ser Phe Gln
210 215 220

Lys Asn Gly Glu Met Glu Asp Gln Arg Glu Leu Ser Val Ser Ile Met
225 230 235 240

Leu Cys Val Asn Val Ala Ile Thr Ala Val Gly Ala Tyr Ala Val Ile
245 250 255

Asn Gln Trp Met Thr Val Gly Gly Leu Ile Ala Ser Asn Met Leu Ala

260 265 270

Ala Lys Ala Ile Gly Pro Leu Ala Ala Leu Thr Gly His Trp Arg Ser
275 280 285

Ile Ala His Ser Arg Glu Ala Thr Asp Arg Leu Asn Lys Val Phe Ala
290 295 300

Ala Asp Glu Glu Lys Gln His Thr Gly Leu Ser Leu Pro Met Pro Ser
305 310 315 320

Gly Ala Leu Arg Leu Glu Asn Val Ser Tyr Gln His Val Gly Ala Gln
325 330 335

Lys Glu Val Val Lys Ser Val Ser Ala Gln Ile Gly Pro Arg Gly Ile
340 345 350

Tyr Gly Leu Ala Gly Asp Asn Gly Ala Gly Lys Ser Thr Leu Leu Lys
355 360 365

Leu Leu Arg Gly Leu Tyr Glu Pro Gln Ser Gly Arg Val Leu Leu Asp
370 375 380

Glu Tyr Asp Leu Ser Gln Phe Ser Arg Gln Glu Leu Ala Lys Trp Ile
385 390 395 400

Gly Phe Leu Pro Gln Thr Ser Gln Leu Phe Glu Gly Thr Ile Val Glu
405 410 415

Asn Leu Arg Arg Ser Asn Pro Asp Ala Ser Asp Glu Gln Ile Leu Leu
420 425 430

Ala Ala Lys Arg Ser Gly Ala His Glu Phe Ile Ala Lys Met Pro Asp
435 440 445

Gly Tyr Met Thr Gln Val Gly Glu Gly Gly Asn Arg Leu Ser Gly Gly
450 455 460

Gln Arg Arg Arg Val Ala Ile Thr Gln Ala Phe Leu Ser Asp Ala Pro
465 470 475 480

Val Leu Leu Leu Asp Glu Pro Thr Asn Asp Leu Asp Phe Ala Ala Glu
485 490 495

Thr His Leu Met Ala Val Phe Lys Ser Leu Ala Thr Val Lys Thr Ile
500 505 510

Ile Met Val Thr His Ser Val Arg Leu Met Ser Ile Cys Asp Lys Ile
515 520 525

Ile Tyr Leu Asp Lys Ala Ser Lys Leu His Val Gly Ala Thr Pro Glu

530 535 540

Met Leu Lys Leu Leu Tyr Gly Ile Ser Val Pro Lys Pro Val Pro Ala
545 550 555 560

Ala Pro Lys Ala Ala Ser Gln Val Thr Ser Glu Ala Ala
565 570

<210> 264
<211> 568
<212> PRT
<213> Pseudomonas stutzeri

<400> 264

Val Asp Thr Ser Asp Gly Asp Trp Leu His Val Leu Leu Gln Pro Leu
1 5 10 15

Arg Pro Ala Tyr Arg Gln Ala Leu Met Leu Ala Gly Leu Val Asn Leu
20 25 30

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

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

Leu Ile Ala Ile Ala Phe Asp His Leu Leu Arg Ala Gly Arg Ala Gln
65 70 75 80

Leu Leu Gln Arg Val Gly Leu Gln Ile Glu Val Ala Ile Ala Arg Ser
85 90 95

Ala Phe Glu Arg Leu Leu Ala Leu Pro Ala Thr Val Leu Glu Ser Arg
100 105 110

Pro Pro Ala Tyr Trp Gln Thr Val Phe Arg Asp Ile Glu Leu Val Arg
115 120 125

Ala Thr Trp Ser Gly Ala Thr Ala Leu Leu Leu Val Asp Leu Pro Phe
130 135 140

Leu Val Leu Ala Leu Ala Leu Leu Ala Leu Ile Ala Leu Pro Leu Leu
145 150 155 160

Pro Val Ala Leu Cys Val Ile Ala Ala Phe Val Val Leu Ala Trp Arg
165 170 175

Ser Gly Arg Val Thr Arg Asp Ala Ala Glu Ser Glu Arg Glu Lys Leu
180 185 190

Val Gly Arg Asp Ala Ala Ile Ser Glu Leu Ala His Ala Arg Met Leu
195 200 205

```
Leu Lys Ala Ile Gly Ala Gln Gln Ser Ala His Ala Arg Trp Glu Lys
    210                 215                 220

Asn Tyr Ala Glu Trp Met Ser Glu Ala Ala Gly Arg Ser Arg Asp Gly
225                 230                 235                 240

Asp His Tyr Arg Asp Val Ala His Gly Met Ser Thr Leu Ala Thr Ile
                245                 250                 255

Ala Ile Thr Gly Ala Gly Ala Leu Ala Ile Leu Ala Asn Leu Met Thr
            260                 265                 270

Met Gly Ala Leu Ile Ala Ala Asn Ile Leu Thr Gly Arg Met Ile Ala
        275                 280                 285

Pro Leu Val Gln Leu Val Gly Gln Trp Lys Gln Phe Gly Gln Tyr Arg
    290                 295                 300

Ala Ala Arg Lys Arg Leu Asp Ala Leu Phe Ala Thr His Ala Glu Arg
305                 310                 315                 320

Ala Thr Thr Ala Val Ala Leu Pro Arg Pro Gln Gly Thr Leu Ile Leu
                325                 330                 335

Asp Gly Leu Ser Phe Arg Tyr Pro Arg Cys Glu His Asp Gln Ile Gln
            340                 345                 350

Asp Ile Ser Gly Gln Ile Gly Pro His Gly Leu His Ala Ile Val Gly
        355                 360                 365

Ala Asn Gly Ser Gly Lys Ser Thr Leu Leu Lys Leu Leu Arg Gly Leu
    370                 375                 380

Tyr Arg Pro Ala Ala Gly Arg Val Leu Leu Asp Gly Gly Asp Leu Ala
385                 390                 395                 400

Gln Phe Gly Gln Gln Asp Leu Ala Arg Trp Ile Gly Tyr Leu Pro Gln
                405                 410                 415

Gln Val Gln Leu Ile Ser Gly Ser Val Arg Asp Asn Ile Ala Leu Ala
            420                 425                 430

Asp Pro Gly Ile Thr Asp Glu Ala Ile Leu Leu Ala Ala Gln Arg Ala
        435                 440                 445

Cys Ala His Asp Phe Ile Leu Asn Leu Pro Asp Gly Tyr Ala Thr Glu
    450                 455                 460

Val Gly Glu Gly Gly Gly Arg Phe Ser Gly Gly Glu Lys Lys Arg Ile
465                 470                 475                 480
```

```
Ala Ile Ala Gln Leu Leu Leu Arg Asp Pro Pro Ile Leu Leu Leu Asp
                485                 490                 495

Glu Pro Thr Ala Asp Leu Asp Arg Glu Ala Glu Gln Ala Phe Ile Ala
            500                 505                 510

Thr Leu Arg Ala Leu Ala Ala Asp His Thr Val Leu Val Val Ser His
        515                 520                 525

Ser Leu Ala Val Leu Ser Gln Cys Asn Gly Ile Leu Met Leu Glu Lys
    530                 535                 540

Gly Arg Leu Lys Ala Ala Gly Pro Ala Arg Gln Ile Leu Pro Ala Leu
545                 550                 555                 560

Gly Phe Gly Glu Pro Ala Pro Gln
                565
```

<210> 265
<211> 547
<212> PRT
<213> Osedax symbiont Rs1

<400> 265

```
Ile Tyr Arg Asp Val Leu Ile Ala Ser Phe Leu Ile Asn Leu Phe Val
1               5                   10                  15

Leu Ala Asn Pro Leu Phe Val Met Asn Val Tyr Asp Arg Val Val Pro
            20                  25                  30

Asn Ser Ala Ile Glu Thr Leu Trp Val Leu Ala Ile Gly Val Phe Val
        35                  40                  45

Val Tyr Ala Phe Asp Phe Gly Leu Lys Met Leu Arg Ala Tyr Phe Leu
    50                  55                  60

Glu Ile Ala Gly Lys Lys Ala Asp Ile Leu Met Ser Ala Met Leu Phe
65                  70                  75                  80

Glu Lys Val Met Ser Met Gln Tyr Ala Phe Met Pro Lys Ser Val Gly
                85                  90                  95

Ser Phe Ala Ser Asn Leu Arg Glu Phe Glu Ser Ile Arg Gly Phe Leu
            100                 105                 110

Ser Ser Thr Thr Thr Thr Val Leu Ile Asp Ile Pro Phe Ala Val Ile
        115                 120                 125

Phe Leu Ile Val Met Phe Leu Ile Gly Gly Pro Leu Val Tyr Val Pro
    130                 135                 140
```

```
Leu Val Ala Ile Pro Ile Ile Leu Ile Tyr Ser Leu Ile Ala Ser Lys
145                 150                 155                 160

Lys Leu Lys Glu Ser Val Glu Gln Thr Phe Ala Ala Ser Ala Gln Lys
                165                 170                 175

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

Gln Arg Ala Ser Ser Val Leu Gln Leu Arg Trp Glu Gln Ala Glu Gly
        195                 200                 205

Phe Ile Ala Lys Trp Ser Leu Lys Ser Lys Met Ile Ser Ser Ser Val
    210                 215                 220

Thr Asn Phe Ala Gly Phe Val Thr Gln Leu Ser Ser Val Cys Leu Val
225                 230                 235                 240

Ile Val Gly Val Tyr Leu Ile Ser Glu Arg Glu Leu Thr Met Gly Ala
                245                 250                 255

Leu Ile Ala Ala Asn Ile Leu Ser Gly Arg Val Leu Gln Pro Met Ala
            260                 265                 270

Gln Val Thr Gly Leu Val Thr Ser Phe Phe Gln Ser Lys Thr Ala Leu
        275                 280                 285

Ala Ser Leu Asn Gln Ile Met Glu Leu Pro Asp Glu Arg Ala Glu Gly
    290                 295                 300

Lys Asn Tyr Val His Arg Pro Asp Leu Tyr Gly Ala Ile Asp Phe Lys
305                 310                 315                 320

Ala Val Lys Phe Ser Tyr Pro Glu Ala Glu Gln Val Ser Leu Asp Lys
                325                 330                 335

Ile Asp Phe Ser Ile Lys Ser Gly Glu Lys Val Ala Leu Ile Gly Arg
            340                 345                 350

Ile Gly Ser Gly Lys Ser Thr Ile Glu Lys Leu Leu Met Gly Leu Tyr
        355                 360                 365

Lys Pro Glu Glu Gly Ala Val Arg Ile Asp Gly Ile Asp Leu Asn Gln
    370                 375                 380

Ile Asp Pro Val Asp Leu Arg Arg Asn Ile Gly Tyr Val Pro Gln Glu
385                 390                 395                 400

Leu Met Leu Phe Asp Gly Thr Val Arg Asp Asn Ile Ile Met Gly Ser
                405                 410                 415
```

Pro Glu Ile Asp Asp Asp Ser Leu Ile Lys Ala Ala Ala Ile Ala Gly
420 425 430

Val Asp Gln Phe Val Asn Arg His Pro Leu Gly Phe Glu Met Pro Val
435 440 445

Gly Glu Arg Gly Ala Arg Leu Ser Gly Gly Gln Lys Gln Ala Ile Ala
450 455 460

Ile Ala Arg Ala Leu Ile His Ser Pro Asn Ile Leu Ile Leu Asp Glu
465 470 475 480

Pro Thr Asn Ser Met Asp Asn Ser Ser Glu Asp Phe Leu Arg Lys Gln
485 490 495

Leu Ser Lys Tyr Cys Gln Asp Arg Thr Leu Ile Leu Val Thr His Lys
500 505 510

Met Ser Leu Leu Ser Leu Val Glu Arg Ile Ile Val Met Asp Ser Gly
515 520 525

Arg Val Val Ala Asp Gly Pro Lys Asp Val Val Leu Asp Ala Leu Lys
530 535 540

Gln Gly Arg
545

<210> 266
<211> 563
<212> PRT
<213> Thauera sp. 28

<400> 266

Thr Arg Ala Gly His Trp Phe Trp Ser Val Met Ala Glu Asn Arg Ala
1 5 10 15

Leu Tyr Arg Asp Val Leu Leu Ala Ala Leu Val Ile Asn Val Phe Ala
20 25 30

Leu Ala Leu Pro Leu Phe Ser Met Asn Val Tyr Asp Arg Val Val Pro
35 40 45

Asn Asn Ala Ile Glu Thr Leu Trp Ala Leu Ala Ile Gly Val Met Ile
50 55 60

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

Asp Leu Ala Gly Ser Arg Ala Asp Val Lys Leu Ser Ala Val Ile Met
85 90 95

```
Glu Lys Val Leu Gly Leu Arg Met Glu Ala Arg Pro Asp Ser Ala Gly
            100                 105                 110

Ser Phe Ala Ser Asn Leu Arg Ala Phe Glu Ser Val Arg Asp Phe Ile
        115                 120                 125

Ser Ser Ala Thr Val Thr Ala Phe Ile Asp Leu Pro Phe Ala Leu Leu
    130                 135                 140

Phe Val Ile Val Ile Gly Trp Ile Gly Trp Pro Met Val Ile Pro Phe
145                 150                 155                 160

Val Val Gly Ile Thr Leu Leu Leu Leu Tyr Ser Leu Thr Val Gln Arg
                165                 170                 175

Arg Met His Ala Leu Ala Glu Thr Thr Tyr Arg Ala Ser Ala Gln Arg
            180                 185                 190

Asn Ala Thr Leu Val Glu Gly Leu Val Gly Met Glu Thr Val Lys Ala
        195                 200                 205

Met Gly Ala Glu Ala Val Ile Gln Gly Lys Trp Glu Lys Ser Ala Ala
    210                 215                 220

Leu Val Ala Ser Val Gly Ala Arg Leu Arg Leu Leu Ala Ala Thr Ser
225                 230                 235                 240

Ser Asn Gly Ala Leu Trp Val Gln Gln Met Val Ser Leu Ser Thr Val
                245                 250                 255

Ile Ile Gly Val Tyr Leu Ile Ser Glu Gly Glu Leu Thr Met Gly Gly
            260                 265                 270

Leu Ile Ala Cys Tyr Leu Leu Ser Ser Arg Ala Met Ala Pro Ile Gly
        275                 280                 285

Gln Val Ala Gly Leu Leu Val Gln Tyr His Ser Ala Ala Thr Ala Phe
    290                 295                 300

Glu Ser Leu Glu Glu Leu Met Gln Arg Pro Val Glu Arg Pro Gln Asp
305                 310                 315                 320

Lys Arg Phe Leu Ser Arg Pro Leu Leu Arg Gly Asp Ile Glu Phe Arg
                325                 330                 335

Asn Val Ser Phe Ala Tyr Gly Glu Gly Glu Met Pro Ala Leu Arg Glu
            340                 345                 350

Val Ser Phe Thr Ile Arg Thr Gly Glu Arg Val Gly Ile Leu Gly Arg
        355                 360                 365
```

Val Gly Ser Gly Lys Thr Thr Leu Glu Lys Leu Ile Leu Gly Leu Tyr
370 375 380

Gln Pro Thr Gly Gly Ala Val Leu Val Asp Gly Ile Asp Leu Arg Gln
385 390 395 400

Leu Asp Pro Ala Glu Leu Arg Arg Asn Ile Gly Tyr Val Pro Gln Asp
405 410 415

Val Thr Leu Phe Tyr Gly Ser Leu Arg Asp Asn Ile Val Ile Gly Met
420 425 430

Pro Glu Ala Gly Asp Asp Lys Val Leu Arg Ala Ala Arg Ile Ala Gly
435 440 445

Ile Ala Asp Phe Val Asp Ala His Pro His Gly Tyr Gly Met Leu Val
450 455 460

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

Ile Ala Arg Ala Leu Val Ala Asp Pro Pro Ile Leu Leu Leu Asp Glu
485 490 495

Pro Ser Ala Ser Met Asp His Ala Ser Glu Glu Ala Leu Lys Gln Gln
500 505 510

Leu Arg Ala His Gly Ala Gly Lys Thr Leu Ile Val Ile Thr His Arg
515 520 525

Thr Ser Leu Leu Asp Leu Val Asp Arg Ile Ile Val Ile Asp Ala Gly
530 535 540

Arg Ile Val Ala Asp Gly Pro Lys Ala Gln Val Val Asp Ala Leu Arg
545 550 555 560

Gln Gly Arg

<210> 267
<211> 563
<212> PRT
<213> Thauera sp. 27

<400> 267

Thr Arg Ala Gly His Trp Phe Trp Ser Val Met Ala Glu Asn Arg Ala
1 5 10 15

Leu Tyr Arg Asp Val Leu Leu Ala Ala Leu Val Ile Asn Val Phe Ala
20 25 30

Leu Ala Leu Pro Leu Phe Ser Met Asn Val Tyr Asp Arg Val Val Pro

```
        35                  40                  45

Asn Asn Ala Ile Glu Thr Leu Trp Ala Leu Ala Ile Gly Val Met Ile
    50                  55                  60

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

Asp Leu Ala Gly Ser Arg Ala Asp Val Lys Leu Ser Ala Val Ile Met
                85                  90                  95

Glu Lys Val Leu Gly Leu Arg Met Glu Ala Arg Pro Asp Ser Ala Gly
            100                 105                 110

Ser Phe Ala Ser Asn Leu Arg Ala Phe Glu Ser Val Arg Asp Phe Ile
        115                 120                 125

Ser Ser Ala Thr Val Thr Ala Phe Ile Asp Leu Pro Phe Ala Leu Leu
    130                 135                 140

Phe Val Ile Val Ile Gly Trp Ile Gly Trp Pro Met Val Ile Pro Phe
145                 150                 155                 160

Val Val Gly Ile Thr Leu Leu Leu Leu Tyr Ser Leu Thr Val Gln Arg
                165                 170                 175

Arg Met His Ala Leu Ala Glu Thr Thr Tyr Arg Ala Ser Ala Gln Arg
            180                 185                 190

Asn Ala Thr Leu Val Glu Gly Leu Val Gly Met Glu Thr Val Lys Ala
        195                 200                 205

Met Gly Ala Glu Ala Val Ile Gln Gly Lys Trp Glu Lys Ser Ala Ala
    210                 215                 220

Leu Val Ala Ser Val Gly Ala Arg Leu Arg Leu Leu Ala Ala Thr Ser
225                 230                 235                 240

Ser Asn Gly Ala Leu Trp Val Gln Gln Met Val Ser Leu Ser Thr Val
                245                 250                 255

Ile Ile Gly Val Tyr Leu Ile Ser Glu Gly Glu Leu Thr Met Gly Gly
            260                 265                 270

Leu Ile Ala Cys Tyr Leu Leu Ser Ser Arg Ala Met Ala Pro Ile Gly
        275                 280                 285

Gln Val Ala Gly Leu Leu Val Gln Tyr His Ser Ala Ala Thr Ala Phe
    290                 295                 300

Glu Ser Leu Glu Glu Leu Met Gln Arg Pro Val Glu Arg Pro Gln Asp
```

305 310 315 320

Lys Arg Phe Leu Ser Arg Pro Leu Leu Arg Gly Asp Ile Glu Phe Arg
325 330 335

Asn Val Ser Phe Ala Tyr Gly Glu Gly Glu Met Pro Ala Leu Arg Glu
340 345 350

Val Ser Phe Thr Ile Arg Ala Gly Glu Arg Val Gly Ile Leu Gly Arg
355 360 365

Val Gly Ser Gly Lys Thr Thr Leu Glu Lys Leu Ile Leu Gly Leu Tyr
370 375 380

Gln Pro Thr Gly Gly Ala Val Leu Val Asp Gly Ile Asp Leu Arg Gln
385 390 395 400

Leu Asp Pro Ala Glu Leu Arg Arg Asn Ile Gly Tyr Val Pro Gln Asp
405 410 415

Val Thr Leu Phe Tyr Gly Ser Leu Arg Asp Asn Ile Val Ile Gly Met
420 425 430

Pro Glu Ala Gly Asp Asp Lys Val Leu Arg Ala Ala Arg Ile Ala Gly
435 440 445

Ile Ala Asp Phe Val Asp Ala His Pro His Gly Tyr Gly Met Leu Val
450 455 460

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

Ile Ala Arg Ala Leu Val Ala Asp Pro Pro Ile Leu Leu Leu Asp Glu
485 490 495

Pro Ser Ala Ser Met Asp His Ala Ser Glu Glu Ala Leu Lys Gln Gln
500 505 510

Leu Arg Ala His Gly Ala Gly Lys Thr Leu Ile Val Ile Thr His Arg
515 520 525

Thr Ser Leu Leu Asp Leu Val Asp Arg Ile Ile Val Ile Asp Ala Gly
530 535 540

Arg Ile Val Ala Asp Gly Pro Lys Ala Gln Val Val Asp Ala Leu Arg
545 550 555 560

Gln Gly Arg

<210> 268

<211> 562
<212> PRT
<213> Thioalkalivibrio sp. ALgr5

<400> 268

```
Asp Lys Gly His Trp Phe Trp Arg Val Ile Arg Glu Asn Arg Pro Leu
1               5                   10                  15

Tyr Arg Asp Val Leu Val Ala Ala Val Met Ile Asn Leu Phe Ala Leu
            20                  25                  30

Ala Met Pro Leu Phe Val Leu Asn Val Tyr Asp Arg Val Val Pro Asn
        35                  40                  45

His Ala Thr Glu Thr Leu Phe Met Phe Ala Ala Gly Val Val Ile Val
    50                  55                  60

Leu Ile Ala Asp Leu Val Leu Arg Thr Met Arg Ser His Phe Val Asp
65                  70                  75                  80

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

Arg Val Leu Gly Leu Arg Met Glu Asn Arg Pro Ala Ser Val Gly Ser
            100                 105                 110

Phe Ala Ser Asn Ile Gly Ala Phe Glu Ser Val Arg Ser Phe Ile Ser
        115                 120                 125

Ser Ala Thr Ile Ile Ala Phe Val Asp Leu Pro Phe Ser Leu Leu Phe
    130                 135                 140

Ile Ala Ile Ile Ala Leu Ile Ala Trp Pro Leu Ala Val Pro Val Leu
145                 150                 155                 160

Ile Gly Ala Leu Val Leu Leu Leu Tyr Ala Thr Ala Ile His Arg Lys
                165                 170                 175

Leu His Ala Leu Ala Glu Glu Ser Tyr Arg Val Ala Ala Gln Arg Asn
            180                 185                 190

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

Ser Ala Glu Gly Arg Val Gln Ala Thr Trp Glu Arg Ser Thr Ala His
    210                 215                 220

Leu Ala Arg Thr Ser Ala Gln Asn Arg Leu Leu Thr Ala Ser Val Thr
225                 230                 235                 240

His Thr Ala Leu Trp Ala Gln His Thr Val Gly Val Ala Ile Ile Val
                245                 250                 255
```

```
Leu Gly Val Phe Leu Leu Met Glu Gly Asp Leu Ser Met Gly Gly Leu
            260                 265                 270

Ile Ala Ala Tyr Leu Ile Ser Ser Arg Ala Met Ala Pro Ile Ser Gln
        275                 280                 285

Thr Ala Gly Leu Leu Met Gln Tyr His Gln Ala Ser Thr Ala Leu Gly
    290                 295                 300

Ser Leu Asn Glu Ile Met Thr Leu Pro Val Glu Arg Pro Pro Glu Thr
305                 310                 315                 320

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

Val Asp Phe Ala Tyr Pro Glu Gln Pro Asn Pro Ala Leu Arg Asn Val
            340                 345                 350

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

Gly Ser Gly Lys Ser Thr Leu Ala Lys Leu Ile Met Gly Leu Tyr Gln
    370                 375                 380

Pro Thr Gly Gly Ala Val Met Val Asp Gly Ile Asp Val Arg Gln Leu
385                 390                 395                 400

Asp Pro Ala Glu Leu Arg Arg Ser Met Gly Tyr Val Gly Gln Glu Val
                405                 410                 415

Thr Leu Phe Tyr Gly Ser Leu Arg Glu Asn Leu Val Ala Ser Asp Pro
            420                 425                 430

Leu Ala Ser Asp Glu Ala Ile Arg Lys Ala Ile Ala Ile Ser Gly Ile
        435                 440                 445

Glu Asp Leu Ile Asn Thr His Pro Gln Gly Ile Asp Met Gln Val Gly
    450                 455                 460

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

Ala Arg Ala Val Leu His Glu Pro Asn Met Leu Leu Leu Asp Glu Pro
                485                 490                 495

Thr Ser Ser Met Asp Asn Ser Thr Glu Gln Ala Met Lys Arg Arg Leu
            500                 505                 510

Ala Glu Phe Met Glu Gly Arg Thr Ala Val Ile Val Thr His Arg Thr
        515                 520                 525
```

Ser Leu Leu Glu Leu Val Asp Arg Ile Ile Val Leu Asp Gln Gly Arg
530 535 540

Val Val Ala Asp Gly Pro Lys Asp Gln Val Val Gln Ala Leu Arg Glu
545 550 555 560

Gly Arg

<210> 269
<211> 476
<212> PRT
<213> Pseudomonas fluorescens

<400> 269

Met Gly Val Phe Asp Tyr Lys Asn Leu Gly Thr Glu Ala Ser Lys Thr
1 5 10 15

Leu Phe Ala Asp Ala Thr Ala Ile Thr Leu Tyr Thr Tyr His Asn Leu
20 25 30

Asp Asn Gly Phe Ala Val Gly Tyr Gln Gln His Gly Leu Gly Leu Gly
35 40 45

Leu Pro Ala Thr Leu Val Gly Ala Leu Leu Gly Ser Thr Asp Ser Gln
50 55 60

Gly Val Ile Pro Gly Ile Pro Trp Asn Pro Asp Ser Glu Lys Ala Ala
65 70 75 80

Leu Asp Ala Val His Ala Ala Gly Trp Thr Pro Ile Ser Ala Ser Ala
85 90 95

Leu Gly Tyr Gly Gly Lys Val Asp Ala Arg Gly Thr Phe Phe Gly Glu
100 105 110

Lys Ala Gly Tyr Thr Thr Ala Gln Ala Glu Val Leu Gly Lys Tyr Asp
115 120 125

Asp Ala Gly Lys Leu Leu Glu Ile Gly Ile Gly Phe Arg Gly Thr Ser
130 135 140

Gly Pro Arg Glu Ser Leu Ile Thr Asp Ser Ile Gly Asp Leu Val Ser
145 150 155 160

Asp Leu Leu Ala Ala Leu Gly Pro Lys Asp Tyr Ala Lys Asn Tyr Ala
165 170 175

Gly Glu Ala Phe Gly Gly Leu Leu Lys Thr Val Ala Asp Tyr Ala Gly
180 185 190

```
Ala His Gly Leu Ser Gly Lys Asp Val Leu Val Ser Gly His Ser Leu
        195                 200                 205

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

Ala Gly Phe Tyr Lys Asp Ala Asn Tyr Leu Ala Tyr Ala Ser Pro Thr
225                 230                 235                 240

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

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

Val His Asp Lys Ala His Glu Ser Thr Thr Asp Asn Ile Val Ser Phe
        275                 280                 285

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

Ala Asn Leu Ser Thr Trp Val Ser His Leu Pro Ser Ala Tyr Gly Asp
305                 310                 315                 320

Gly Met Thr Arg Val Leu Glu Ser Gly Phe Tyr Glu Gln Met Thr Arg
                325                 330                 335

Asp Ser Thr Ile Ile Val Ala Asn Leu Ser Asp Pro Ala Arg Ala Asn
            340                 345                 350

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

Thr Phe Ile Ile Gly Ser Asp Gly Asn Asp Leu Ile Gln Gly Gly Lys
    370                 375                 380

Gly Ala Asp Phe Ile Glu Gly Gly Lys Gly Asn Asp Thr Ile Arg Asp
385                 390                 395                 400

Asn Ser Gly His Asn Thr Phe Leu Phe Ser Gly His Phe Gly Gln Asp
                405                 410                 415

Arg Ile Ile Gly Tyr Gln Pro Thr Asp Arg Leu Val Phe Gln Gly Ala
            420                 425                 430

Asp Gly Ser Thr Asp Leu Arg Asp His Ala Lys Ala Val Gly Ala Asp
        435                 440                 445

Thr Val Leu Ser Phe Gly Ala Asp Ser Val Thr Leu Val Gly Val Gly
    450                 455                 460
```

Leu Gly Gly Leu Trp Ser Glu Gly Val Leu Ile Ser
465 470 475

<210> 270
<211> 60
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 270

Thr His Val Asp Gly Gly Asp Gly Asn Asp Thr Leu Thr Thr Gly Ser
1 5 10 15

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

Gly Gly Gly Arg Asp Thr Phe Val Leu Ser Ala Ala Asp Thr Ile Ala
35 40 45

Asp Tyr Ser Pro His Asp Lys Met Val Val Arg Gly
50 55 60

<210> 271
<211> 96
<212> PRT
<213> Magnetospirillum gryphiswaldense MSR-1

<400> 271

Ala Asn Ala Glu Thr Ile Thr Val Asn Ser Ser Ala Thr Ile Asn Asn
1 5 10 15

Gly Arg Ser Phe Leu Ser Tyr Asp Leu Phe Asp Gly Val Asp Val Phe
20 25 30

Thr Asp Thr Gly Ala Ala Ala Thr His Val Asp Gly Gly Asp Gly Asn
35 40 45

Asp Thr Leu Thr Thr Gly Ser Gly Ala Asp Glu Leu Thr Gly Gly Glu
50 55 60

Gly Ala Asp Ile Leu Thr Gly Gly Gly Gly Arg Asp Thr Phe Val Leu
65 70 75 80

Ser Ala Ala Asp Thr Ile Ala Asp Tyr Ser Pro His Asp Lys Met Val
85 90 95

<210> 272
<211> 55
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 272

Ser Gly Asn Asp Val Leu Asp Gly Gly Ser Gly Asn Asp Gln Ile His
1 5 10 15

Gly Gly Ala Gly Asn Asp Thr Ile Ile Gly Gly Thr Gly Asp Asp Val
20 25 30

Met Phe Gly Asp Gln Gly Asn Asp Thr Phe Leu Phe Asp Phe Gly Phe
35 40 45

Gly His Asp Val Val Asp Gly
50 55

<210> 273
<211> 55
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 273

Ser Gly Asn Asp Val Leu Asp Gly Gly Ser Gly Asn Asp Gln Ile His
1 5 10 15

Gly Gly Ala Gly Asn Asp Thr Ile Ile Gly Gly Thr Gly Asp Asp Val
20 25 30

Met Phe Gly Asp Gln Gly Asn Asp Thr Phe Leu Phe Asp Phe Gly Phe
35 40 45

Gly His Asp Val Val Asp Gly
50 55

<210> 274
<211> 19
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 274

Gly Asn Asp Asp Ile Ile Gly Thr Asn Gly Asn Asp Leu Leu Leu Gly
1 5 10 15

Gly Lys Gly

<210> 275
<211> 54
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 275

Gly Asn Asp Ile Leu Asp Gly Gly Ala Gly Asn Asp Gln Ile His Gly
1 5 10 15

Gly Gly Gly Asn Asp Thr Ile Thr Gly Gly Thr Gly Asp Asp Val Met
20 25 30

Phe Gly Asp Gln Gly Ser Asp Thr Phe Leu Phe Asp Phe Gly Phe Gly

35 40 45

His Asp Val Val Asp Gly
50

<210> 276
<211> 80
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 276

Asn Val Ala Val Thr Thr Leu Asp Gly Thr Ser Thr Ala Val Thr Asn
1 5 10 15

Ser Ser Phe Asn Val Ser Phe Ser Gly Gly Phe Asn Asp Thr Ile Thr
20 25 30

Gly Gly Ala Gly Ala Asp Thr Met Tyr Gly Gly Ala Gly Asn Asp Thr
35 40 45

Phe Lys Val Ser Gly Ala Thr Glu Ser Val Gly Asp Ile Tyr Asp Gly
50 55 60

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

<210> 277
<211> 23
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 277

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

Gly Thr Gly Asp Asp Thr Val
20

<210> 278
<211> 73
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 278

Gly Asn Asp Thr Leu Thr Gly Ser Ala Gly Asn Asp Leu Met Asp Gly
1 5 10 15

Gly Ala Gly Asn Asp Val Leu Asn Gly Val Ala Gly Ala Asp Thr Val
20 25 30

Leu Gly Gly Thr Gly Asn Asp Thr Ile Asp Ala Gly Ala Gly Asp Asp
35 40 45

Leu Leu Ser Gly Gly Ala Gly Ala Asp Arg Leu Thr Gly Asp Ser Gly
50 55 60

Ile Asp Thr Ala Ser Tyr Ser Gly Ser
65 70

<210> 279
<211> 67
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 279

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

Ala Gly Val Asn Val Ile Asp Gly Gly Ala Gly Asn Asp Thr Leu Gly
20 25 30

Gly Ala Ala Gly Ala Asp Thr Leu Val Gly Gly Ala Gly Asn Asp Ala
35 40 45

Leu Asp Gly Gly Asp Gly Asn Asp Leu Leu Ser Gly Gly Ala Gly Ala
50 55 60

Asp Thr Leu
65

<210> 280
<211> 48
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 280

Asp Val Leu Thr Gly Asp Ala Gly Val Asn Val Ile Asp Gly Gly Ala
1 5 10 15

Gly Asn Asp Thr Leu Gly Gly Ala Ala Gly Ala Asp Thr Leu Val Gly
20 25 30

Gly Ala Gly Asn Asp Ala Leu Asp Gly Gly Asp Gly Asn Asp Leu Leu
35 40 45

<210> 281
<211> 41
<212> PRT
<213> Magnetospirillum sp. SO-1

<400> 281

Leu Leu Gln Gly Gly Gly Gly Ala Asp Thr Leu Asp Gly Ala Ala Gly
1 5 10 15

Asn Asp Val Leu Arg Gly Gly Ala Gly Ala Asp Thr Leu Ala Gly Gly
20 25 30

Ala Gly Thr Asp Thr Val Thr Tyr Ser
35 40

<210> 282
<211> 54
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 282

Asn Val Thr Val Gln Gly Ser Gln Gly Asn Asp Ile Ile Asn Gly Gly
1 5 10 15

Asn Ala Gly Glu Phe Leu Trp Gly Asp Gln Gly Asn Asp Thr Ile Ala
20 25 30

Gly Gly Gln Gly Asn Asp Thr Ile Leu Gly Gly Ala Gly Thr Asp Val
35 40 45

Ala Val Phe Thr Gly Ala
50

<210> 283
<211> 39
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 283

Ile Thr Gly Thr Thr Gly Asn Asp Thr Leu Val Gly Gly Ala Gly Asp
1 5 10 15

Asp Thr Leu Ala Gly Gly Ala Gly Thr Asn Thr Leu Ser Gly Gly Ser
20 25 30

Gly Ser Asp Thr Phe Val Leu
35

<210> 284
<211> 48
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 284

Asn Ala Ala Pro Arg Thr Thr Gly Leu Thr Leu Ile Gly Gly Ala Gly
1 5 10 15

Asn Asp Gln Phe Leu Gly Ser Leu Gly Asn Asp Thr Ile Thr Gly Gly
20 25 30

Gly Gly Thr Asn Ser Met Asp Gly Gly Gly Gly Thr Asp Thr Val Ser
35 40 45

<210> 285
<211> 41

<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 285

Asp Leu Gln Phe Asp Ile Thr Gly Thr Thr Gly Asn Asp Thr Leu Val
1 5 10 15

Gly Gly Ala Gly Asp Asp Thr Leu Ala Gly Gly Ala Gly Thr Asn Thr
20 25 30

Leu Ser Gly Gly Ser Gly Ser Asp Thr
35 40

<210> 286
<211> 103
<212> PRT
<213> Magnetospirillum magnetotacticum

<400> 286

His Ser Thr Ser Ala Ser Asn Val Val Asp Thr Asp Phe Phe Gly Ile
1 5 10 15

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

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

Ala Ser Gly Ala Ser Gly Gly Val Ala Asn Thr Gly Gly Val Thr Val
50 55 60

Asn Ala Ser Ala Tyr Ser Thr Ala Val Ser Ile Ser Gly Gly Ser Gly
65 70 75 80

Ala Asp Thr Phe Thr Gly Gly Ser Gly Ala Asp Ser Phe Val Gly Gly
85 90 95

Gly Gly Asn Asp Val Ile His
100

<210> 287
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic construct

<220>
<221> misc_feature
<222> (3)..(3)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature

<222> (5)..(5)
<223> Xaa can be any naturally occurring amino acid

<400> 287

Gly Gly Xaa Gly Xaa Asp
1 5

<210> 288
<211> 1377
<212> PRT
<213> Escherichia coli

<400> 288

Met Asn Arg Ile Tyr Ser Leu Arg Tyr Ser Ala Val Ala Arg Gly Phe
1 5 10 15

Ile Ala Val Ser Glu Phe Ala Arg Lys Cys Val His Lys Ser Val Arg
20 25 30

Arg Leu Cys Phe Pro Val Leu Leu Leu Ile Pro Val Leu Phe Ser Ala
35 40 45

Gly Ser Leu Ala Gly Thr Val Asn Asn Glu Leu Gly Tyr Gln Leu Phe
50 55 60

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

Ile Ala Ile Tyr Asn Lys Gln Gly Glu Phe Val Gly Thr Leu Asp Lys
85 90 95

Ala Ala Met Pro Asp Phe Ser Ala Val Asp Ser Glu Ile Gly Val Ala
100 105 110

Thr Leu Ile Asn Pro Gln Tyr Ile Ala Ser Val Lys His Asn Gly Gly
115 120 125

Tyr Thr Asn Val Ser Phe Gly Asp Gly Glu Asn Arg Tyr Asn Ile Val
130 135 140

Asp Arg Asn Asn Ala Pro Ser Leu Asp Phe His Ala Pro Arg Leu Asp
145 150 155 160

Lys Leu Val Thr Glu Val Ala Pro Thr Ala Val Thr Ala Gln Gly Ala
165 170 175

Val Ala Gly Ala Tyr Leu Asp Lys Glu Arg Tyr Pro Val Phe Tyr Arg
180 185 190

Leu Gly Ser Gly Thr Gln Tyr Ile Lys Asp Ser Asn Gly Gln Leu Thr
195 200 205

```
Lys Met Gly Gly Ala Tyr Ser Trp Leu Thr Gly Gly Thr Val Gly Ser
    210                 215                 220

Leu Ser Ser Tyr Gln Asn Gly Glu Met Ile Ser Thr Ser Ser Gly Leu
225                 230                 235                 240

Val Phe Asp Tyr Lys Leu Asn Gly Ala Met Pro Ile Tyr Gly Glu Ala
                245                 250                 255

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

Trp Val Leu Val Gly Val Leu Thr Ala Gly Asn Gly Ala Gly Gly Arg
        275                 280                 285

Gly Asn Asn Trp Ala Val Ile Pro Leu Asp Phe Ile Gly Gln Lys Phe
    290                 295                 300

Asn Glu Asp Asn Asp Ala Pro Val Thr Phe Arg Thr Ser Glu Gly Gly
305                 310                 315                 320

Ala Leu Glu Trp Ser Phe Asn Ser Ser Thr Gly Ala Gly Ala Leu Thr
                325                 330                 335

Gln Gly Thr Thr Thr Tyr Ala Met His Gly Gln Gln Gly Asn Asp Leu
            340                 345                 350

Asn Ala Gly Lys Asn Leu Ile Phe Gln Gly Gln Asn Gly Gln Ile Asn
        355                 360                 365

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

Asn Tyr Thr Val Thr Thr Ser Asn Gly Ser Thr Trp Thr Gly Ala Gly
385                 390                 395                 400

Ile Val Val Asp Asn Gly Val Ser Val Asn Trp Gln Val Asn Gly Val
                405                 410                 415

Lys Gly Asp Asn Leu His Lys Ile Gly Glu Gly Thr Leu Thr Val Gln
            420                 425                 430

Gly Thr Gly Ile Asn Glu Gly Gly Leu Lys Val Gly Asp Gly Lys Val
        435                 440                 445

Val Leu Asn Gln Gln Ala Asp Asn Lys Gly Gln Val Gln Ala Phe Ser
    450                 455                 460

Ser Val Asn Ile Ala Ser Gly Arg Pro Thr Val Val Leu Thr Asp Glu
465                 470                 475                 480
```

```
Arg Gln Val Asn Pro Asp Thr Val Ser Trp Gly Tyr Arg Gly Gly Thr
                485                 490                 495

Leu Asp Val Asn Gly Asn Ser Leu Thr Phe His Gln Leu Lys Ala Ala
            500                 505                 510

Asp Tyr Gly Ala Val Leu Ala Asn Asn Val Asp Lys Arg Ala Thr Ile
        515                 520                 525

Thr Leu Asp Tyr Ala Leu Arg Ala Asp Lys Val Ala Leu Asn Gly Trp
    530                 535                 540

Ser Glu Ser Gly Lys Gly Thr Ala Gly Asn Leu Tyr Lys Tyr Asn Asn
545                 550                 555                 560

Pro Tyr Thr Asn Thr Thr Asp Tyr Phe Ile Leu Lys Gln Ser Thr Tyr
                565                 570                 575

Gly Tyr Phe Pro Thr Asp Gln Ser Ser Asn Ala Thr Trp Glu Phe Val
            580                 585                 590

Gly His Ser Gln Gly Asp Ala Gln Lys Leu Val Ala Asp Arg Phe Asn
        595                 600                 605

Thr Ala Gly Tyr Leu Phe His Gly Gln Leu Lys Gly Asn Leu Asn Val
    610                 615                 620

Asp Asn Arg Leu Pro Glu Gly Val Thr Gly Ala Leu Val Met Asp Gly
625                 630                 635                 640

Ala Ala Asp Ile Ser Gly Thr Phe Thr Gln Glu Asn Gly Arg Leu Thr
                645                 650                 655

Leu Gln Gly His Pro Val Ile His Ala Tyr Asn Thr Gln Ser Val Ala
            660                 665                 670

Asp Lys Leu Ala Ala Ser Gly Asp His Ser Val Leu Thr Gln Pro Thr
        675                 680                 685

Ser Phe Ser Gln Glu Asp Trp Glu Asn Arg Ser Phe Thr Phe Asp Arg
    690                 695                 700

Leu Ser Leu Lys Asn Thr Asp Phe Gly Leu Gly Arg Asn Ala Thr Leu
705                 710                 715                 720

Asn Thr Thr Ile Gln Ala Asp Asn Ser Ser Val Thr Leu Gly Asp Ser
                725                 730                 735

Arg Val Phe Ile Asp Lys Asn Asp Gly Gln Gly Thr Ala Phe Thr Leu
            740                 745                 750
```

```
Glu Glu Gly Thr Ser Val Ala Thr Lys Asp Ala Asp Lys Ser Val Phe
        755                 760                 765

Asn Gly Thr Val Asn Leu Asp Asn Gln Ser Val Leu Asn Ile Asn Asp
    770                 775                 780

Ile Phe Asn Gly Gly Ile Gln Ala Asn Asn Ser Thr Val Asn Ile Ser
785                 790                 795                 800

Ser Asp Ser Ala Val Leu Gly Asn Ser Thr Leu Thr Ser Thr Ala Leu
                805                 810                 815

Asn Leu Asn Lys Gly Ala Asn Ala Leu Ala Ser Gln Ser Phe Val Ser
            820                 825                 830

Asp Gly Pro Val Asn Ile Ser Asp Ala Thr Leu Ser Leu Asn Ser Arg
        835                 840                 845

Pro Asp Glu Val Ser His Thr Leu Leu Pro Val Tyr Asp Tyr Ala Gly
    850                 855                 860

Ser Trp Asn Leu Lys Gly Asp Asp Ala Arg Leu Asn Val Gly Pro Tyr
865                 870                 875                 880

Ser Met Leu Ser Gly Asn Ile Asn Val Gln Asp Lys Gly Thr Val Thr
                885                 890                 895

Leu Gly Gly Glu Gly Glu Leu Ser Pro Asp Leu Thr Leu Gln Asn Gln
            900                 905                 910

Met Leu Tyr Ser Leu Phe Asn Gly Tyr Arg Asn Ile Trp Ser Gly Ser
        915                 920                 925

Leu Asn Ala Pro Asp Ala Thr Val Ser Met Thr Asp Thr Gln Trp Ser
    930                 935                 940

Met Asn Gly Asn Ser Thr Ala Gly Asn Met Lys Leu Asn Arg Thr Ile
945                 950                 955                 960

Val Gly Phe Asn Gly Gly Thr Ser Pro Phe Thr Thr Leu Thr Thr Asp
                965                 970                 975

Asn Leu Asp Ala Val Gln Ser Ala Phe Val Met Arg Thr Asp Leu Asn
            980                 985                 990

Lys Ala Asp Lys Leu Val Ile Asn  Lys Ser Ala Thr Gly  His Asp Asn
        995                 1000                1005

Ser Ile  Trp Val Asn Phe Leu  Lys Lys Pro Ser Asn  Lys Asp Thr
    1010                1015                1020
```

```
Leu Asp  Ile Pro Leu Val Ser  Ala Pro Glu Ala Thr  Ala Asp Asn
    1025                1030                1035

Leu Phe  Arg Ala Ser Thr Arg  Val Val Gly Phe Ser  Asp Val Thr
    1040                1045                1050

Pro Ile  Leu Ser Val Arg Lys  Glu Asp Gly Lys Lys  Glu Trp Val
    1055                1060                1065

Leu Asp  Gly Tyr Gln Val Ala  Arg Asn Asp Gly Gln  Gly Lys Ala
    1070                1075                1080

Ala Ala  Thr Phe Met His Ile  Ser Tyr Asn Asn Phe  Ile Thr Glu
    1085                1090                1095

Val Asn  Asn Leu Asn Lys Arg  Met Gly Asp Leu Arg  Asp Ile Asn
    1100                1105                1110

Gly Glu  Ala Gly Thr Trp Val  Arg Leu Leu Asn Gly  Ser Gly Ser
    1115                1120                1125

Ala Asp  Gly Gly Phe Thr Asp  His Tyr Thr Leu Leu  Gln Met Gly
    1130                1135                1140

Ala Asp  Arg Lys His Glu Leu  Gly Ser Met Asp Leu  Phe Thr Gly
    1145                1150                1155

Val Met  Ala Thr Tyr Thr Asp  Thr Asp Ala Ser Ala  Asp Leu Tyr
    1160                1165                1170

Ser Gly  Lys Thr Lys Ser Trp  Gly Gly Gly Phe Tyr  Ala Ser Gly
    1175                1180                1185

Leu Phe  Arg Ser Gly Ala Tyr  Phe Asp Val Ile Ala  Lys Tyr Ile
    1190                1195                1200

His Asn  Glu Asn Lys Tyr Asp  Leu Asn Phe Ala Gly  Ala Gly Lys
    1205                1210                1215

Gln Asn  Phe Arg Ser His Ser  Leu Tyr Ala Gly Ala  Glu Val Gly
    1220                1225                1230

Tyr Arg  Tyr His Leu Thr Asp  Thr Thr Phe Val Glu  Pro Gln Ala
    1235                1240                1245

Glu Leu  Val Trp Gly Arg Leu  Gln Gly Gln Thr Phe  Asn Trp Asn
    1250                1255                1260

Asp Ser  Gly Met Asp Val Ser  Met Arg Arg Asn Ser  Val Asn Pro
    1265                1270                1275
```

Leu Val Gly Arg Thr Gly Val Val Ser Gly Lys Thr Phe Ser Gly
1280 1285 1290

Lys Asp Trp Ser Leu Thr Ala Arg Ala Gly Leu His Tyr Glu Phe
1295 1300 1305

Asp Leu Thr Asp Ser Ala Asp Val His Leu Lys Asp Ala Ala Gly
1310 1315 1320

Glu His Gln Ile Asn Gly Arg Lys Asp Ser Arg Met Leu Tyr Gly
1325 1330 1335

Val Gly Leu Asn Ala Arg Phe Gly Asp Asn Thr Arg Leu Gly Leu
1340 1345 1350

Glu Val Glu Arg Ser Ala Phe Gly Lys Tyr Asn Thr Asp Asp Ala
1355 1360 1365

Ile Asn Ala Asn Ile Arg Tyr Ser Phe
1370 1375

<210> 289
<211> 1250
<212> PRT
<213> Escherichia coli

<400> 289

Met Arg Ile Ile Phe Leu Arg Lys Glu Tyr Leu Ser Leu Leu Pro Ser
1 5 10 15

Met Ile Ala Ser Leu Phe Ser Ala Asn Gly Val Ala Ala Val Thr Asp
20 25 30

Ser Cys Gln Gly Tyr Asp Val Lys Ala Ser Cys Gln Ala Ser Arg Gln
35 40 45

Ser Leu Ser Gly Ile Thr Gln Asp Trp Ser Ile Ala Asp Gly Gln Trp
50 55 60

Leu Val Phe Ser Asp Met Thr Asn Asn Ala Ser Gly Gly Ala Val Phe
65 70 75 80

Leu Gln Gln Gly Ala Glu Phe Ser Leu Leu Pro Glu Asn Glu Thr Gly
85 90 95

Met Thr Leu Phe Ala Asn Asn Thr Val Thr Gly Glu Tyr Asn Asn Gly
100 105 110

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

Ile Phe Ser Gly Asn Val Ala Gly Gly Tyr Gly Gly Ala Ile Tyr Ser

```
    130                 135                 140

Ser Gly Thr Asn Asp Thr Gly Ala Val Asp Leu Arg Val Thr Asn Ala
145                 150                 155                 160

Met Phe Arg Asn Asn Ile Ala Asn Asp Gly Lys Gly Gly Ala Ile Tyr
                165                 170                 175

Thr Ile Asn Asn Asp Val Tyr Leu Ser Asp Val Ile Phe Asp Asn Asn
            180                 185                 190

Gln Ala Tyr Thr Ser Thr Ser Tyr Ser Asp Gly Asp Gly Gly Ala Ile
        195                 200                 205

Asp Val Thr Asp Asn Asn Ser Asp Ser Lys His Pro Ser Gly Tyr Thr
    210                 215                 220

Ile Val Asn Asn Thr Ala Phe Thr Asn Asn Thr Ala Glu Gly Tyr Gly
225                 230                 235                 240

Gly Ala Ile Tyr Thr Asn Ser Val Thr Ala Pro Tyr Leu Ile Asp Ile
                245                 250                 255

Ser Val Asp Asp Ser Tyr Ser Gln Asn Gly Gly Val Leu Val Asp Glu
            260                 265                 270

Asn Asn Ser Ala Ala Gly Tyr Gly Asp Gly Pro Ser Ser Ala Ala Gly
        275                 280                 285

Gly Phe Met Tyr Leu Gly Leu Ser Glu Val Thr Phe Asp Ile Ala Asp
    290                 295                 300

Gly Lys Thr Leu Val Ile Gly Asn Thr Glu Asn Asp Gly Ala Val Asp
305                 310                 315                 320

Ser Ile Ala Gly Thr Gly Leu Ile Thr Lys Thr Gly Ser Gly Asp Leu
                325                 330                 335

Val Leu Asn Ala Asp Asn Asn Asp Phe Thr Gly Glu Met Gln Ile Glu
            340                 345                 350

Asn Gly Glu Val Thr Leu Gly Arg Ser Asn Ser Leu Met Asn Val Gly
        355                 360                 365

Asp Thr His Cys Gln Asp Asp Pro Gln Asp Cys Tyr Gly Leu Thr Ile
    370                 375                 380

Gly Ser Ile Asp Gln Tyr Gln Asn Gln Ala Glu Leu Asn Val Gly Ser
385                 390                 395                 400

Thr Gln Gln Thr Phe Val His Ala Leu Thr Gly Phe Gln Asn Gly Thr
```

405 410 415

Leu Asn Ile Asp Ala Gly Gly Asn Val Thr Val Asn Gln Gly Ser Phe
420 425 430

Ala Gly Ile Ile Glu Gly Ala Gly Gln Leu Thr Ile Ala Gln Asn Gly
435 440 445

Ser Tyr Val Leu Ala Gly Ala Gln Ser Met Ala Leu Thr Gly Asp Ile
450 455 460

Val Val Asp Asp Gly Ala Val Leu Ser Leu Glu Gly Asp Ala Ala Asp
465 470 475 480

Leu Thr Ala Leu Gln Asp Asp Pro Gln Ser Ile Val Leu Asn Gly Gly
485 490 495

Val Leu Asp Leu Ser Asp Phe Ser Thr Trp Gln Ser Gly Thr Ser Tyr
500 505 510

Asn Asp Gly Leu Glu Val Ser Gly Ser Ser Gly Thr Val Ile Gly Ser
515 520 525

Gln Asp Val Val Asp Leu Ala Gly Gly Asp Asn Leu His Ile Gly Gly
530 535 540

Asp Gly Lys Asp Gly Val Tyr Val Val Val Asp Ala Ser Asp Gly Gln
545 550 555 560

Val Ser Leu Ala Asn Asn Asn Ser Tyr Leu Gly Thr Thr Gln Ile Ala
565 570 575

Ser Gly Thr Leu Met Val Ser Asp Asn Ser Gln Leu Gly Asp Thr His
580 585 590

Tyr Asn Arg Gln Val Ile Phe Thr Asp Lys Gln Gln Glu Ser Val Met
595 600 605

Glu Ile Thr Ser Asp Val Asp Thr Arg Ser Asp Ala Ala Gly His Gly
610 615 620

Arg Asp Ile Glu Met Arg Ala Asp Gly Glu Val Ala Val Asp Ala Gly
625 630 635 640

Val Asp Thr Gln Trp Gly Ala Leu Met Ala Asp Ser Ser Gly Gln His
645 650 655

Gln Asp Glu Gly Ser Thr Leu Thr Lys Thr Gly Ala Gly Thr Leu Glu
660 665 670

Leu Thr Ala Ser Gly Thr Thr Gln Ser Ala Val Arg Val Glu Glu Gly

675 680 685

Thr Leu Lys Gly Asp Val Ala Asp Ile Leu Pro Tyr Ala Ser Ser Leu
690 695 700

Trp Val Gly Asp Gly Ala Thr Phe Val Thr Gly Ala Asp Gln Asp Ile
705 710 715 720

Gln Ser Ile Asp Ala Ile Ser Ser Gly Thr Ile Asp Ile Ser Asp Gly
725 730 735

Thr Val Leu Arg Leu Thr Gly Gln Asp Thr Ser Val Ala Leu Asn Ala
740 745 750

Ser Leu Phe Asn Gly Asp Gly Thr Leu Val Asn Ala Thr Asp Gly Val
755 760 765

Thr Leu Thr Gly Glu Leu Asn Thr Asn Leu Glu Thr Asp Ser Leu Thr
770 775 780

Tyr Leu Ser Asn Val Thr Val Asn Gly Asn Leu Thr Asn Thr Ser Gly
785 790 795 800

Ala Val Ser Leu Gln Asn Gly Val Ala Gly Asp Thr Leu Thr Val Asn
805 810 815

Gly Asp Tyr Thr Gly Gly Gly Thr Leu Leu Leu Asp Ser Glu Leu Asn
820 825 830

Gly Asp Asp Ser Val Ser Asp Gln Leu Val Met Asn Gly Asn Thr Ala
835 840 845

Gly Asn Thr Thr Val Val Val Asn Ser Ile Thr Gly Ile Gly Glu Pro
850 855 860

Thr Ser Thr Gly Ile Lys Val Val Asp Phe Ala Ala Asp Pro Thr Gln
865 870 875 880

Phe Gln Asn Asn Ala Gln Phe Ser Leu Ala Gly Ser Gly Tyr Val Asn
885 890 895

Met Gly Ala Tyr Asp Tyr Thr Leu Val Glu Asp Asn Asn Asp Trp Tyr
900 905 910

Leu Arg Ser Gln Glu Val Thr Pro Pro Ser Pro Pro Asp Pro Asp Pro
915 920 925

Thr Pro Asp Pro Asp Pro Thr Pro Asp Pro Asp Pro Thr Pro Asp Pro
930 935 940

Glu Pro Thr Pro Ala Tyr Gln Pro Val Leu Asn Ala Lys Val Gly Gly

945 950 955 960

Tyr Leu Asn Asn Leu Arg Ala Ala Asn Gln Ala Phe Met Met Glu Arg
965 970 975

Arg Asp His Ala Gly Gly Asp Gly Gln Thr Leu Asn Leu Arg Val Ile
980 985 990

Gly Gly Asp Tyr His Tyr Thr Ala Ala Gly Gln Leu Ala Gln His Glu
995 1000 1005

Asp Thr Ser Thr Val Gln Leu Ser Gly Asp Leu Phe Ser Gly Arg
1010 1015 1020

Trp Gly Thr Asp Gly Glu Trp Met Leu Gly Ile Val Gly Gly Tyr
1025 1030 1035

Ser Asp Asn Gln Gly Asp Ser Arg Ser Asn Met Thr Gly Thr Arg
1040 1045 1050

Ala Asp Asn Gln Asn His Gly Tyr Ala Val Gly Leu Thr Ser Ser
1055 1060 1065

Trp Phe Gln His Gly Asn Gln Lys Gln Gly Ala Trp Leu Asp Ser
1070 1075 1080

Trp Leu Gln Tyr Ala Trp Phe Ser Asn Asp Val Ser Glu Gln Glu
1085 1090 1095

Asp Gly Thr Asp His Tyr His Ser Ser Gly Ile Ile Ala Ser Leu
1100 1105 1110

Glu Ala Gly Tyr Gln Trp Leu Pro Gly Arg Gly Val Val Ile Glu
1115 1120 1125

Pro Gln Ala Gln Val Ile Tyr Gln Gly Val Gln Gln Asp Asp Phe
1130 1135 1140

Thr Ala Ala Asn Arg Ala Arg Val Ser Gln Ser Gln Gly Asp Asp
1145 1150 1155

Ile Gln Thr Arg Leu Gly Leu His Ser Glu Trp Arg Thr Ala Val
1160 1165 1170

His Val Ile Pro Thr Leu Asp Leu Asn Tyr Tyr His Asp Pro His
1175 1180 1185

Ser Thr Glu Ile Glu Glu Asp Gly Ser Thr Ile Ser Asp Asp Ala
1190 1195 1200

Val Lys Gln Arg Gly Glu Ile Lys Val Gly Val Thr Gly Asn Ile

1205 1210 1215

Ser Gln Arg Val Ser Leu Arg Gly Ser Val Ala Trp Gln Lys Gly
1220 1225 1230

Ser Asp Asp Phe Ala Gln Thr Ala Gly Phe Leu Ser Met Thr Val
1235 1240 1245

Lys Trp
1250

<210> 290
<211> 15
<212> PRT
<213> Agrobacterium tumefaciens

<220>
<221> misc_feature
<222> (2)..(8)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (10)..(10)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (12)..(12)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (14)..(15)
<223> Xaa can be any naturally occurring amino acid

<400> 290

Arg Xaa Xaa Xaa Xaa Xaa Xaa Xaa Arg Xaa Arg Xaa Arg Xaa Xaa
1 5 10 15

<210> 291
<211> 200
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 291

Asp Ser Gly Thr Gly Trp Ile Trp Asp Pro Thr Leu Asn Gly Thr Ser
1 5 10 15

Leu Ser Val Thr Ala His Ala Ala Thr Thr Val Asn Gly Asn Ser Thr
20 25 30

Tyr Asn Gly Gly Ala Thr Ala Asp Tyr Val Ile Gly Leu Gly Gln Asn
35 40 45

Glu Met Val His Leu Gly Gly Gly Ala Asp Val Tyr Ala Gly His Gly
50 55 60

```
Ser Tyr Asn Thr Ile Gly Val Ser Asp Met Asn Phe His Phe Leu Asp
65                  70                  75                  80

Gly Gly Ala Gly Gly Gly Asn Thr Leu Gln Trp Glu Asn Leu Asn Asn
                85                  90                  95

Gln Ala Phe Asp Leu Thr Gly Leu Trp Asn Asn Ala Val Gln Asn Phe
            100                 105                 110

Asp Val Leu Asp Leu Ser His Ala Asn Asn Asn Asn Ala Val Leu Asp
        115                 120                 125

Leu Ala His Leu Gln Ser Met Leu Asn Gly Thr Asn Ala Val Thr Gly
    130                 135                 140

Thr Gly Asn Ala Leu Val Val Ile Gly Gly Asn Ser Val Thr Leu Ala
145                 150                 155                 160

Gly Ser Gly Trp Gln Ala Asn Gly Thr Ala Glu Leu Thr Val Asn Gly
                165                 170                 175

Gln His Asp Ser Tyr Thr Gln Tyr Ser Asn Gly Asp Thr His Val Tyr
            180                 185                 190

Val Glu Asn His Thr His Val Gly
        195                 200


<210>  292
<211>  218
<212>  PRT
<213>  Escherichia coli

<400>  292

Gly Asn Ser Leu Ala Lys Asn Val Leu Ser Gly Gly Lys Gly Asn Asp
1               5                   10                  15

Lys Leu Tyr Gly Ser Glu Gly Ala Asp Leu Leu Asp Gly Gly Glu Gly
            20                  25                  30

Asn Asp Leu Leu Lys Gly Gly Tyr Gly Asn Asp Ile Tyr Arg Tyr Leu
        35                  40                  45

Ser Gly Tyr Gly His His Ile Ile Asp Asp Asp Gly Gly Lys Asp Asp
    50                  55                  60

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

Glu Gly Asn Asp Leu Ile Met Tyr Lys Ala Glu Gly Asn Val Leu Ser
                85                  90                  95
```

```
Ile Gly His Lys Asn Gly Ile Thr Phe Arg Asn Trp Phe Glu Lys Glu
            100                 105                 110

Ser Gly Asp Ile Ser Asn His Gln Ile Glu Gln Ile Phe Asp Lys Asp
        115                 120                 125

Gly Arg Val Ile Thr Pro Asp Ser Leu Lys Lys Ala Leu Glu Tyr Gln
    130                 135                 140

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

Tyr Gly Ser Gln Asp Asn Leu Asn Pro Leu Ile Asn Glu Ile Ser Lys
                165                 170                 175

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

Ala Ser Leu Leu Gln Leu Ser Gly Asn Ala Ser Asp Phe Ser Tyr Gly
        195                 200                 205

Arg Asn Ser Ile Thr Leu Thr Ala Ser Ala
    210                 215
```

<210> 293
<211> 104
<212> PRT
<213> Pseudomonas fluorescens

<400> 293

```
Gly Ser Asp Gly Asn Asp Leu Ile Gln Gly Gly Lys Gly Ala Asp Phe
1               5                   10                  15

Ile Glu Gly Gly Lys Gly Asn Asp Thr Ile Arg Asp Asn Ser Gly His
            20                  25                  30

Asn Thr Phe Leu Phe Ser Gly His Phe Gly Gln Asp Arg Ile Ile Gly
        35                  40                  45

Tyr Gln Pro Thr Asp Arg Leu Val Phe Gln Gly Ala Asp Gly Ser Thr
    50                  55                  60

Asp Leu Arg Asp His Ala Lys Ala Val Gly Ala Asp Thr Val Leu Ser
65                  70                  75                  80

Phe Gly Ala Asp Ser Val Thr Leu Val Gly Val Gly Leu Gly Gly Leu
                85                  90                  95

Trp Ser Glu Gly Val Leu Ile Ser
            100
```

<210> 294
<211> 220
<212> PRT
<213> Magnetospirillum magneticum AMB-1

<400> 294

Gly Ala Ile Gly Gly Ala Gly Ala Ile Pro Gly Ile Thr Leu Val Gly
1 5 10 15

Asn Ala Gly Asn Asp Asp Ile Ile Gly Thr Asn Gly Asn Asp Leu Leu
20 25 30

Leu Gly Gly Lys Gly Gly Ala Thr Tyr Arg Phe Ser Gly Gly Gly Cys
35 40 45

Gly Ser Gly Gly Gly Trp Ser Ile Val Gln Ser Asp Thr Asn Asp Val
50 55 60

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

Val Asn Gly Asn Ile Gln Ile Thr Gly Ser Gly Asn Asp Val Leu Asp
85 90 95

Gly Gly Ser Gly Asn Asp Gln Ile His Gly Gly Ala Gly Asn Asp Thr
100 105 110

Ile Ile Gly Gly Thr Gly Asp Asp Val Met Phe Gly Asp Gln Gly Asn
115 120 125

Asp Thr Phe Leu Phe Asp Phe Gly Phe Gly His Asp Val Val Asp Gly
130 135 140

Gly Arg Gly Ser Asn Trp Thr Asp Thr Leu Asp Leu Thr His Asp Asn
145 150 155 160

Gln Ile Ser Ser Val Asn Ile Glu Gly Val Ser Gly Trp Ala Val Ser
165 170 175

Val Asp Ala Gln Gly His His Val Ala Gln Ala Thr Asn Gly Ala His
180 185 190

Asp Ala Asn Gly Thr Ile Val Val Thr Asn His Asp Gly Ser Gln Asp
195 200 205

Thr Ile Glu Phe His Asn Val Glu Lys Val Val Trp
210 215 220

<210> 295
<211> 226
<212> PRT
<213> Xanthomonas oryzae

<400> 295

Met Leu Met Gly Met Ser Glu Glu His Pro Ser Asn Val Gln Ile Asp
1 5 10 15

Asp Ala Gln Arg Val Arg Leu Leu Arg Ala Val Phe Asp Ala Tyr Tyr
20 25 30

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

Cys Ser Arg Leu Thr Gly Leu Ala Arg Leu Phe Pro Arg Ser Arg Met
50 55 60

Ile Cys Cys Val Arg Asp Val Gly Trp Ile Val Asp Ser Phe Glu Arg
65 70 75 80

Leu Ala Gln Ser Gln Pro Leu Arg Leu Ser Ala Leu Phe Gly Tyr Asp
85 90 95

Pro Glu Asp Ser Val Ser Met His Ala Asp Leu Leu Thr Ala Pro Arg
100 105 110

Gly Val Val Gly Tyr Ala Leu Asp Gly Leu Arg Gln Ala Phe Tyr Gly
115 120 125

Asp His Ala Asp Arg Leu Leu Leu Leu Arg Tyr Asp Thr Leu Ala Gln
130 135 140

Arg Pro Ala Gln Ala Met Glu Gln Val Tyr Ala Phe Leu Gln Leu Pro
145 150 155 160

Ala Phe Ala His Asp Tyr Ala Gly Val Gln Ala Glu Ala Glu Arg Phe
165 170 175

Asp Ala Ala Leu Gln Met Pro Gly Leu His Arg Val Arg Arg Gly Val
180 185 190

His Tyr Val Pro Arg Arg Ser Val Leu Pro Pro Ala Leu Phe Asp Gln
195 200 205

Leu Gln Glu Leu Ala Phe Trp Glu Ser Ala Pro Ser His Gly Ala Leu
210 215 220

Leu Val
225

<210> 296
<211> 1250
<212> PRT
<213> Escherichia coli

<400> 296

```
Met Arg Ile Ile Phe Leu Arg Lys Glu Tyr Leu Ser Leu Leu Pro Ser
1               5                  10                  15

Met Ile Ala Ser Leu Phe Ser Ala Asn Gly Val Ala Ala Val Thr Asp
            20                  25                  30

Ser Cys Gln Gly Tyr Asp Val Lys Ala Ser Cys Gln Ala Ser Arg Gln
        35                  40                  45

Ser Leu Ser Gly Ile Thr Gln Asp Trp Ser Ile Ala Asp Gly Gln Trp
    50                  55                  60

Leu Val Phe Ser Asp Met Thr Asn Asn Ala Ser Gly Gly Ala Val Phe
65                  70                  75                  80

Leu Gln Gln Gly Ala Glu Phe Ser Leu Leu Pro Glu Asn Glu Thr Gly
                85                  90                  95

Met Thr Leu Phe Ala Asn Asn Thr Val Thr Gly Glu Tyr Asn Asn Gly
            100                 105                 110

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

Ile Phe Ser Gly Asn Val Ala Gly Gly Tyr Gly Gly Ala Ile Tyr Ser
    130                 135                 140

Ser Gly Thr Asn Asp Thr Gly Ala Val Asp Leu Arg Val Thr Asn Ala
145                 150                 155                 160

Met Phe Arg Asn Asn Ile Ala Asn Asp Gly Lys Gly Gly Ala Ile Tyr
                165                 170                 175

Thr Ile Asn Asn Asp Val Tyr Leu Ser Asp Val Ile Phe Asp Asn Asn
            180                 185                 190

Gln Ala Tyr Thr Ser Thr Ser Tyr Ser Asp Gly Asp Gly Gly Ala Ile
        195                 200                 205

Asp Val Thr Asp Asn Asn Ser Asp Ser Lys His Pro Ser Gly Tyr Thr
    210                 215                 220

Ile Val Asn Asn Thr Ala Phe Thr Asn Asn Thr Ala Glu Gly Tyr Gly
225                 230                 235                 240

Gly Ala Ile Tyr Thr Asn Ser Val Thr Ala Pro Tyr Leu Ile Asp Ile
                245                 250                 255

Ser Val Asp Asp Ser Tyr Ser Gln Asn Gly Gly Val Leu Val Asp Glu
            260                 265                 270
```

```
Asn Asn Ser Ala Ala Gly Tyr Gly Asp Gly Pro Ser Ser Ala Ala Gly
        275                 280                 285

Gly Phe Met Tyr Leu Gly Leu Ser Glu Val Thr Phe Asp Ile Ala Asp
    290                 295                 300

Gly Lys Thr Leu Val Ile Gly Asn Thr Glu Asn Asp Gly Ala Val Asp
305                 310                 315                 320

Ser Ile Ala Gly Thr Gly Leu Ile Thr Lys Thr Gly Ser Gly Asp Leu
                325                 330                 335

Val Leu Asn Ala Asp Asn Asn Asp Phe Thr Gly Glu Met Gln Ile Glu
            340                 345                 350

Asn Gly Glu Val Thr Leu Gly Arg Ser Asn Ser Leu Met Asn Val Gly
        355                 360                 365

Asp Thr His Cys Gln Asp Asp Pro Gln Asp Cys Tyr Gly Leu Thr Ile
    370                 375                 380

Gly Ser Ile Asp Gln Tyr Gln Asn Gln Ala Glu Leu Asn Val Gly Ser
385                 390                 395                 400

Thr Gln Gln Thr Phe Val His Ala Leu Thr Gly Phe Gln Asn Gly Thr
                405                 410                 415

Leu Asn Ile Asp Ala Gly Gly Asn Val Thr Val Asn Gln Gly Ser Phe
            420                 425                 430

Ala Gly Ile Ile Glu Gly Ala Gly Gln Leu Thr Ile Ala Gln Asn Gly
        435                 440                 445

Ser Tyr Val Leu Ala Gly Ala Gln Ser Met Ala Leu Thr Gly Asp Ile
    450                 455                 460

Val Val Asp Asp Gly Ala Val Leu Ser Leu Glu Gly Asp Ala Ala Asp
465                 470                 475                 480

Leu Thr Ala Leu Gln Asp Asp Pro Gln Ser Ile Val Leu Asn Gly Gly
                485                 490                 495

Val Leu Asp Leu Ser Asp Phe Ser Thr Trp Gln Ser Gly Thr Ser Tyr
            500                 505                 510

Asn Asp Gly Leu Glu Val Ser Gly Ser Ser Gly Thr Val Ile Gly Ser
        515                 520                 525

Gln Asp Val Val Asp Leu Ala Gly Gly Asp Asn Leu His Ile Gly Gly
    530                 535                 540
```

```
Asp Gly Lys Asp Gly Val Tyr Val Val Val Asp Ala Ser Asp Gly Gln
545                 550                 555                 560

Val Ser Leu Ala Asn Asn Asn Ser Tyr Leu Gly Thr Thr Gln Ile Ala
                565                 570                 575

Ser Gly Thr Leu Met Val Ser Asp Asn Ser Gln Leu Gly Asp Thr His
            580                 585                 590

Tyr Asn Arg Gln Val Ile Phe Thr Asp Lys Gln Gln Glu Ser Val Met
        595                 600                 605

Glu Ile Thr Ser Asp Val Asp Thr Arg Ser Asp Ala Ala Gly His Gly
    610                 615                 620

Arg Asp Ile Glu Met Arg Ala Asp Gly Glu Val Ala Val Asp Ala Gly
625                 630                 635                 640

Val Asp Thr Gln Trp Gly Ala Leu Met Ala Asp Ser Ser Gly Gln His
                645                 650                 655

Gln Asp Glu Gly Ser Thr Leu Thr Lys Thr Gly Ala Gly Thr Leu Glu
            660                 665                 670

Leu Thr Ala Ser Gly Thr Thr Gln Ser Ala Val Arg Val Glu Glu Gly
        675                 680                 685

Thr Leu Lys Gly Asp Val Ala Asp Ile Leu Pro Tyr Ala Ser Ser Leu
    690                 695                 700

Trp Val Gly Asp Gly Ala Thr Phe Val Thr Gly Ala Asp Gln Asp Ile
705                 710                 715                 720

Gln Ser Ile Asp Ala Ile Ser Ser Gly Thr Ile Asp Ile Ser Asp Gly
                725                 730                 735

Thr Val Leu Arg Leu Thr Gly Gln Asp Thr Ser Val Ala Leu Asn Ala
            740                 745                 750

Ser Leu Phe Asn Gly Asp Gly Thr Leu Val Asn Ala Thr Asp Gly Val
        755                 760                 765

Thr Leu Thr Gly Glu Leu Asn Thr Asn Leu Glu Thr Asp Ser Leu Thr
    770                 775                 780

Tyr Leu Ser Asn Val Thr Val Asn Gly Asn Leu Thr Asn Thr Ser Gly
785                 790                 795                 800

Ala Val Ser Leu Gln Asn Gly Val Ala Gly Asp Thr Leu Thr Val Asn
                805                 810                 815
```

```
Gly Asp Tyr Thr Gly Gly Gly Thr Leu Leu Leu Asp Ser Glu Leu Asn
            820                 825                 830

Gly Asp Asp Ser Val Ser Asp Gln Leu Val Met Asn Gly Asn Thr Ala
        835                 840                 845

Gly Asn Thr Thr Val Val Val Asn Ser Ile Thr Gly Ile Gly Glu Pro
    850                 855                 860

Thr Ser Thr Gly Ile Lys Val Val Asp Phe Ala Ala Asp Pro Thr Gln
865                 870                 875                 880

Phe Gln Asn Asn Ala Gln Phe Ser Leu Ala Gly Ser Gly Tyr Val Asn
                885                 890                 895

Met Gly Ala Tyr Asp Tyr Thr Leu Val Glu Asp Asn Asn Asp Trp Tyr
            900                 905                 910

Leu Arg Ser Gln Glu Val Thr Pro Pro Ser Pro Pro Asp Pro Asp Pro
        915                 920                 925

Thr Pro Asp Pro Asp Pro Thr Pro Asp Pro Asp Pro Thr Pro Asp Pro
    930                 935                 940

Glu Pro Thr Pro Ala Tyr Gln Pro Val Leu Asn Ala Lys Val Gly Gly
945                 950                 955                 960

Tyr Leu Asn Asn Leu Arg Ala Ala Asn Gln Ala Phe Met Met Glu Arg
                965                 970                 975

Arg Asp His Ala Gly Gly Asp Gly Gln Thr Leu Asn Leu Arg Val Ile
            980                 985                 990

Gly Gly Asp Tyr His Tyr Thr Ala  Ala Gly Gln Leu Ala  Gln His Glu
        995                 1000                1005

Asp Thr  Ser Thr Val Gln Leu  Ser Gly Asp Leu Phe  Ser Gly Arg
    1010                1015                1020

Trp Gly  Thr Asp Gly Glu Trp  Met Leu Gly Ile Val  Gly Gly Tyr
    1025                1030                1035

Ser Asp  Asn Gln Gly Asp Ser  Arg Ser Asn Met Thr  Gly Thr Arg
    1040                1045                1050

Ala Asp  Asn Gln Asn His Gly  Tyr Ala Val Gly Leu  Thr Ser Ser
    1055                1060                1065

Trp Phe  Gln His Gly Asn Gln  Lys Gln Gly Ala Trp  Leu Asp Ser
    1070                1075                1080
```

```
Trp Leu  Gln Tyr Ala Trp Phe  Ser Asn Asp Val Ser  Glu Gln Glu
    1085                1090                1095

Asp Gly  Thr Asp His Tyr His  Ser Ser Gly Ile Ile  Ala Ser Leu
    1100                1105                1110

Glu Ala  Gly Tyr Gln Trp Leu  Pro Gly Arg Gly Val  Val Ile Glu
    1115                1120                1125

Pro Gln  Ala Gln Val Ile Tyr  Gln Gly Val Gln Gln  Asp Asp Phe
    1130                1135                1140

Thr Ala  Ala Asn Arg Ala Arg  Val Ser Gln Ser Gln  Gly Asp Asp
    1145                1150                1155

Ile Gln  Thr Arg Leu Gly Leu  His Ser Glu Trp Arg  Thr Ala Val
    1160                1165                1170

His Val  Ile Pro Thr Leu Asp  Leu Asn Tyr Tyr His  Asp Pro His
    1175                1180                1185

Ser Thr  Glu Ile Glu Glu Asp  Gly Ser Thr Ile Ser  Asp Asp Ala
    1190                1195                1200

Val Lys  Gln Arg Gly Glu Ile  Lys Val Gly Val Thr  Gly Asn Ile
    1205                1210                1215

Ser Gln  Arg Val Ser Leu Arg  Gly Ser Val Ala Trp  Gln Lys Gly
    1220                1225                1230

Ser Asp  Asp Phe Ala Gln Thr  Ala Gly Phe Leu Ser  Met Thr Val
    1235                1240                1245

Lys Trp
    1250
```

<210> 297
<211> 1039
<212> PRT
<213> Escherichia coli

<400> 297

```
Met Lys Arg His Leu Asn Thr Cys Tyr Arg Leu Val Trp Asn His Met
1               5                  10                  15

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

Arg Gly Gly Val Ala Val Ala Leu Ser Leu Ala Ala Val Thr Ser Leu
        35                  40                  45
```

```
Pro Val Leu Ala Ala Asp Ile Val Val His Pro Gly Glu Thr Val Asn
    50                  55                  60

Gly Gly Thr Leu Ala Asn His Asp Asn Gln Ile Val Phe Gly Thr Thr
65                  70                  75                  80

Asn Gly Met Thr Ile Ser Thr Gly Leu Glu Tyr Gly Pro Asp Asn Glu
                85                  90                  95

Ala Asn Thr Gly Gly Gln Trp Val Gln Asp Gly Gly Thr Ala Asn Lys
            100                 105                 110

Thr Thr Val Thr Ser Gly Gly Leu Gln Arg Val Asn Pro Gly Gly Ser
        115                 120                 125

Val Ser Asp Thr Val Ile Ser Ala Gly Gly Gly Gln Ser Leu Gln Gly
    130                 135                 140

Arg Ala Val Asn Thr Thr Leu Asn Gly Gly Glu Gln Trp Met His Glu
145                 150                 155                 160

Gly Ala Ile Ala Thr Gly Thr Val Ile Asn Asp Lys Gly Trp Gln Val
                165                 170                 175

Val Lys Pro Gly Thr Val Ala Thr Asp Thr Val Val Asn Thr Gly Ala
            180                 185                 190

Glu Gly Gly Pro Asp Ala Glu Asn Gly Asp Thr Gly Gln Phe Val Arg
        195                 200                 205

Gly Asp Ala Val Arg Thr Thr Ile Asn Lys Asn Gly Arg Gln Ile Val
    210                 215                 220

Arg Ala Glu Gly Thr Ala Asn Thr Thr Val Val Tyr Ala Gly Gly Asp
225                 230                 235                 240

Gln Thr Val His Gly His Ala Leu Asp Thr Thr Leu Asn Gly Gly Tyr
                245                 250                 255

Gln Tyr Val His Asn Gly Gly Thr Ala Ser Asp Thr Val Val Asn Ser
            260                 265                 270

Asp Gly Trp Gln Ile Val Lys Asn Gly Gly Val Ala Gly Asn Thr Thr
        275                 280                 285

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

Asn Val Thr Leu Lys Gln Gly Gly Ala Leu Val Thr Ser Thr Ala Ala
305                 310                 315                 320
```

```
Thr Val Thr Gly Ile Asn Arg Leu Gly Ala Phe Ser Val Val Glu Gly
                325                 330                 335

Lys Ala Asp Asn Val Val Leu Glu Asn Gly Gly Arg Leu Asp Val Leu
            340                 345                 350

Thr Gly His Thr Ala Thr Asn Thr Arg Val Asp Asp Gly Gly Thr Leu
        355                 360                 365

Asp Val Arg Asn Gly Gly Thr Ala Thr Thr Val Ser Met Gly Asn Gly
    370                 375                 380

Gly Val Leu Leu Ala Asp Ser Gly Ala Ala Val Ser Gly Thr Arg Ser
385                 390                 395                 400

Asp Gly Lys Ala Phe Ser Ile Gly Gly Gly Gln Ala Asp Ala Leu Met
                405                 410                 415

Leu Glu Lys Gly Ser Ser Phe Thr Leu Asn Ala Gly Asp Thr Ala Thr
            420                 425                 430

Asp Thr Thr Val Asn Gly Gly Leu Phe Thr Ala Arg Gly Gly Thr Leu
        435                 440                 445

Ala Gly Thr Thr Thr Leu Asn Asn Gly Ala Ile Leu Thr Leu Ser Gly
    450                 455                 460

Lys Thr Val Asn Asn Asp Thr Leu Thr Ile Arg Glu Gly Asp Ala Leu
465                 470                 475                 480

Leu Gln Gly Gly Ser Leu Thr Gly Asn Gly Ser Val Glu Lys Ser Gly
                485                 490                 495

Ser Gly Thr Leu Thr Val Ser Asn Thr Thr Leu Thr Gln Lys Ala Val
            500                 505                 510

Asn Leu Asn Glu Gly Thr Leu Thr Leu Asn Asp Ser Thr Val Thr Thr
        515                 520                 525

Asp Val Ile Ala Gln Arg Gly Thr Ala Leu Lys Leu Thr Gly Ser Thr
    530                 535                 540

Val Leu Asn Gly Ala Ile Asp Pro Thr Asn Val Thr Leu Ala Ser Gly
545                 550                 555                 560

Ala Thr Trp Asn Ile Pro Asp Asn Ala Thr Val Gln Ser Val Val Asp
                565                 570                 575

Asp Leu Ser His Ala Gly Gln Ile His Phe Thr Ser Thr Arg Thr Gly
            580                 585                 590
```

```
Lys Phe Val Pro Ala Thr Leu Lys Val Lys Asn Leu Asn Gly Gln Asn
        595                 600                 605

Gly Thr Ile Ser Leu Arg Val Arg Pro Asp Met Ala Gln Asn Asn Ala
    610                 615                 620

Asp Arg Leu Val Ile Asp Gly Gly Arg Ala Thr Gly Lys Thr Ile Leu
625                 630                 635                 640

Asn Leu Val Asn Ala Gly Asn Ser Ala Ser Gly Leu Ala Thr Ser Gly
                645                 650                 655

Lys Gly Ile Gln Val Val Glu Ala Ile Asn Gly Ala Thr Thr Glu Glu
            660                 665                 670

Gly Ala Phe Val Gln Gly Asn Arg Leu Gln Ala Gly Ala Phe Asn Tyr
        675                 680                 685

Ser Leu Asn Arg Asp Ser Asp Glu Ser Trp Tyr Leu Arg Ser Glu Asn
    690                 695                 700

Ala Tyr Arg Ala Glu Val Pro Leu Tyr Ala Ser Met Leu Thr Gln Ala
705                 710                 715                 720

Met Asp Tyr Asp Arg Ile Val Ala Gly Ser Arg Ser His Gln Thr Gly
                725                 730                 735

Val Asn Gly Glu Asn Asn Ser Val Arg Leu Ser Ile Gln Gly Gly His
            740                 745                 750

Leu Gly His Asp Asn Asn Gly Gly Ile Ala Arg Gly Ala Thr Pro Glu
        755                 760                 765

Ser Ser Gly Ser Tyr Gly Phe Val Arg Leu Glu Gly Asp Leu Met Arg
    770                 775                 780

Thr Glu Val Ala Gly Met Ser Val Thr Ala Gly Val Tyr Gly Ala Ala
785                 790                 795                 800

Gly His Ser Ser Val Asp Val Lys Asp Asp Asp Gly Ser Arg Ala Gly
                805                 810                 815

Thr Val Arg Asp Asp Ala Gly Ser Leu Gly Gly Tyr Leu Asn Leu Val
            820                 825                 830

His Thr Ser Ser Gly Leu Trp Ala Asp Ile Val Ala Gln Gly Thr Arg
        835                 840                 845

His Ser Met Lys Ala Ser Ser Asp Asn Asn Asp Phe Arg Ala Arg Gly
    850                 855                 860
```

Trp Gly Trp Leu Gly Ser Leu Glu Thr Gly Leu Pro Phe Ser Ile Thr
865 870 875 880

Asp Asn Leu Met Leu Glu Pro Gln Leu Gln Tyr Thr Trp Gln Gly Leu
885 890 895

Ser Leu Asp Asp Gly Lys Asp Asn Ala Gly Tyr Val Lys Phe Gly His
900 905 910

Gly Ser Ala Gln His Val Arg Ala Gly Phe Arg Leu Gly Ser His Asn
915 920 925

Asp Met Thr Phe Gly Glu Gly Thr Ser Ser Arg Ala Pro Leu Arg Asp
930 935 940

Ser Ala Lys His Ser Val Ser Glu Leu Pro Val Asn Trp Trp Val Gln
945 950 955 960

Pro Ser Val Ile Arg Thr Phe Ser Ser Arg Gly Asp Met Arg Val Gly
965 970 975

Thr Ser Thr Ala Gly Ser Gly Met Thr Phe Ser Pro Ser Gln Asn Gly
980 985 990

Thr Ser Leu Asp Leu Gln Ala Gly Leu Glu Ala Arg Val Arg Glu Asn
995 1000 1005

Ile Thr Leu Gly Val Gln Ala Gly Tyr Ala His Ser Val Ser Gly
1010 1015 1020

Ser Ser Ala Glu Gly Tyr Asn Gly Gln Ala Thr Leu Asn Val Thr
1025 1030 1035

Phe

<210> 298
<211> 457
<212> PRT
<213> Escherichia coli

<400> 298

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

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

Glu Gly Glu Gly Asp Ala Thr Tyr Gly Lys Leu Thr Leu Lys Phe Ile
35 40 45

Cys Thr Thr Gly Lys Leu Pro Val Pro Trp Pro Thr Leu Val Thr Thr

50 55 60

Leu Thr Tyr Gly Val Gln Cys Phe Ser Arg Tyr Pro Asp His Met Lys
65 70 75 80

Gln His Asp Phe Phe Lys Ser Ala Met Pro Glu Gly Tyr Val Gln Glu
85 90 95

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

Val Lys Phe Glu Gly Asp Thr Leu Val Asn Arg Ile Glu Leu Lys Gly
115 120 125

Ile Asp Phe Lys Glu Asp Gly Asn Ile Leu Gly His Lys Leu Glu Tyr
130 135 140

Asn Tyr Asn Ser His Asn Val Tyr Ile Met Ala Asp Lys Gln Lys Asn
145 150 155 160

Gly Ile Lys Val Asn Phe Lys Ile Arg His Asn Ile Glu Asp Gly Ser
165 170 175

Val Gln Leu Ala Asp His Tyr Gln Gln Asn Thr Pro Ile Gly Asp Gly
180 185 190

Pro Val Leu Leu Pro Asp Asn His Tyr Leu Ser Thr Gln Ser Ala Leu
195 200 205

Ser Lys Asp Pro Asn Glu Lys Arg Asp His Met Val Leu Leu Glu Phe
210 215 220

Val Thr Ala Ala Gly Ile Thr Leu Gly Met Asp Glu Leu Tyr Lys Gly
225 230 235 240

Asn Ser Leu Ala Lys Asn Val Leu Ser Gly Gly Lys Gly Asn Asp Lys
245 250 255

Leu Tyr Gly Ser Glu Gly Ala Asp Leu Leu Asp Gly Gly Glu Gly Asn
260 265 270

Asp Leu Leu Lys Gly Gly Tyr Gly Asn Asp Ile Tyr Arg Tyr Leu Ser
275 280 285

Gly Tyr Gly His His Ile Ile Asp Asp Asp Gly Gly Lys Asp Asp Lys
290 295 300

Leu Ser Leu Ala Asp Ile Asp Phe Arg Asp Val Ala Phe Arg Arg Glu
305 310 315 320

Gly Asn Asp Leu Ile Met Tyr Lys Ala Glu Gly Asn Val Leu Ser Ile

325 330 335

Gly His Lys Asn Gly Ile Thr Phe Lys Asn Trp Phe Glu Lys Glu Ser
340 345 350

Gly Asp Ile Ser Asn His Gln Ile Glu Gln Ile Phe Asp Lys Asp Gly
355 360 365

Arg Val Ile Thr Pro Asp Ser Leu Lys Lys Ala Leu Glu Tyr Gln Gln
370 375 380

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

Gly Ser Gln Gly Asn Leu Asn Pro Leu Ile Asn Glu Ile Ser Lys Ile
405 410 415

Ile Ser Ala Ala Gly Asn Phe Asp Val Lys Glu Glu Arg Ala Ala Ala
420 425 430

Ser Leu Leu Gln Leu Ser Gly Asn Ala Ser Asp Phe Ser Tyr Gly Arg
435 440 445

Asn Ser Ile Thr Leu Thr Ala Ser Ala
450 455

<210> 299
<211> 265
<212> PRT
<213> Helicobacter pylori

<400> 299

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

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

Glu Gly Glu Gly Asp Ala Thr Tyr Gly Lys Leu Thr Leu Lys Phe Ile
35 40 45

Cys Thr Thr Gly Lys Leu Pro Val Pro Trp Pro Thr Leu Val Thr Thr
50 55 60

Leu Thr Tyr Gly Val Gln Cys Phe Ser Arg Tyr Pro Asp His Met Lys
65 70 75 80

Gln His Asp Phe Phe Lys Ser Ala Met Pro Glu Gly Tyr Val Gln Glu
85 90 95

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

```
Val Lys Phe Glu Gly Asp Thr Leu Val Asn Arg Ile Glu Leu Lys Gly
        115                 120                 125

Ile Asp Phe Lys Glu Asp Gly Asn Ile Leu Gly His Lys Leu Glu Tyr
    130                 135                 140

Asn Tyr Asn Ser His Asn Val Tyr Ile Met Ala Asp Lys Gln Lys Asn
145                 150                 155                 160

Gly Ile Lys Val Asn Phe Lys Ile Arg His Asn Ile Glu Asp Gly Ser
                165                 170                 175

Val Gln Leu Ala Asp His Tyr Gln Gln Asn Thr Pro Ile Gly Asp Gly
            180                 185                 190

Pro Val Leu Leu Pro Asp Asn His Tyr Leu Ser Thr Gln Ser Ala Leu
        195                 200                 205

Ser Lys Asp Pro Asn Glu Lys Arg Asp His Met Val Leu Leu Glu Phe
    210                 215                 220

Val Thr Ala Ala Gly Ile Thr Leu Gly Met Asp Glu Leu Tyr Lys Leu
225                 230                 235                 240

Ala Arg Ala Glu Leu Ala Arg Ala Pro Ala Pro Arg Gln Arg Gly Met
                245                 250                 255

Asp Arg Gly Gly Pro Asp Phe Ser Met
            260                 265
```

<210> 300
<211> 289
<212> PRT
<213> Agrobacterium tumefaciens

<400> 300

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

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

Glu Gly Glu Gly Asp Ala Thr Tyr Gly Lys Leu Thr Leu Lys Phe Ile
        35                  40                  45

Cys Thr Thr Gly Lys Leu Pro Val Pro Trp Pro Thr Leu Val Thr Thr
    50                  55                  60

Leu Thr Tyr Gly Val Gln Cys Phe Ser Arg Tyr Pro Asp His Met Lys
65                  70                  75                  80
```

```
Gln His Asp Phe Phe Lys Ser Ala Met Pro Glu Gly Tyr Val Gln Glu
                85                  90                  95

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

Val Lys Phe Glu Gly Asp Thr Leu Val Asn Arg Ile Glu Leu Lys Gly
        115                 120                 125

Ile Asp Phe Lys Glu Asp Gly Asn Ile Leu Gly His Lys Leu Glu Tyr
    130                 135                 140

Asn Tyr Asn Ser His Asn Val Tyr Ile Met Ala Asp Lys Gln Lys Asn
145                 150                 155                 160

Gly Ile Lys Val Asn Phe Lys Ile Arg His Asn Ile Glu Asp Gly Ser
                165                 170                 175

Val Gln Leu Ala Asp His Tyr Gln Gln Asn Thr Pro Ile Gly Asp Gly
            180                 185                 190

Pro Val Leu Leu Pro Asp Asn His Tyr Leu Ser Thr Gln Ser Ala Leu
        195                 200                 205

Ser Lys Asp Pro Asn Glu Lys Arg Asp His Met Val Leu Leu Glu Phe
    210                 215                 220

Val Thr Ala Ala Gly Ile Thr Leu Gly Met Asp Glu Leu Tyr Lys Ile
225                 230                 235                 240

Ser Ala Leu Asp Arg Thr Ala Arg Leu Ile Ser Thr Ser Pro Ser Lys
                245                 250                 255

Ala Arg Ser Lys Ala Glu Thr Glu Lys Ala Ile Asp Glu Leu Asp Asp
            260                 265                 270

Arg Arg Val Tyr Asp Pro Arg Asp Arg Ala Gln Asp Lys Ala Phe Lys
        275                 280                 285

Arg
```