SEQUENCE LISTING

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<120> Recombinant VWF Formulations

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<150> 61/017,881
<151> 2007-12-31

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Arg Ser Phe Ser Ile Ile Gly Asp Phe Gln Asn Gly Lys Arg Val Ser
65                  70                  75                  80

Leu Ser Val Tyr Leu Gly Glu Phe Phe Asp Ile His Leu Phe Val Asn
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Ile Phe Ala Glu Asp Asp Phe Met Thr Gln Glu Gly Thr Leu Thr Ser
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Asp Pro Tyr Asp Phe Ala Asn Ser Trp Ala Leu Ser Ser Gly Glu Gln
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Gln Lys Gly Leu Trp Glu Gln Cys Gln Leu Leu Lys Ser Thr Ser Val
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Phe Ala Arg Cys His Pro Leu Val Asp Pro Glu Pro Phe Cys Glu Lys
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Tyr Arg Gln Cys Val Ser Pro Cys Ala Arg Thr Cys Gln Ser Leu His
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Ile Asn Glu Met Cys Gln Glu Arg Cys Val Asp Gly Cys Ser Cys Pro
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Glu Gly Gln Leu Leu Asp Glu Gly Leu Cys Val Glu Ser Thr Glu Cys
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Pro Cys Val His Ser Gly Lys Arg Tyr Pro Pro Gly Thr Ser Leu Ser
            340                 345                 350

Arg Asp Cys Asn Thr Cys Ile Cys Arg Asn Ser Gln Trp Ile Cys Ser
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Asn Glu Glu Cys Pro Gly Glu Cys Leu Val Thr Gly Gln Ser His Phe
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Thr Val Gln Cys Ala Asp Asp Arg Asp Ala Val Cys Thr Arg Ser Val
            420                 425                 430

Thr Val Arg Leu Pro Gly Leu His Asn Ser Leu Val Lys Leu Lys His
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Lys Gly Asp Leu Arg Ile Gln His Thr Val Thr Ala Ser Val Arg Leu
465                 470                 475                 480

Ser Tyr Gly Glu Asp Leu Gln Met Asp Trp Asp Gly Arg Gly Arg Leu
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Leu Val Lys Leu Ser Pro Val Tyr Ala Gly Lys Thr Cys Gly Leu Cys
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Gly Asn Tyr Asn Gly Asn Gln Gly Asp Asp Phe Leu Thr Pro Ser Gly
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Cys Leu Cys Gly Ser Tyr Ala Ala Ala Cys Ala Gly Arg Gly Val Arg
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Val Ala Trp Arg Glu Pro Gly Arg Cys Glu Leu Asn Cys Pro Lys Gly
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Gln Val Tyr Leu Gln Cys Gly Thr Pro Cys Asn Leu Thr Cys Arg Ser
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Leu Ser Tyr Pro Asp Glu Glu Cys Asn Glu Ala Cys Leu Glu Gly Cys
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Phe Cys Pro Pro Met Asp Glu Arg Gly Asp Cys Val Pro Lys Ala Gln
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Cys Pro Cys Tyr Tyr Asp Gly Glu Ile Phe Gln Pro Glu Asp Ile Phe
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Ser Asp His His Thr Met Cys Tyr Cys Glu Asp Gly Phe Met His Cys
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Thr Met Ser Gly Val Pro Gly Ser Leu Leu Pro Asp Ala Val Leu Ser
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Ser Pro Leu Ser His Arg Ser Lys Arg Ser Leu Ser Cys Arg Pro Pro
            740                 745                 750

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        755                 760                 765

Glu Cys Thr Lys Thr Cys Gln Asn Tyr Asp Leu Glu Cys Met Ser Met
    770                 775                 780

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Asn Arg Cys Glu Arg Cys Pro Cys Phe His Gln Gly Lys Glu Tyr Ala
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Pro Gly Glu Thr Val Lys Ile Gly Cys Asn Thr Cys Val Cys Arg Asp
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Arg Lys Trp Asn Cys Thr Asp His Val Cys Asp Ala Thr Cys Ser Thr
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    850                 855                 860

Pro Gly Glu Cys Gln Tyr Val Leu Val Gln Asp Tyr Cys Gly Ser Asn
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Pro Gly Thr Phe Arg Ile Leu Val Gly Asn Lys Gly Cys Ser His Pro
                885                 890                 895

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            900                 905                 910

Ile Glu Leu Phe Asp Gly Glu Val Asn Val Lys Arg Pro Met Lys Asp
        915                 920                 925
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Glu Thr His Phe Glu Val Val Glu Ser Gly Arg Tyr Ile Ile Leu Leu
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Leu Gly Lys Ala Leu Ser Val Val Trp Asp Arg His Leu Ser Ile Ser
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Val Val Leu Lys Gln Thr Tyr Gln Glu Lys Val Cys Gly Leu Cys Gly
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Pro Gly  Gly Leu Val Val Pro  Pro Thr Asp Ala Pro  Val Ser Pro
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Val Val  Asp Met Met Glu Arg  Leu Arg Ile Ser Gln  Lys Trp Val
    1280                1285                1290

Arg Val  Ala Val Val Glu Tyr  His Asp Gly Ser His  Ala Tyr Ile
    1295                1300                1305

Gly Leu  Lys Asp Arg Lys Arg  Pro Ser Glu Leu Arg  Arg Ile Ala
    1310                1315                1320

Ser Gln  Val Lys Tyr Ala Gly  Ser Gln Val Ala Ser  Thr Ser Glu
    1325                1330                1335
```

```
Val Leu Lys Tyr Thr Leu Phe Gln Ile Phe Ser Lys Ile Asp Arg
    1340                1345                1350

Pro Glu Ala Ser Arg Ile Thr Leu Leu Leu Met Ala Ser Gln Glu
    1355                1360                1365

Pro Gln Arg Met Ser Arg Asn Phe Val Arg Tyr Val Gln Gly Leu
    1370                1375                1380

Lys Lys Lys Lys Val Ile Val Ile Pro Val Gly Ile Gly Pro His
    1385                1390                1395

Ala Asn Leu Lys Gln Ile Arg Leu Ile Glu Lys Gln Ala Pro Glu
    1400                1405                1410

Asn Lys Ala Phe Val Leu Ser Ser Val Asp Glu Leu Glu Gln Gln
    1415                1420                1425

Arg Asp Glu Ile Val Ser Tyr Leu Cys Asp Leu Ala Pro Glu Ala
    1430                1435                1440
```

```
Pro Pro Pro Thr Leu Pro Pro Asp Met Ala Gln Val Thr Val Gly
    1445                1450                1455

Pro Gly Leu Leu Gly Val Ser Thr Leu Gly Pro Lys Arg Asn Ser
    1460                1465                1470

Met Val Leu Asp Val Ala Phe Val Leu Glu Gly Ser Asp Lys Ile
    1475                1480                1485

Gly Glu Ala Asp Phe Asn Arg Ser Lys Glu Phe Met Glu Glu Val
    1490                1495                1500

Ile Gln Arg Met Asp Val Gly Gln Asp Ser Ile His Val Thr Val
    1505                1510                1515

Leu Gln Tyr Ser Tyr Met Val Thr Val Glu Tyr Pro Phe Ser Glu
    1520                1525                1530

Ala Gln Ser Lys Gly Asp Ile Leu Gln Arg Val Arg Glu Ile Arg
    1535                1540                1545

Tyr Gln Gly Gly Asn Arg Thr Asn Thr Gly Leu Ala Leu Arg Tyr
    1550                1555                1560

Leu Ser Asp His Ser Phe Leu Val Ser Gln Gly Asp Arg Glu Gln
    1565                1570                1575

Ala Pro Asn Leu Val Tyr Met Val Thr Gly Asn Pro Ala Ser Asp
    1580                1585                1590
```

```
Glu Ile  Lys Arg Leu Pro Gly  Asp Ile Gln Val Val  Pro Ile Gly
    1595                 1600                 1605

Val Gly  Pro Asn Ala Asn Val  Gln Glu Leu Glu Arg  Ile Gly Trp
    1610                 1615                 1620

Pro Asn  Ala Pro Ile Leu Ile  Gln Asp Phe Glu Thr  Leu Pro Arg
    1625                 1630                 1635

Glu Ala  Pro Asp Leu Val Leu  Gln Arg Cys Cys Ser  Gly Glu Gly
    1640                 1645                 1650

Leu Gln  Ile Pro Thr Leu Ser  Pro Ala Pro Asp Cys  Ser Gln Pro
    1655                 1660                 1665

Leu Asp  Val Ile Leu Leu Leu  Asp Gly Ser Ser Ser  Phe Pro Ala
    1670                 1675                 1680

Ser Tyr  Phe Asp Glu Met Lys  Ser Phe Ala Lys Ala  Phe Ile Ser
    1685                 1690                 1695
```

```
Lys Ala  Asn Ile Gly Pro Arg  Leu Thr Gln Val Ser  Val Leu Gln
    1700                 1705                 1710

Tyr Gly  Ser Ile Thr Thr Ile  Asp Val Pro Trp Asn  Val Val Pro
    1715                 1720                 1725

Glu Lys  Ala His Leu Leu Ser  Leu Val Asp Val Met  Gln Arg Glu
    1730                 1735                 1740

Gly Gly  Pro Ser Gln Ile Gly  Asp Ala Leu Gly Phe  Ala Val Arg
    1745                 1750                 1755

Tyr Leu  Thr Ser Glu Met His  Gly Ala Arg Pro Gly  Ala Ser Lys
    1760                 1765                 1770

Ala Val  Val Ile Leu Val Thr  Asp Val Ser Val Asp  Ser Val Asp
    1775                 1780                 1785

Ala Ala  Ala Asp Ala Ala Arg  Ser Asn Arg Val Thr  Val Phe Pro
    1790                 1795                 1800

Ile Gly  Ile Gly Asp Arg Tyr  Asp Ala Ala Gln Leu  Arg Ile Leu
    1805                 1810                 1815

Ala Gly  Pro Ala Gly Asp Ser  Asn Val Val Lys Leu  Gln Arg Ile
    1820                 1825                 1830

Glu Asp  Leu Pro Thr Met Val  Thr Leu Gly Asn Ser  Phe Leu His
    1835                 1840                 1845
```

Lys Leu Cys Ser Gly Phe Val Arg Ile Cys Met Asp Glu Asp Gly
1850 1855 1860

Asn Glu Lys Arg Pro Gly Asp Val Trp Thr Leu Pro Asp Gln Cys
1865 1870 1875

His Thr Val Thr Cys Gln Pro Asp Gly Gln Thr Leu Leu Lys Ser
1880 1885 1890

His Arg Val Asn Cys Asp Arg Gly Leu Arg Pro Ser Cys Pro Asn
1895 1900 1905

Ser Gln Ser Pro Val Lys Val Glu Glu Thr Cys Gly Cys Arg Trp
1910 1915 1920

Thr Cys Pro Cys Val Cys Thr Gly Ser Ser Thr Arg His Ile Val
1925 1930 1935

Thr Phe Asp Gly Gln Asn Phe Lys Leu Thr Gly Ser Cys Ser Tyr
1940 1945 1950

Val Leu Phe Gln Asn Lys Glu Gln Asp Leu Glu Val Ile Leu His
1955 1960 1965

Asn Gly Ala Cys Ser Pro Gly Ala Arg Gln Gly Cys Met Lys Ser
1970 1975 1980

Ile Glu Val Lys His Ser Ala Leu Ser Val Glu Leu His Ser Asp
1985 1990 1995

Met Glu Val Thr Val Asn Gly Arg Leu Val Ser Val Pro Tyr Val
2000 2005 2010

Gly Gly Asn Met Glu Val Asn Val Tyr Gly Ala Ile Met His Glu
2015 2020 2025

Val Arg Phe Asn His Leu Gly His Ile Phe Thr Phe Thr Pro Gln
2030 2035 2040

Asn Asn Glu Phe Gln Leu Gln Leu Ser Pro Lys Thr Phe Ala Ser
2045 2050 2055

Lys Thr Tyr Gly Leu Cys Gly Ile Cys Asp Glu Asn Gly Ala Asn
2060 2065 2070

Asp Phe Met Leu Arg Asp Gly Thr Val Thr Thr Asp Trp Lys Thr
2075 2080 2085

Leu Val Gln Glu Trp Thr Val Gln Arg Pro Gly Gln Thr Cys Gln
2090 2095 2100

Pro Glu Gln Cys Leu Val Pro Asp Ser Ser His Cys Gln Val Leu
2105 2110 2115

Leu Leu Pro Leu Phe Ala Glu Cys His Lys Val Leu Ala Pro Ala
2120 2125 2130

Thr Phe Tyr Ala Ile Cys Gln Gln Asp Ser Cys His Gln Glu Gln
2135 2140 2145

Val Cys Glu Val Ile Ala Ser Tyr Ala His Leu Cys Arg Thr Asn
2150 2155 2160

Gly Val Cys Val Asp Trp Arg Thr Pro Asp Phe Cys Ala Met Ser
2165 2170 2175

Cys Pro Pro Ser Leu Val Tyr Asn His Cys Glu His Gly Cys Pro
2180 2185 2190

Arg His Cys Asp Gly Asn Val Ser Ser Cys Gly Asp His Pro Ser
2195 2200 2205

Glu Gly Cys Phe Cys Pro Pro Asp Lys Val Met Leu Glu Gly Ser
2210 2215 2220

Cys Val Pro Glu Glu Ala Cys Thr Gln Cys Ile Gly Glu Asp Gly
2225 2230 2235

Val Gln His Gln Phe Leu Glu Ala Trp Val Pro Asp His Gln Pro
2240 2245 2250

Cys Gln Ile Cys Thr Cys Leu Ser Gly Arg Lys Val Asn Cys Thr
2255 2260 2265

Thr Gln Pro Cys Pro Thr Ala Lys Ala Pro Thr Cys Gly Leu Cys
2270 2275 2280

Glu Val Ala Arg Leu Arg Gln Asn Ala Asp Gln Cys Cys Pro Glu
2285 2290 2295

Tyr Glu Cys Val Cys Asp Pro Val Ser Cys Asp Leu Pro Pro Val
2300 2305 2310

Pro His Cys Glu Arg Gly Leu Gln Pro Thr Leu Thr Asn Pro Gly
2315 2320 2325

Glu Cys Arg Pro Asn Phe Thr Cys Ala Cys Arg Lys Glu Glu Cys
2330 2335 2340

Lys Arg Val Ser Pro Pro Ser Cys Pro Pro His Arg Leu Pro Thr
2345 2350 2355

```
Leu Arg  Lys Thr Gln Cys Cys  Asp Glu Tyr Glu Cys  Ala Cys Asn
    2360                 2365                 2370

Cys Val  Asn Ser Thr Val Ser  Cys Pro Leu Gly Tyr  Leu Ala Ser
    2375                 2380                 2385

Thr Ala  Thr Asn Asp Cys Gly  Cys Thr Thr Thr Thr  Cys Leu Pro
    2390                 2395                 2400

Asp Lys  Val Cys Val His Arg  Ser Thr Ile Tyr Pro  Val Gly Gln
    2405                 2410                 2415

Phe Trp  Glu Glu Gly Cys Asp  Val Cys Thr Cys Thr  Asp Met Glu
    2420                 2425                 2430

Asp Ala  Val Met Gly Leu Arg  Val Ala Gln Cys Ser  Gln Lys Pro
    2435                 2440                 2445

Cys Glu  Asp Ser Cys Arg Ser  Gly Phe Thr Tyr Val  Leu His Glu
    2450                 2455                 2460
```

```
Gly Glu  Cys Cys Gly Arg Cys  Leu Pro Ser Ala Cys  Glu Val Val
    2465                 2470                 2475

Thr Gly  Ser Pro Arg Gly Asp  Ser Gln Ser Ser Trp  Lys Ser Val
    2480                 2485                 2490

Gly Ser  Gln Trp Glu Asn Pro  Cys Leu Ile Asn Glu  Cys Val Arg
    2495                 2500                 2505

Val Lys  Glu Glu Val Phe Ile  Gln Gln Arg Asn Val  Ser Cys Pro
    2510                 2515                 2520

Gln Leu  Glu Val Pro Val Cys  Pro Ser Gly Phe Gln  Leu Ser Cys
    2525                 2530                 2535

Lys Thr  Ser Ala Cys Cys Pro  Ser Cys Arg Cys Glu  Arg Met Glu
    2540                 2545                 2550

Ala Cys  Met Leu Asn Gly Thr  Val Ile Gly Pro Gly  Lys Thr Val
    2555                 2560                 2565

Met Ile  Asp Val Cys Thr Thr  Cys Arg Cys Met Val  Gln Val Gly
    2570                 2575                 2580

Val Ile  Ser Gly Phe Lys Leu  Glu Cys Arg Lys Thr  Thr Cys Asn
    2585                 2590                 2595

Pro Cys  Pro Leu Gly Tyr Lys  Glu Glu Asn Asn Thr  Gly Glu Cys
    2600                 2605                 2610
```

```
Cys Gly  Arg Cys Leu Pro Thr  Ala Cys Thr Ile Gln  Leu Arg Gly
    2615                 2620                 2625

Gly Gln  Ile Met Thr Leu Lys  Arg Asp Glu Thr Leu  Gln Asp Gly
    2630                 2635                 2640

Cys Asp  Thr His Phe Cys Lys  Val Asn Glu Arg Gly  Glu Tyr Phe
    2645                 2650                 2655

Trp Glu  Lys Arg Val Thr Gly  Cys Pro Pro Phe Asp  Glu His Lys
    2660                 2665                 2670

Cys Leu  Ala Glu Gly Gly Lys  Ile Met Lys Ile Pro  Gly Thr Cys
    2675                 2680                 2685

Cys Asp  Thr Cys Glu Glu Pro  Glu Cys Asn Asp Ile  Thr Ala Arg
    2690                 2695                 2700

Leu Gln  Tyr Val Lys Val Gly  Ser Cys Lys Ser Glu  Val Glu Val
    2705                 2710                 2715
```

```
Asp Ile  His Tyr Cys Gln Gly  Lys Cys Ala Ser Lys  Ala Met Tyr
    2720                 2725                 2730

Ser Ile  Asp Ile Asn Asp Val  Gln Asp Gln Cys Ser  Cys Cys Ser
    2735                 2740                 2745

Pro Thr  Arg Thr Glu Pro Met  Gln His Cys Thr Asn  Gly Ser Val
    2750                 2755                 2760

Val Tyr  His Glu Val Leu Asn  Ala Met Glu Cys Lys  Cys Ser Pro
    2765                 2770                 2775

Arg Lys  Cys Ser Lys
    2780
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<210> 3
<211> 2050
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<220>
<221> MISC_FEATURE
<223> mature VWF

<400> 3

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Ser Leu Ser Cys Arg Pro Pro Met Val Lys Leu Val Cys Pro Ala Asp
1               5                  10                  15
```

```
Asn Leu Arg Ala Glu Gly Leu Glu Cys Thr Lys Thr Cys Gln Asn Tyr
            20                  25                  30

Asp Leu Glu Cys Met Ser Met Gly Cys Val Ser Gly Cys Leu Cys Pro
        35                  40                  45

Pro Gly Met Val Arg His Glu Asn Arg Cys Val Ala Leu Glu Arg Cys
    50                  55                  60

Pro Cys Phe His Gln Gly Lys Glu Tyr Ala Pro Gly Glu Thr Val Lys
65                  70                  75                  80

Ile Gly Cys Asn Thr Cys Val Cys Arg Asp Arg Lys Trp Asn Cys Thr
                85                  90                  95

Asp His Val Cys Asp Ala Thr Cys Ser Thr Ile Gly Met Ala His Tyr
            100                 105                 110

Leu Thr Phe Asp Gly Leu Lys Tyr Leu Phe Pro Gly Glu Cys Gln Tyr
        115                 120                 125

Val Leu Val Gln Asp Tyr Cys Gly Ser Asn Pro Gly Thr Phe Arg Ile
    130                 135                 140

Leu Val Gly Asn Lys Gly Cys Ser His Pro Ser Val Lys Cys Lys Lys
145                 150                 155                 160

Arg Val Thr Ile Leu Val Glu Gly Gly Glu Ile Glu Leu Phe Asp Gly
                165                 170                 175

Glu Val Asn Val Lys Arg Pro Met Lys Asp Glu Thr His Phe Glu Val
            180                 185                 190

Val Glu Ser Gly Arg Tyr Ile Ile Leu Leu Leu Gly Lys Ala Leu Ser
        195                 200                 205

Val Val Trp Asp Arg His Leu Ser Ile Ser Val Val Leu Lys Gln Thr
    210                 215                 220

Tyr Gln Glu Lys Val Cys Gly Leu Cys Gly Asn Phe Asp Gly Ile Gln
225                 230                 235                 240

Asn Asn Asp Leu Thr Ser Ser Asn Leu Gln Val Glu Glu Asp Pro Val
                245                 250                 255

Asp Phe Gly Asn Ser Trp Lys Val Ser Ser Gln Cys Ala Asp Thr Arg
            260                 265                 270

Lys Val Pro Leu Asp Ser Ser Pro Ala Thr Cys His Asn Asn Ile Met
        275                 280                 285
```

```
Lys Gln Thr Met Val Asp Ser Ser Cys Arg Ile Leu Thr Ser Asp Val
290                 295                 300

Phe Gln Asp Cys Asn Lys Leu Val Asp Pro Glu Pro Tyr Leu Asp Val
305                 310                 315                 320

Cys Ile Tyr Asp Thr Cys Ser Cys Glu Ser Ile Gly Asp Cys Ala Cys
                325                 330                 335

Phe Cys Asp Thr Ile Ala Ala Tyr Ala His Val Cys Ala Gln His Gly
            340                 345                 350

Lys Val Val Thr Trp Arg Thr Ala Thr Leu Cys Pro Gln Ser Cys Glu
        355                 360                 365

Glu Arg Asn Leu Arg Glu Asn Gly Tyr Glu Cys Glu Trp Arg Tyr Asn
    370                 375                 380

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

Ala Cys Pro Val Gln Cys Val Glu Gly Cys His Ala His Cys Pro Pro
                405                 410                 415

Gly Lys Ile Leu Asp Glu Leu Leu Gln Thr Cys Val Asp Pro Glu Asp
            420                 425                 430

Cys Pro Val Cys Glu Val Ala Gly Arg Arg Phe Ala Ser Gly Lys Lys
        435                 440                 445

Val Thr Leu Asn Pro Ser Asp Pro Glu His Cys Gln Ile Cys His Cys
    450                 455                 460

Asp Val Val Asn Leu Thr Cys Glu Ala Cys Gln Glu Pro Gly Gly Leu
465                 470                 475                 480

Val Val Pro Pro Thr Asp Ala Pro Val Ser Pro Thr Thr Leu Tyr Val
                485                 490                 495

Glu Asp Ile Ser Glu Pro Pro Leu His Asp Phe Tyr Cys Ser Arg Leu
            500                 505                 510

Leu Asp Leu Val Phe Leu Leu Asp Gly Ser Ser Arg Leu Ser Glu Ala
        515                 520                 525

Glu Phe Glu Val Leu Lys Ala Phe Val Val Asp Met Met Glu Arg Leu
    530                 535                 540

Arg Ile Ser Gln Lys Trp Val Arg Val Ala Val Val Glu Tyr His Asp
545                 550                 555                 560
```

```
Gly Ser His Ala Tyr Ile Gly Leu Lys Asp Arg Lys Arg Pro Ser Glu
                565                 570                 575

Leu Arg Arg Ile Ala Ser Gln Val Lys Tyr Ala Gly Ser Gln Val Ala
            580                 585                 590

Ser Thr Ser Glu Val Leu Lys Tyr Thr Leu Phe Gln Ile Phe Ser Lys
        595                 600                 605

Ile Asp Arg Pro Glu Ala Ser Arg Ile Thr Leu Leu Leu Met Ala Ser
    610                 615                 620

Gln Glu Pro Gln Arg Met Ser Arg Asn Phe Val Arg Tyr Val Gln Gly
625                 630                 635                 640

Leu Lys Lys Lys Lys Val Ile Val Ile Pro Val Gly Ile Gly Pro His
                645                 650                 655

Ala Asn Leu Lys Gln Ile Arg Leu Ile Glu Lys Gln Ala Pro Glu Asn
            660                 665                 670

Lys Ala Phe Val Leu Ser Ser Val Asp Glu Leu Glu Gln Gln Arg Asp
        675                 680                 685

Glu Ile Val Ser Tyr Leu Cys Asp Leu Ala Pro Glu Ala Pro Pro Pro
    690                 695                 700

Thr Leu Pro Pro Asp Met Ala Gln Val Thr Val Gly Pro Gly Leu Leu
705                 710                 715                 720

Gly Val Ser Thr Leu Gly Pro Lys Arg Asn Ser Met Val Leu Asp Val
                725                 730                 735

Ala Phe Val Leu Glu Gly Ser Asp Lys Ile Gly Glu Ala Asp Phe Asn
            740                 745                 750

Arg Ser Lys Glu Phe Met Glu Glu Val Ile Gln Arg Met Asp Val Gly
        755                 760                 765

Gln Asp Ser Ile His Val Thr Val Leu Gln Tyr Ser Tyr Met Val Thr
    770                 775                 780

Val Glu Tyr Pro Phe Ser Glu Ala Gln Ser Lys Gly Asp Ile Leu Gln
785                 790                 795                 800

Arg Val Arg Glu Ile Arg Tyr Gln Gly Gly Asn Arg Thr Asn Thr Gly
                805                 810                 815

Leu Ala Leu Arg Tyr Leu Ser Asp His Ser Phe Leu Val Ser Gln Gly
            820                 825                 830
```

Asp Arg Glu Gln Ala Pro Asn Leu Val Tyr Met Val Thr Gly Asn Pro
835 840 845

Ala Ser Asp Glu Ile Lys Arg Leu Pro Gly Asp Ile Gln Val Val Pro
850 855 860

Ile Gly Val Gly Pro Asn Ala Asn Val Gln Glu Leu Glu Arg Ile Gly
865 870 875 880

Trp Pro Asn Ala Pro Ile Leu Ile Gln Asp Phe Glu Thr Leu Pro Arg
885 890 895

Glu Ala Pro Asp Leu Val Leu Gln Arg Cys Cys Ser Gly Glu Gly Leu
900 905 910

Gln Ile Pro Thr Leu Ser Pro Ala Pro Asp Cys Ser Gln Pro Leu Asp
915 920 925

Val Ile Leu Leu Leu Asp Gly Ser Ser Ser Phe Pro Ala Ser Tyr Phe
930 935 940

Asp Glu Met Lys Ser Phe Ala Lys Ala Phe Ile Ser Lys Ala Asn Ile
945 950 955 960

Gly Pro Arg Leu Thr Gln Val Ser Val Leu Gln Tyr Gly Ser Ile Thr
965 970 975

Thr Ile Asp Val Pro Trp Asn Val Val Pro Glu Lys Ala His Leu Leu
980 985 990

Ser Leu Val Asp Val Met Gln Arg Glu Gly Gly Pro Ser Gln Ile Gly
995 1000 1005

Asp Ala Leu Gly Phe Ala Val Arg Tyr Leu Thr Ser Glu Met His
1010 1015 1020

Gly Ala Arg Pro Gly Ala Ser Lys Ala Val Val Ile Leu Val Thr
1025 1030 1035

Asp Val Ser Val Asp Ser Val Asp Ala Ala Ala Asp Ala Ala Arg
1040 1045 1050

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

Asp Ala Ala Gln Leu Arg Ile Leu Ala Gly Pro Ala Gly Asp Ser
1070 1075 1080

Asn Val Val Lys Leu Gln Arg Ile Glu Asp Leu Pro Thr Met Val
1085 1090 1095

```
Thr Leu Gly Asn Ser Phe Leu His Lys Leu Cys Ser Gly Phe Val
1100                1105                1110

Arg Ile Cys Met Asp Glu Asp Gly Asn Glu Lys Arg Pro Gly Asp
1115                1120                1125

Val Trp Thr Leu Pro Asp Gln Cys His Thr Val Thr Cys Gln Pro
1130                1135                1140

Asp Gly Gln Thr Leu Leu Lys Ser His Arg Val Asn Cys Asp Arg
1145                1150                1155

Gly Leu Arg Pro Ser Cys Pro Asn Ser Gln Ser Pro Val Lys Val
1160                1165                1170

Glu Glu Thr Cys Gly Cys Arg Trp Thr Cys Pro Cys Val Cys Thr
1175                1180                1185

Gly Ser Ser Thr Arg His Ile Val Thr Phe Asp Gly Gln Asn Phe
1190                1195                1200

Lys Leu Thr Gly Ser Cys Ser Tyr Val Leu Phe Gln Asn Lys Glu
1205                1210                1215

Gln Asp Leu Glu Val Ile Leu His Asn Gly Ala Cys Ser Pro Gly
1220                1225                1230

Ala Arg Gln Gly Cys Met Lys Ser Ile Glu Val Lys His Ser Ala
1235                1240                1245

Leu Ser Val Glu Leu His Ser Asp Met Glu Val Thr Val Asn Gly
1250                1255                1260

Arg Leu Val Ser Val Pro Tyr Val Gly Gly Asn Met Glu Val Asn
1265                1270                1275

Val Tyr Gly Ala Ile Met His Glu Val Arg Phe Asn His Leu Gly
1280                1285                1290

His Ile Phe Thr Phe Thr Pro Gln Asn Asn Glu Phe Gln Leu Gln
1295                1300                1305

Leu Ser Pro Lys Thr Phe Ala Ser Lys Thr Tyr Gly Leu Cys Gly
1310                1315                1320

Ile Cys Asp Glu Asn Gly Ala Asn Asp Phe Met Leu Arg Asp Gly
1325                1330                1335

Thr Val Thr Thr Asp Trp Lys Thr Leu Val Gln Glu Trp Thr Val
1340                1345                1350
```

```
Gln Arg  Pro Gly Gln Thr Cys  Gln Pro Ile Leu Glu  Glu Gln Cys
    1355                 1360                 1365

Leu Val  Pro Asp Ser Ser His  Cys Gln Val Leu Leu  Leu Pro Leu
    1370                 1375                 1380

Phe Ala  Glu Cys His Lys Val  Leu Ala Pro Ala Thr  Phe Tyr Ala
    1385                 1390                 1395

Ile Cys  Gln Gln Asp Ser Cys  His Gln Glu Gln Val  Cys Glu Val
    1400                 1405                 1410

Ile Ala  Ser Tyr Ala His Leu  Cys Arg Thr Asn Gly  Val Cys Val
    1415                 1420                 1425

Asp Trp  Arg Thr Pro Asp Phe  Cys Ala Met Ser Cys  Pro Pro Ser
    1430                 1435                 1440

Leu Val  Tyr Asn His Cys Glu  His Gly Cys Pro Arg  His Cys Asp
    1445                 1450                 1455

Gly Asn  Val Ser Ser Cys Gly  Asp His Pro Ser Glu  Gly Cys Phe
    1460                 1465                 1470

Cys Pro  Pro Asp Lys Val Met  Leu Glu Gly Ser Cys  Val Pro Glu
    1475                 1480                 1485

Glu Ala  Cys Thr Gln Cys Ile  Gly Glu Asp Gly Val  Gln His Gln
    1490                 1495                 1500

Phe Leu  Glu Ala Trp Val Pro  Asp His Gln Pro Cys  Gln Ile Cys
    1505                 1510                 1515

Thr Cys  Leu Ser Gly Arg Lys  Val Asn Cys Thr Thr  Gln Pro Cys
    1520                 1525                 1530

Pro Thr  Ala Lys Ala Pro Thr  Cys Gly Leu Cys Glu  Val Ala Arg
    1535                 1540                 1545

Leu Arg  Gln Asn Ala Asp Gln  Cys Cys Pro Glu Tyr  Glu Cys Val
    1550                 1555                 1560

Cys Asp  Pro Val Ser Cys Asp  Leu Pro Pro Val Pro  His Cys Glu
    1565                 1570                 1575

Arg Gly  Leu Gln Pro Thr Leu  Thr Asn Pro Gly Glu  Cys Arg Pro
    1580                 1585                 1590

Asn Phe  Thr Cys Ala Cys Arg  Lys Glu Glu Cys Lys  Arg Val Ser
    1595                 1600                 1605
```

```
Pro Pro  Ser Cys Pro Pro His  Arg Leu Pro Thr Leu  Arg Lys Thr
    1610                 1615                 1620

Gln Cys  Cys Asp Glu Tyr Glu  Cys Ala Cys Asn Cys  Val Asn Ser
    1625                 1630                 1635

Thr Val  Ser Cys Pro Leu Gly  Tyr Leu Ala Ser Thr  Ala Thr Asn
    1640                 1645                 1650

Asp Cys  Gly Cys Thr Thr Thr  Thr Cys Leu Pro Asp  Lys Val Cys
    1655                 1660                 1665

Val His  Arg Ser Thr Ile Tyr  Pro Val Gly Gln Phe  Trp Glu Glu
    1670                 1675                 1680

Gly Cys  Asp Val Cys Thr Cys  Thr Asp Met Glu Asp  Ala Val Met
    1685                 1690                 1695

Gly Leu  Arg Val Ala Gln Cys  Ser Gln Lys Pro Cys  Glu Asp Ser
    1700                 1705                 1710

Cys Arg  Ser Gly Phe Thr Tyr  Val Leu His Glu Gly  Glu Cys Cys
    1715                 1720                 1725

Gly Arg  Cys Leu Pro Ser Ala  Cys Glu Val Val Thr  Gly Ser Pro
    1730                 1735                 1740

Arg Gly  Asp Ser Gln Ser Ser  Trp Lys Ser Val Gly  Ser Gln Trp
    1745                 1750                 1755

Ala Ser  Pro Glu Asn Pro Cys  Leu Ile Asn Glu Cys  Val Arg Val
    1760                 1765                 1770

Lys Glu  Glu Val Phe Ile Gln  Gln Arg Asn Val Ser  Cys Pro Gln
    1775                 1780                 1785

Leu Glu  Val Pro Val Cys Pro  Ser Gly Phe Gln Leu  Ser Cys Lys
    1790                 1795                 1800

Thr Ser  Ala Cys Cys Pro Ser  Cys Arg Cys Glu Arg  Met Glu Ala
    1805                 1810                 1815

Cys Met  Leu Asn Gly Thr Val  Ile Gly Pro Gly Lys  Thr Val Met
    1820                 1825                 1830

Ile Asp  Val Cys Thr Thr Cys  Arg Cys Met Val Gln  Val Gly Val
    1835                 1840                 1845

Ile Ser  Gly Phe Lys Leu Glu  Cys Arg Lys Thr Thr  Cys Asn Pro
    1850                 1855                 1860
```

```
Cys Pro  Leu Gly Tyr Lys Glu  Glu Asn Asn Thr Gly  Glu Cys Cys
    1865                 1870                 1875

Gly Arg  Cys Leu Pro Thr Ala  Cys Thr Ile Gln Leu  Arg Gly Gly
    1880                 1885                 1890

Gln Ile  Met Thr Leu Lys Arg  Asp Glu Thr Leu Gln  Asp Gly Cys
    1895                 1900                 1905

Asp Thr  His Phe Cys Lys Val  Asn Glu Arg Gly Glu  Tyr Phe Trp
    1910                 1915                 1920

Glu Lys  Arg Val Thr Gly Cys  Pro Pro Phe Asp Glu  His Lys Cys
    1925                 1930                 1935

Leu Ala  Glu Gly Gly Lys Ile  Met Lys Ile Pro Gly  Thr Cys Cys
    1940                 1945                 1950

Asp Thr  Cys Glu Glu Pro Glu  Cys Asn Asp Ile Thr  Ala Arg Leu
    1955                 1960                 1965

Gln Tyr  Val Lys Val Gly Ser  Cys Lys Ser Glu Val  Glu Val Asp
    1970                 1975                 1980

Ile His  Tyr Cys Gln Gly Lys  Cys Ala Ser Lys Ala  Met Tyr Ser
    1985                 1990                 1995

Ile Asp  Ile Asn Asp Val Gln  Asp Gln Cys Ser Cys  Cys Ser Pro
    2000                 2005                 2010

Thr Arg  Thr Glu Pro Met Gln  Val Ala Leu His Cys  Thr Asn Gly
    2015                 2020                 2025

Ser Val  Val Tyr His Glu Val  Leu Asn Ala Met Glu  Cys Lys Cys
    2030                 2035                 2040

Ser Pro  Arg Lys Cys Ser Lys
    2045                 2050
```