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<110> Illumina, Inc.

<120> MODIFIED TRANSPOSASES FOR IMPROVED INSERTION SEQUENCE BIAS

<130> IP-1198-PCT

<160> 26

<170> PatentIn version 3.5

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<220>
<223> Transposase Tn5

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


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110
```

```
Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300
```

```
Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
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<223> X = Y, T, K, S, L, A, W, P, G, R, F, H

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

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45

Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

Val Leu Leu Leu Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His
    130                 135                 140
```

```
Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Xaa Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335
```

```
Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
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Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Xaa Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125


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


Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160


Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175
```

```
Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365
```

```
Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
```

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<213>  Unknown

<220>
<223>  Transposase Tn5

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

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30
```

```
Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45

Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Met Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220
```

```
Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415
```

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
420 425 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
435 440 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
450 455 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465 470 475

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<220>
<223> Transposase Tn5

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

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
20 25 30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
35 40 45

Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
50 55 60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65 70 75 80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
85 90 95

```
Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Val Lys Arg Gly Lys Arg Lys Asn
                245                 250                 255

Arg Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr
            260                 265                 270

Leu Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile
        275                 280                 285
```

```
Asn Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser
    290                 295                 300

Glu Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr
305                 310                 315                 320

Thr His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly
                325                 330                 335

Ala Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg
            340                 345                 350

Met Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg
        355                 360                 365

Glu Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys
    370                 375                 380

Glu Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro
385                 390                 395                 400

Asp Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg
                405                 410                 415

Lys Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg
            420                 425                 430

Leu Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly
        435                 440                 445

Ala Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe
    450                 455                 460

Leu Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
```

<210> 6
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Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45

Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Xaa Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125
```

```
Val Leu Leu Leu Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His
    130                 135                 140

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320
```

```
His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
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Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110
```

```
Lys Leu Gly Ser Ile Gln Xaa Xaa Ser Arg Gly Trp Met Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Xaa Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300
```

```
Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
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<212> PRT
<213> Unknown

<220>
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<400>  8

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125


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


Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160


Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175
```

```
Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Arg His Arg Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Val Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365
```

```
Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
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<210>  9
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<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<400>  9

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                   10                  15

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30
```

```
Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45

Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Arg His Arg Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220
```

```
Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Arg Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Val Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415
```

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
420 425 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
435 440 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
450 455 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465 470 475

<210> 10
<211> 476
<212> PRT
<213> Unknown

<220>
<223> Transposase Tn5

<400> 10

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

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
20 25 30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
35 40 45

Ser Ser Glu Gly Ser Glu Ala Met Gln Glu Gly Ala Tyr Arg Phe Ile
50 55 60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65 70 75 80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
85 90 95

```
Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Gln Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Gly Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Arg Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285
```

```
Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Leu Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
```

<210> 11
<211> 476
<212> PRT
<213> Unknown

<220>
<223> Transposase Tn5

<400> 11

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125


Val Leu Leu Leu Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His
    130                 135                 140
```

```
Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335
```

```
Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
```

<210>  12
<211>  476
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<220>
<221>  VARIANT
<222>  (248)..(248)

<223> X = Y, T, K, S, L, A, W, P, G, R, F, H

<400> 12

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125


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


Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160


Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175
```

```
Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Xaa Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365
```

```
Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
```

<210>  13
<211>  476
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<220>
<221>  Variant
<222>  (119)..(119)
<223>  X = L, M, S, A, V

<400>  13

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                   10                  15
```

```
Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45

Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Xaa Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205
```

```
Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400
```

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
405 410 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
420 425 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
435 440 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
450 455 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465 470 475

<210> 14
<211> 476
<212> PRT
<213> Unknown

<220>
<223> Transposase Tn5

<400> 14

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

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
20 25 30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
35 40 45

Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
50 55 60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65 70 75 80

```
Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Met Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270
```

```
Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460
```

```
Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475


<210>  15
<211>  477
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<400>  15

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


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125
```

```
Val Leu Leu Leu Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His
    130                 135                 140

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Val Lys Arg Gly Lys Arg Lys Asn
                245                 250                 255

Arg Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr
            260                 265                 270

Leu Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile
        275                 280                 285

Asn Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser
    290                 295                 300

Glu Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr
305                 310                 315                 320
```

```
Thr His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly
                325                 330                 335

Ala Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg
            340                 345                 350

Met Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg
        355                 360                 365

Glu Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys
    370                 375                 380

Glu Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro
385                 390                 395                 400

Asp Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg
                405                 410                 415

Lys Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg
            420                 425                 430

Leu Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly
        435                 440                 445

Ala Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe
    450                 455                 460

Leu Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
```

<210> 16
<211> 476
<212> PRT
<213> Unknown

<220>
<223> Transposase Tn5

<220>
<221> Variant
<222> (120)..(120)
<223> X = Y, F, W, E

<400> 16

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                  10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Asp Xaa Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125


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


Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160
```

```
Glu Ser Gly Lys Trp Leu Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350
```

```
Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365


Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380


Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400


Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415


Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430


Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445


Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460


Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475


<210>  17
<211>  476
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5


<220>
<221>  Variant
<222>  (119)..(119)
<223>  X = L, M, S, A, V

<220>
<221>  Variant
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<222> (120)..(120)
<223> X = Y, F, W, E

<220>
<221> Variant
<222> (248)..(248)
<223> X = Y, T, K, S, L, A, W, P, G, R, F, H

<400> 17

```
Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                   10                  15


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Xaa Xaa Ser Arg Gly Trp Met Val His Ser
        115                 120                 125


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


Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160
```

```
Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Xaa Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350
```

```
Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365


Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380


Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400


Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415


Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430


Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445


Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460


Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475


<210>  18
<211>  476
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<400>  18

Met Ile Thr Ser Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val
1               5                   10                  15
```

```
Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45

Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80

Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205
```

```
Val Arg Ser Arg His Arg Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Val Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400
```

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
405 410 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
420 425 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
435 440 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
450 455 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465 470 475

<210> 19
<211> 476
<212> PRT
<213> Unknown

<220>
<223> Transposase Tn5

<400> 19

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

Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
20 25 30

Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
35 40 45

Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
50 55 60

Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65 70 75 80

```
Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95

Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110

Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125

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

Gln Glu Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Arg His Arg Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Arg Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270
```

```
Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320

His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Val Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460
```

```
Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475


<210>  20
<211>  476
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<400>  20

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


Phe Ser Ser Ala Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val
            20                  25                  30


Asn Val Ala Ala Gln Leu Ala Lys Tyr Ser Gly Lys Ser Ile Thr Ile
        35                  40                  45


Ser Ser Glu Gly Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile
    50                  55                  60


Arg Asn Pro Asn Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met
65                  70                  75                  80


Gln Thr Val Lys Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu
                85                  90                  95


Asp Thr Thr Ser Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly
            100                 105                 110


Lys Leu Gly Ser Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser
        115                 120                 125
```

```
Val Leu Leu Leu Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His
    130                 135                 140

Gln Gln Trp Trp Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys
145                 150                 155                 160

Glu Ser Gly Lys Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met
                165                 170                 175

Gly Ser Met Met Ser Asn Val Ile Ala Val Cys Asp Arg Gly Ala Asp
            180                 185                 190

Ile His Ala Tyr Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val
        195                 200                 205

Val Arg Ser Lys His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu
    210                 215                 220

Tyr Asp His Leu Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser
225                 230                 235                 240

Ile Pro Gln Lys Gly Val Val Asp Lys Arg Arg Lys Arg Lys Asn Arg
                245                 250                 255

Pro Ala Arg Lys Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu
            260                 265                 270

Lys Gln Gly Asn Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn
        275                 280                 285

Pro Pro Lys Gly Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu
    290                 295                 300

Pro Val Glu Ser Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr
305                 310                 315                 320
```

```
His Arg Trp Arg Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala
                325                 330                 335

Gly Ala Glu Arg Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met
            340                 345                 350

Val Ser Ile Leu Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu
        355                 360                 365

Ser Phe Thr Pro Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu
    370                 375                 380

Ala Glu His Val Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp
385                 390                 395                 400

Glu Cys Gln Leu Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys
                405                 410                 415

Glu Lys Ala Gly Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu
            420                 425                 430

Gly Gly Phe Met Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala
        435                 440                 445

Leu Trp Glu Gly Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu
    450                 455                 460

Ala Ala Lys Asp Leu Met Ala Gln Gly Ile Lys Ile
465                 470                 475
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<210>  21
<211>  10
<212>  PRT
<213>  Unknown

<220>
<223>  Transposase Tn5

<220>
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<222> (1)..(1)
<223> x= W, R, K, P, T

<220>
<221> Variant
<222> (2)..(2)
<223> x= W, N, V, K, M

<220>
<221> Variant
<222> (3)..(3)
<223> x= V, F, I, T, L

<220>
<221> Variant
<222> (4)..(4)
<223> x= H, L, W, C

<220>
<221> Variant
<222> (5)..(5)
<223> x= S, G, V, F

<220>
<221> Variant
<222> (6)..(6)
<223> x= V, A, W

<220>
<221> Variant
<222> (7)..(7)
<223> x= L, T, V, Q, W

<220>
<221> Variant
<222> (8)..(8)
<223> x= L, H, D

<220>
<221> Variant
<222> (9)..(9)
<223> x= L, H, V

<220>
<221> Variant

<222> (10)..(10)
<223> x= E, Y, A, K, Q

<400> 21

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<212> DNA
<213> Escherichia coli

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atggattgca aaaaagcact gactgaagct aacggcgaca tcgagctggc aatcgaaaac 120

atgcgtaagt ccggtgctat taaagcagcg aaaaaagcag gcaacgttgc tgctgacggc 180

gtgatcaaaa ccaaaatcga cggcaactac ggcatcattc tggaagttaa ctgccagact 240

gacttcgttg caaaagacgc tggtttccag gcgttcgcag acaaagttct ggacgcagct 300

gttgctggca aaatcactga cgttgaagtt ctgaaagcac agttcgaaga agaacgtgtt 360

gcgctggtag cgaaaattgg tgaaaacatc aacattcgcc gcgttgctgc gctggaaggc 420

gacgttctgg gttcttatca gcacggtgcg cgtatcggcg ttctggttgc tgctaaaggc 480

gctgacgaag agctggttaa acacatcgct atgcacgttg ctgcaagcaa gccagaattc 540

atcaaaccgg aagacgtatc cgctgaagtg gtagaaaaag aataccaggt acagctggat 600

atcgcgatgc agtctggtaa gccgaaagaa atcgcagaga aaatggttga aggccgcatg 660

aagaaattca ccggcgaagt ttctctgacc ggtcagccgt tcgttatgga accaagcaaa 720

actgttggtc agctgctgaa agagcataac gctgaagtga ctggcttcat ccgcttcgaa 780

gtgggtgaag gcatcgagaa agttgagact gactttgcag cagaagttgc tgcgatgtcc 840

aagcagtctt aa 852

<210> 23
<211> 283

<212> PRT
<213> Escherichia coli

<400> 23

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


Gly Ala Gly Met Met Asp Cys Lys Lys Ala Leu Thr Glu Ala Asn Gly
            20                  25                  30


Asp Ile Glu Leu Ala Ile Glu Asn Met Arg Lys Ser Gly Ala Ile Lys
        35                  40                  45


Ala Ala Lys Lys Ala Gly Asn Val Ala Ala Asp Gly Val Ile Lys Thr
    50                  55                  60


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


Asp Phe Val Ala Lys Asp Ala Gly Phe Gln Ala Phe Ala Asp Lys Val
                85                  90                  95


Leu Asp Ala Ala Val Ala Gly Lys Ile Thr Asp Val Glu Val Leu Lys
            100                 105                 110


Ala Gln Phe Glu Glu Glu Arg Val Ala Leu Val Ala Lys Ile Gly Glu
        115                 120                 125


Asn Ile Asn Ile Arg Arg Val Ala Ala Leu Glu Gly Asp Val Leu Gly
    130                 135                 140


Ser Tyr Gln His Gly Ala Arg Ile Gly Val Leu Val Ala Ala Lys Gly
145                 150                 155                 160


Ala Asp Glu Glu Leu Val Lys His Ile Ala Met His Val Ala Ala Ser
                165                 170                 175
```

Lys Pro Glu Phe Ile Lys Pro Glu Asp Val Ser Ala Glu Val Val Glu
180 185 190

Lys Glu Tyr Gln Val Gln Leu Asp Ile Ala Met Gln Ser Gly Lys Pro
195 200 205

Lys Glu Ile Ala Glu Lys Met Val Glu Gly Arg Met Lys Lys Phe Thr
210 215 220

Gly Glu Val Ser Leu Thr Gly Gln Pro Phe Val Met Glu Pro Ser Lys
225 230 235 240

Thr Val Gly Gln Leu Leu Lys Glu His Asn Ala Glu Val Thr Gly Phe
245 250 255

Ile Arg Phe Glu Val Gly Glu Gly Ile Glu Lys Val Glu Thr Asp Phe
260 265 270

Ala Ala Glu Val Ala Ala Met Ser Lys Gln Ser
275 280

<210> 24
<211> 2283
<212> DNA
<213> Unknown

<220>
<223> TS-Tn5 nucleic acid sequence

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atggattgca aaaaagcact gactgaagct aacggcgaca tcgagctggc aatcgaaaac 120

atgcgtaagt ccggtgctat taaagcagcg aaaaaagcag gcaacgttgc tgctgacggc 180

gtgatcaaaa ccaaaatcga cggcaactac ggcatcattc tggaagttaa ctgccagact 240

gacttcgttg caaaagacgc tggtttccag gcgttcgcag acaaagttct ggacgcagct 300

gttgctggca aaatcactga cgttgaagtt ctgaaagcac agttcgaaga agaacgtgtt 360

gcgctggtag cgaaaattgg tgaaaacatc aacattcgcc gcgttgctgc gctggaaggc 420

gacgttctgg gttcttatca gcacggtgcg cgtatcggcg ttctggttgc tgctaaaggc 480

gctgacgaag agctggttaa acacatcgct atgcacgttg ctgcaagcaa gccagaattc 540

atcaaaccgg aagacgtatc cgctgaagtg gtagaaaaag aataccaggt acagctggat 600

atcgcgatgc agtctggtaa gccgaaagaa atcgcagaga aaatggttga aggccgcatg 660

aagaaattca ccggcgaagt ttctctgacc ggtcagccgt tcgttatgga accaagcaaa 720

actgttggtc agctgctgaa agagcataac gctgaagtga ctggcttcat ccgcttcgaa 780

gtgggtgaag gcatcgagaa agttgagact gactttgcag cagaagttgc tgcgatgtcc 840

aagcagtctg gtaccataac ttctgctctt catcgtgcgg ccgactgggc taaatctgtg 900

ttctcttcgg cggcgctggg tgatcctcgc cgtactgccc gcttggttaa cgtcgccgcc 960

caattggcaa aatattctgg taaatcaata accatctcat cagagggtag taaagccgcc 1020

caggaaggcg cttaccgatt tatccgcaat cccaacgttt ctgccgaggc gatcagaaag 1080

gctggcgcca tgcaaacagt caagttggct caggagtttc ccgaactgct ggccattgag 1140

gacaccacct ctttgagtta tcgccaccag gtcgccgaag agcttggcaa gctgggctct 1200

attcaggata aatcccgcgg atggtgggtt cactccgttc tcttgctcga ggccaccaca 1260

ttccgcaccg taggattact gcatcaggag tggtggatgc gcccggatga ccctgccgat 1320

gcggatgaaa aggagagtgg caaatggctg gcagcggccg caactagccg gttacgcatg 1380

ggcagcatga tgagcaacgt gattgcggtc tgtgaccgcg aagccgatat tcatgcttat 1440

ctgcaggaca aactggcgca taacgagcgc ttcgtggtgc gctccaagca cccacgcaag 1500

gacgtagagt ctgggttgta tctgtacgac catctgaaga accaaccgga gttgggtggc 1560

tatcagatca gcattccgca aaagggcgtg gtggataaac gcggtaaacg taaaaatcga 1620

ccagcccgca aggcgagctt gagcctgcgc agtgggcgca tcacgctaaa acaggggaat 1680

atcacgctca acgcggtgct ggccgaggag attaacccgc ccaagggtga gaccccgttg 1740

aaatggttgt tgctgaccag cgaaccggtc gagtcgctag cccaagcctt gcgcgtcatc 1800

gacatttata cccatcgctg gcggatcgag gagttccata aggcatggaa aaccggagca 1860

ggagccgaga ggcaacgcat ggaggagccg gataatctgg agcggatggt ctcgatcctc 1920

tcgtttgttg cggtcaggct gttacagctc agagaaagct tcacgccgcc gcaagcactc 1980

agggcgcaag ggctgctaaa ggaagcggaa cacgtagaaa gccagtccgc agaaacggtg 2040

ctgaccccgg atgaatgtca gctactgggc tatctggaca agggaaaacg caagcgcaaa 2100

gagaaagcag gtagcttgca gtgggcttac atggcgatag ctagactggg cggttttatg 2160

gacagcaagc gaaccggaat tgccagctgg ggcgccctct gggaaggttg ggaagccctg 2220

caaagtaaac tggatggctt tcttgccgcc aaggatctga tggcgcaggg gatcaagatc 2280

tga 2283

<210> 25
<211> 760
<212> PRT
<213> Unknown

<220>
<223> TS-Tn5 Fusion Protein Amino Acid Sequence

<400> 25

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Gly Ala Gly Met Met Asp Cys Lys Lys Ala Leu Thr Glu Ala Asn Gly
20 25 30

Asp Ile Glu Leu Ala Ile Glu Asn Met Arg Lys Ser Gly Ala Ile Lys
35 40 45

Ala Ala Lys Lys Ala Gly Asn Val Ala Ala Asp Gly Val Ile Lys Thr
50 55 60

Lys Ile Asp Gly Asn Tyr Gly Ile Ile Leu Glu Val Asn Cys Gln Thr

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65                  70                  75                  80

Asp Phe Val Ala Lys Asp Ala Gly Phe Gln Ala Phe Ala Asp Lys Val
                85                  90                  95

Leu Asp Ala Ala Val Ala Gly Lys Ile Thr Asp Val Glu Val Leu Lys
            100                 105                 110

Ala Gln Phe Glu Glu Glu Arg Val Ala Leu Val Ala Lys Ile Gly Glu
        115                 120                 125

Asn Ile Asn Ile Arg Arg Val Ala Ala Leu Glu Gly Asp Val Leu Gly
    130                 135                 140

Ser Tyr Gln His Gly Ala Arg Ile Gly Val Leu Val Ala Ala Lys Gly
145                 150                 155                 160

Ala Asp Glu Glu Leu Val Lys His Ile Ala Met His Val Ala Ala Ser
                165                 170                 175

Lys Pro Glu Phe Ile Lys Pro Glu Asp Val Ser Ala Glu Val Val Glu
            180                 185                 190

Lys Glu Tyr Gln Val Gln Leu Asp Ile Ala Met Gln Ser Gly Lys Pro
        195                 200                 205

Lys Glu Ile Ala Glu Lys Met Val Glu Gly Arg Met Lys Lys Phe Thr
    210                 215                 220

Gly Glu Val Ser Leu Thr Gly Gln Pro Phe Val Met Glu Pro Ser Lys
225                 230                 235                 240

Thr Val Gly Gln Leu Leu Lys Glu His Asn Ala Glu Val Thr Gly Phe
                245                 250                 255

Ile Arg Phe Glu Val Gly Glu Gly Ile Glu Lys Val Glu Thr Asp Phe
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```
            260                 265                 270

Ala Ala Glu Val Ala Ala Met Ser Lys Gln Ser Gly Thr Ile Thr Ser
        275                 280                 285

Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val Phe Ser Ser Ala
    290                 295                 300

Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val Asn Val Ala Ala
305                 310                 315                 320

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

Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile Arg Asn Pro Asn
            340                 345                 350

Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met Gln Thr Val Lys
        355                 360                 365

Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu Asp Thr Thr Ser
    370                 375                 380

Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly Lys Leu Gly Ser
385                 390                 395                 400

Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser Val Leu Leu Leu
                405                 410                 415

Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His Gln Glu Trp Trp
            420                 425                 430

Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys Glu Ser Gly Lys
        435                 440                 445

Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met Gly Ser Met Met
```

```
    450                 455                 460

Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp Ile His Ala Tyr
465                 470                 475                 480

Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val Val Arg Ser Lys
                485                 490                 495

His Pro Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu Tyr Asp His Leu
            500                 505                 510

Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser Ile Pro Gln Lys
        515                 520                 525

Gly Val Val Asp Lys Arg Gly Lys Arg Lys Asn Arg Pro Ala Arg Lys
    530                 535                 540

Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu Lys Gln Gly Asn
545                 550                 555                 560

Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn Pro Pro Lys Gly
                565                 570                 575

Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu Pro Val Glu Ser
            580                 585                 590

Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr His Arg Trp Arg
        595                 600                 605

Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala Gly Ala Glu Arg
    610                 615                 620

Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met Val Ser Ile Leu
625                 630                 635                 640

Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu Ser Phe Thr Pro
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645 650 655

Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu Ala Glu His Val
660 665 670

Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp Glu Cys Gln Leu
675 680 685

Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys Glu Lys Ala Gly
690 695 700

Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu Gly Gly Phe Met
705 710 715 720

Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala Leu Trp Glu Gly
725 730 735

Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu Ala Ala Lys Asp
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Leu Met Ala Gln Gly Ile Lys Ile
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Gly Ala Gly Met Met Asp Cys Lys Lys Ala Leu Thr Glu Ala Asn Gly
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        35                  40                  45

Ala Ala Lys Lys Ala Gly Asn Val Ala Ala Asp Gly Val Ile Lys Thr
    50                  55                  60

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

Asp Phe Val Ala Lys Asp Ala Gly Phe Gln Ala Phe Ala Asp Lys Val
                85                  90                  95

Leu Asp Ala Ala Val Ala Gly Lys Ile Thr Asp Val Glu Val Leu Lys
            100                 105                 110

Ala Gln Phe Glu Glu Glu Arg Val Ala Leu Val Ala Lys Ile Gly Glu
        115                 120                 125

Asn Ile Asn Ile Arg Arg Val Ala Ala Leu Glu Gly Asp Val Leu Gly
    130                 135                 140

Ser Tyr Gln His Gly Ala Arg Ile Gly Val Leu Val Ala Ala Lys Gly
145                 150                 155                 160

Ala Asp Glu Glu Leu Val Lys His Ile Ala Met His Val Ala Ala Ser
                165                 170                 175

Lys Pro Glu Phe Ile Lys Pro Glu Asp Val Ser Ala Glu Val Val Glu
            180                 185                 190

Lys Glu Tyr Gln Val Gln Leu Asp Ile Ala Met Gln Ser Gly Lys Pro
        195                 200                 205

Lys Glu Ile Ala Glu Lys Met Val Glu Gly Arg Met Lys Lys Phe Thr
    210                 215                 220
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Gly Glu Val Ser Leu Thr Gly Gln Pro Phe Val Met Glu Pro Ser Lys
225                 230                 235                 240

Thr Val Gly Gln Leu Leu Lys Glu His Asn Ala Glu Val Thr Gly Phe
                245                 250                 255

Ile Arg Phe Glu Val Gly Glu Gly Ile Glu Lys Val Glu Thr Asp Phe
            260                 265                 270

Ala Ala Glu Val Ala Ala Met Ser Lys Gln Ser Gly Thr Ile Thr Ser
        275                 280                 285

Ala Leu His Arg Ala Ala Asp Trp Ala Lys Ser Val Phe Ser Ser Ala
    290                 295                 300

Ala Leu Gly Asp Pro Arg Arg Thr Ala Arg Leu Val Asn Val Ala Ala
305                 310                 315                 320

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

Ser Lys Ala Ala Gln Glu Gly Ala Tyr Arg Phe Ile Arg Asn Pro Asn
            340                 345                 350

Val Ser Ala Glu Ala Ile Arg Lys Ala Gly Ala Met Gln Thr Val Lys
        355                 360                 365

Leu Ala Gln Glu Phe Pro Glu Leu Leu Ala Ile Glu Asp Thr Thr Ser
    370                 375                 380

Leu Ser Tyr Arg His Gln Val Ala Glu Glu Leu Gly Lys Leu Gly Ser
385                 390                 395                 400

Ile Gln Asp Lys Ser Arg Gly Trp Trp Val His Ser Val Leu Leu Leu
                405                 410                 415
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Glu Ala Thr Thr Phe Arg Thr Val Gly Leu Leu His Gln Glu Trp Trp
            420                 425                 430

Met Arg Pro Asp Asp Pro Ala Asp Ala Asp Glu Lys Glu Ser Gly Lys
        435                 440                 445

Trp Leu Ala Ala Ala Ala Thr Ser Arg Leu Arg Met Gly Ser Met Met
    450                 455                 460

Ser Asn Val Ile Ala Val Cys Asp Arg Glu Ala Asp Ile His Ala Tyr
465                 470                 475                 480

Leu Gln Asp Lys Leu Ala His Asn Glu Arg Phe Val Val Arg Ser Arg
                485                 490                 495

His Arg Arg Lys Asp Val Glu Ser Gly Leu Tyr Leu Tyr Asp His Leu
            500                 505                 510

Lys Asn Gln Pro Glu Leu Gly Gly Tyr Gln Ile Ser Ile Pro Gln Lys
        515                 520                 525

Gly Val Val Asp Lys Arg Arg Lys Arg Lys Asn Arg Pro Ala Arg Lys
    530                 535                 540

Ala Ser Leu Ser Leu Arg Ser Gly Arg Ile Thr Leu Lys Gln Gly Asn
545                 550                 555                 560

Ile Thr Leu Asn Ala Val Leu Ala Glu Glu Ile Asn Pro Pro Lys Gly
                565                 570                 575

Glu Thr Pro Leu Lys Trp Leu Leu Leu Thr Ser Glu Pro Val Glu Ser
            580                 585                 590

Leu Ala Gln Ala Leu Arg Val Ile Asp Ile Tyr Thr His Arg Trp Arg
        595                 600                 605
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Ile Glu Glu Phe His Lys Ala Trp Lys Thr Gly Ala Gly Val Glu Arg
    610                 615                 620

Gln Arg Met Glu Glu Pro Asp Asn Leu Glu Arg Met Val Ser Ile Leu
625                 630                 635                 640

Ser Phe Val Ala Val Arg Leu Leu Gln Leu Arg Glu Ser Phe Thr Pro
                645                 650                 655

Pro Gln Ala Leu Arg Ala Gln Gly Leu Leu Lys Glu Ala Glu His Val
            660                 665                 670

Glu Ser Gln Ser Ala Glu Thr Val Leu Thr Pro Asp Glu Cys Gln Leu
        675                 680                 685

Leu Gly Tyr Leu Asp Lys Gly Lys Arg Lys Arg Lys Glu Lys Ala Gly
    690                 695                 700

Ser Leu Gln Trp Ala Tyr Met Ala Ile Ala Arg Leu Gly Gly Phe Met
705                 710                 715                 720

Asp Ser Lys Arg Thr Gly Ile Ala Ser Trp Gly Ala Leu Trp Glu Gly
                725                 730                 735

Trp Glu Ala Leu Gln Ser Lys Leu Asp Gly Phe Leu Ala Ala Lys Asp
            740                 745                 750

Leu Met Ala Gln Gly Ile Lys Ile
        755                 760
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