```
1       ATGGCAGCTAAAGACGTAAAATTCGGTAACGACGCTCGTGTGAAAATGCTGCGCGGCGTA
1       METAlaAlaLysAspValLysPheGlyAsnAspAlaArgValLysMETLeuArgGlyVal

61      AACGTACTGGCAGATGCAGTGAAAGTTACCCTCGGTCCGAAAGGCCGTAACGTAGTTCTG
21      AsnValLeuAlaAspAlaValLysValThrLeuGlyProLysGlyArgAsnValValLeu

121     GATAAATCTTTCGGTGCACCGACCATCACCAAAGATGGTGTTTCCGTTGCTCGTGAAATC
41      AspLysSerPheGlyAlaProThrIleThrLysAspGlyValSerValAlaArgGluIle

181     GAACTGGAAGACAAGTTCGAAAACATGGGTGCGCAGATGGTGAAAGAAGTTGCCTCTAAA
61      GluLeuGluAspLysPheGluAsnMETGlyAlaGlnMETValLysGluValAlaSerLys

241     GCGAACGACGCTGCAGGCGACGGTACCACCACTGCAACCGTACTGGCTCAGGCTATCATC
81      AlaAsnAspAlaAlaGlyAspGlyThrThrThrAlaThrValLeuAlaGlnAlaIleIle

301     ACTGAAGGTCTGAAAGCTGTTGCTGCGGGCATGAACCCGATGGACCTGAAACGTGGTATC
101     ThrGluGlyLeuLysAlaValAlaAlaGlyMETAsnProMETAspLeuLysArgGlyIle

361     GACAAAGCTGTTACCGCTGCAGTTGAAGAACTGAAAGCGCTGTCCGTACCGTGCTCTGAC
121     AspLysAlaValThrAlaAlaValGluGluLeuLysAlaLeuSerValProCysSerAsp

421     TCTAAAGCGATTGCTCAGGTTGGTACTATCTCCGCTAACTCCGACGAAACCGTAGGTAAA
141     SerLysAlaIleAlaGlnValGlyThrIleSerAlaAsnSerAspGluThrValGlyLys

481     CTGATCGCTGAAGCGATGGACAAAGTCGGTAAAGAAGGCGTTATCACCGTTGAAGACGGT
161     LeuIleAlaGluAlaMETAspLysValGlyLysGluGlyValIleThrValGluAspGly

541     ACCGGTCTGCAGGACGAACTGGACGTGGTTGAAGGTATGCAGTTCGACCGTGGCTACCTG
181     ThrGlyLeuGlnAspGluLeuAspValValGluGlyMETGlnPheAspArgGlyTyrLeu

601     TCTCCTTACTTCATCAACAAGCCGGAAACTGGCGCAGTAGAACTGGAAAGCCCGTTCATC
201     SerProTyrPheIleAsnLysProGluThrGlyAlaValGluLeuGluSerProPheIle

661     CTGCTGGCTGACAAGAAAATCTCCAACATCCGCGAAATGCTGCCGGTTCTGGAAGCCGTT
221     LeuLeuAlaAspLysLysIleSerAsnIleArgGluMETLeuProValLeuGluAlaVal

721     GCCAAAGCAGGCAAACCGCTGCTGATCATCGCTGAAGATGTAGAAGGCGAAGCGCTGGCA
241     AlaLysAlaGlyLysProLeuLeuIleIleAlaGluAspValGluGlyGluAlaLeuAla

781     ACTCTGGTTGTTAACACCATGCGTGGCATCGTGAAAGTTGCTGCAGTTAAAGCTCCGGGC
261     ThrLeuValValAsnThrMETArgGlyIleValLysValAlaAlaValLysAlaProGly

841     TTCGGCGATCGTCGTAAAGCTATGCTGCAGGATATCGCAACCCTGACTGGCGGTACCGTA
281     PheGlyAspArgArgLysAlaMETLeuGlnAspIleAlaThrLeuThrGlyGlyThrVal

901     ATCTCTGAAGAGATCGGTATGGAGCTGGAAAAAGCAACCCTGGAAGACCTGGGTCAGGCT
301     IleSerGluGluIleGlyMETGluLeuGluLysAlaThrLeuGluAspLeuGlyGlnAla

961     AAACGCGTTGTGATCAACAAAGACACCACCACCATCATCGATGGCGTGGGCGAAGAAGCT
321     LysArgValValIleAsnLysAspThrThrThrIleIleAspGlyValGlyGluGluAla

1021    GCAATCCAGGGCCGTGTTGCTCAGATCCGTCAGCAGATTGAAGAAGCAACTTCTGACTAC
341     AlaIleGlnGlyArgValAlaGlnIleArgGlnGlnIleGluGluAlaThrSerAspTyr
```

FIG. 1A

```
1081    GACCGTGAAAAACTGCAGGAGCGCGTAGCGAAACTGGCAGGCGGCGTTGCAGTTATCAAA
361     AspArgGluLysLeuGlnGluArgValAlaLysLeuAlaGlyGlyValAlaValIleLys
1141    GTAGGTGCTGCTACCGAAGTTGAAATGAAAGAGAAAAAAGCACGCGTTGAAGACGCCCTG
381     ValGlyAlaAlaThrGluValGluMETLysGluLysLysAlaArgValGluAspAlaLeu
1201    CACGCGACCCGTGCTGCGGTAGAAGAAGGCGTGGTTGCTGGTGGTGGTGTTGCGCTGATC
401     HisAlaThrArgAlaAlaValGluGluGlyValValAlaGlyGlyGlyValAlaLeuIle

1261    CGCGTAGCGTCTAAACTGGCTGACCTGCGTGGTCAGAACGAAGACCAGAACGTGGGTATC
421     ArgValAlaSerLysLeuAlaAspLeuArgGlyGlnAsnGluAspGlnAsnValGlyIle

1321    AAAGTTGCACTGCGTGCAATGGAAGCTCCGCTGCGTCAGATCGTCCTGAACTGCGGCGAA
441     LysValAlaLeuArgAlaMETGluAlaProLeuArgGlnIleValLeuAsnCysGlyGlu

1381    GAACCGTCTGTTGTTGCTAACACCGTTAAAGGCGGCGACGGCAACTACGGTTACAACGCA
461     GluProSerValValAlaAsnThrValLysGlyGlyAspGlyAsnTyrGlyTyrAsnAla

1441    GCAACCGAAGAATACGGCAACATGATCGACATGGGTATCCTGGACCCAACCAAAGTAACC
481     AlaThrGluGluTyrGlyAsnMETIleAspMETGlyIleLeuAspProThrLysValThr

1501    CGTTCTGCTCTGCAGTACGCGGCTTCTGTGGCTGGCCTGATGATCACCACCGAATGCATG
501     ArgSerAlaLeuGlnTyrAlaAlaSerValAlaGlyLeuMETIleThrThrGluCysMET

1561    GTTACCGACCTGCCGAAAAACGATGCAGCTGACTTAGGCGCTGCTGGCGGCATGGGTGGC
521     ValThrAspLeuProLysAsnAspAlaAlaAspLeuGlyAlaAlaGlyGlyMETGlyGly

1621    ATGGGTGGCATGGGCGGCATGATGTAA
541     METGlyGlyMETGlyGlyMETMET***
```

FIG. 1B

```
1          ATGGCAGCTAAAGACGTAAAATTCGGTAACGACGCTCGTGTGAAAATGCTGCGCGGCGTA
1          METAlaAlaLysAspValLysPheGlyAsnAspAlaArgValLysMETLeuArgGlyVal

61         AACGTACTGGCAGATGCAGTGAAAGTTACCCTCGGTCCGAAAGGCCGTAACGTAGTTCTG
21         AsnValLeuAlaAspAlaValLysValThrLeuGlyProLysGlyArgAsnValValLeu

121        GATAAATCTTTCGGTGCACCGACCATCACCAAAGATGGTGTTTCCGTTGCTCGTGAAATC
41         AspLysSerPheGlyAlaProThrIleThrLysAspGlyValSerValAlaArgGluIle

181        GAACTGGAAGACAAGTTCGAAAACATGGGTGCGCAGATGGTGAAAGAAGTTGCCTCTAAA
61         GluLeuGluAspLysPheGluAsnMETGlyAlaGlnMETValLysGluValAlaSerLys

241        GCGAACGACGCTGCAGGCGACGGTACCACCACTGCAACCGTACTGGCTCAGGCTATCATC
81         AlaAsnAspAlaAlaGlyAspGlyThrThrThrAlaThrValLeuAlaGlnAlaIleIle

301        ACTGAAGGTCTGAAAGCTGTTGCTGCGGGCATGAACCCGATGGACCTGAAACGTGGTATC
101        ThrGluGlyLeuLysAlaValAlaAlaGlyMETAsnProMETAspLeuLysArgGlyIle

361        GACAAAGCTGTTACCGCTGCAGTTGAAGAACTGAAAGCGCTGTCCGTACCGTGCTCTGAC
121        AspLysAlaValThrAlaAlaValGluGluLeuLysAlaLeuSerValProCysSerAsp

421        TCTAAAGCGATTGCTCAGGTTGGTACTATCTCCGCTAACTCCGACGAAACCGTAGGTAAA
141        SerLysAlaIleAlaGlnValGlyThrIleSerAlaAsnSerAspGluThrValGlyLys

481        CTGATCGCTGAAGCGATGGACAAAGTCGGTAAAGAAGGCGTTATCACCGTTGAAGACGGT
161        LeuIleAlaGluAlaMETAspLysValGlyLysGluGlyValIleThrValGluAspGly

541        ACCGGTCTGCAGGACGAACTGGACGTGGTTGAAGGTATGCAGTTCGACCGTGGCTACCTG
181        ThrGlyLeuGlnAspGluLeuAspValValGluGlyMETGlnPheAspArgGlyTyrLeu

601        TCTCCTTACTTCATCAACAAGCCGGAAACTGGCGCAGTAGAACTGGAAAGCCCGTTCATC
201        SerProTyrPheIleAsnLysProGluThrGlyAlaValGluLeuGluSerProPheIle

661        CTGCTGGCTGACAAGAAAATCTCCAACATCCGCGAAATGCTGCCGGTTCTGGAAGCCGTT
221        LeuLeuAlaAspLysLysIleSerAsnIleArgGluMETLeuProValLeuGluAlaVal

721        GCCAAAGCAGGCAAACCGCTGCTGATCATCGCTGAAGATGTAGAAGGCGAAGCGCTGGCA
241        AlaLysAlaGlyLysProLeuLeuIleIleAlaGluAspValGluGlyGluAlaLeuAla

781        ACTCTGGTTGTTAACACCATGCGTGGCATCGTGAAAGTTGCTGCAGTTAAAGCTCCGGGC
261        ThrLeuValValAsnThrMETArgGlyIleValLysValAlaAlaValLysAlaProGly

841        TTCGGCGATCGTCGTAAAGCTATGCTGCAGGATATCGCAACCCTGACTGGCGGTACCGTA
281        PheGlyAspArgArgLysAlaMETLeuGlnAspIleAlaThrLeuThrGlyGlyThrVal

901        ATCTCTGAAGAGATCGGTATGGAGCTGGAAAAAGCAACCCTGGAAGACCTGGGTCAGGCT
301        IleSerGluGluIleGlyMETGluLeuGluLysAlaThrLeuGluAspLeuGlyGlnAla

961        AAACGCGTTGTGATCAACAAAGACACCACCACCATCATCGATGGCGTGGGCGAAGAAGCT
321        LysArgValValIleAsnLysAspThrThrThrIleIleAspGlyValGlyGluGluAla
```

FIG. 2A

```
1021        GCAATCCAGGGCCGTGTTGCTCAGATCCGTCAGCAGATTGAAGAAGCAACTTCTGACTAC
341         AlaIleGlnGlyArgValAlaGlnIleArgGlnGlnIleGluGluAlaThrSerAspTyr

1081        GACCGTGAAAAACTGCAGGAGCGCGTAGCGAAACTGGCAGGCGGCGTTGCAGTTATCAAA
361         AspArgGluLysLeuGlnGluArgValAlaLysLeuAlaGlyGlyValAlaValIleLys

1141        GTAGGTGCTGCTACCGAAGTTGAAATGAAAGAGAAAAAAGCACGCGTTGAAGACGCCCTG
381         ValGlyAlaAlaThrGluValGluMETLysGluLysLysAlaArgValGluAspAlaLeu

1201        CACGCGACCCGTGCTGCGGTAGAAGAAGGCGTGGTTGCTGGTGGTGGTGTTGCGCTGATC
401         HisAlaThrArgAlaAlaValGluGluGlyValValAlaGlyGlyGlyValAlaLeuIle

1261        CGCGTAGCGTCTAAACTGGCTGACCTGCGTGGTCAGAACGAAGACCAGAACGTGGGTATC
421         ArgValAlaSerLysLeuAlaAspLeuArgGlyGlnAsnGluAspGlnAsnValGlyIle

1321        AAAGTTGCACTGCGTGCAATGGAAGCTCCGCTGCGTCAGATCGTCCTGAACTGCGGCGAA
441         LysValAlaLeuArgAlaMETGluAlaProLeuArgGlnIleValLeuAsnCysGlyGlu

1381        GAACCGTCTGTTGTTGCTAACACCGTTAAAGGCGGCGACGGCAACTACGGTTACAACGCA
461         GluProSerValValAlaAsnThrValLysGlyGlyAspGlyAsnTyrGlyTyrAsnAla

1441        GCAACCGAAGAATACGGCAACATGATC***TGC***ATGGGTATCCTGGACCCAACCAAAGTAACC
481         AlaThrGluGluTyrGlyAsnMETIle**Cys**METGlyIleLeuAspProThrLysValThr

1501        CGTTCTGCTCTGCAGTACGCGGCTTCTGTGGCTGGCCTGATGATCACCACCGAATGCATG
501         ArgSerAlaLeuGlnTyrAlaAlaSerValAlaGlyLeuMETIleThrThrGluCysMET

1561        GTTACCGACCTGCCGAAAAACGATGCAGCTGACTTAGGCGCTGCTGGCGGCATGGGTGGC
521         ValThrAspLeuProLysAsnAspAlaAlaAspLeuGlyAlaAlaGlyGlyMETGlyGly

1621        ATGGGTGGCATGGGCGGCATGATGTAA
541         METGlyGlyMETGlyGlyMETMET***
```

FIG. 2B

```
1          ATGGCAGCTAAAGACGTAAAATTCGGTAACGACGCTCGTGTGAAAATGCTGCGCGGCGTA
1          METAlaAlaLysAspValLysPheGlyAsnAspAlaArgValLysMETLeuArgGlyVal

61         AACGTACTGGCAGATGCAGTGAAAGTTACCCTCGGTCCAAAAGGCCGTAACGTAGTTCTG
21         AsnValLeuAlaAspAlaValLysValThrLeuGlyProLysGlyArgAsnValValLeu
121        GATAAATCTTTCGGTGCACCGACCATCACCAAAGATGGTGTTTCCGTTGCTCGTGAAATC
41         AspLysSerPheGlyAlaProThrIleThrLysAspGlyValSerValAlaArgGluIle

181        GAACTGGAAGACAAGTTCGAAAATATGGGTGCGCAGATGGTGAAAGAAGTTGCCTCTAAA
61         GluLeuGluAspLysPheGluAsnMETGlyAlaGlnMETValLysGluValAlaSerLys

241        GCAAACGACGCTGCAGGCGACGGTACCACCACTGCAACCGTACTGGCTCAGGCTATCATC
81         AlaAsnAspAlaAlaGlyAspGlyThrThrThrAlaThrValLeuAlaGlnAlaIleIle

301        ACTGAAGGTCTGAAAGCTGTTGCTGCGGGCATGAACCCGATGGACCTGAAACGTGGTATC
101        ThrGluGlyLeuLysAlaValAlaAlaGlyMETAsnProMETAspLeuLysArgGlyIle

361        GACAAAGCGGTTACCGTTGCAGTTGAAGAACTGAAAGCGCTGTCCGTACCATGCTCTGAC
121        AspLysAlaValThrValAlaValGluGluLeuLysAlaLeuSerValProCysSerAsp

421        TCTAAAGCGATTGCTCAGGTTGGTACCATCTCCGCTAACTCCGACGAAACCGTAGGTAAA
141        SerLysAlaIleAlaGlnValGlyThrIleSerAlaAsnSerAspGluThrValGlyLys

481        CTGATCGCTGAAGCGATGGACAAAGTCGGTAAAGAAGGCGTTATCACCGTTGAAGACGGT
161        LeuIleAlaGluAlaMETAspLysValGlyLysGluGlyValIleThrValGluAspGly

541        ACCGGTCTGCAGGACGAACTGGACGTGGTTGAAGGTATGCAGTTCGACCGTGGCTAC CGT
181        ThrGlyLeuGlnAspGluLeuAspValValGluGlyMETGlnPheAspArgGlyTyr Arg

601        TATGAT TACTTCATCAACAAGCCGGAAACTGGCGCAGTAGAACTGGAAAGCCCGTTCATC
201        TyrAsp TyrPheIleAsnLysProGluThrGlyAlaValGluLeuGluSerProPheIle

661        CTGCTGGCTGACAAGAAAATCTCCAACATCCGCGAAATGCTGCCGGTTCTGGAAGCTGTT
221        LeuLeuAlaAspLysLysIleSerAsnIleArgGluMETLeuProValLeuGluAlaVal

721        GCCAAAGCAGGCAAACCGCTGCTGATCATCGCTGAAGATGTAGAAGGCGAAGCGCTGGCA
241        AlaLysAlaGlyLysProLeuLeuIleIleAlaGluAspValGluGlyGluAlaLeuAla

781        ACTCTGGTTGTTAACACCATGCGTGGCATCGTGAAAGTCGCTGCGGTTAAAGCACCGGGC
261        ThrLeuValValAsnThrMETArgGlyIleValLysValAlaAlaValLysAlaProGly

841        TTCGGCGATCGTCGTAAAGCTATGCTGCAGGATATCGCAACCCTGACTGGCGGTACCGTG
281        PheGlyAspArgArgLysAlaMETLeuGlnAspIleAlaThrLeuThrGlyGlyThrVal

901        ATCTCTGAAGAGATCGGTATGGAGCTGGAAAAAGCAACCCTGGAAGACCTGGGTCAGGCT
301        IleSerGluGluIleGlyMETGluLeuGluLysAlaThrLeuGluAspLeuGlyGlnAla

961        AAACGTGTTGTGATCAACAAAGACACCACCACTATCATCGATGGCGTGGGTGAAGAAGCT
321        LysArgValValIleAsnLysAspThrThrThrIleIleAspGlyValGlyGluGluAla

1021       GCAATCCAGGGCCGTGTTGCTCAGATCCGTCAGCAGATTGAAGAAGCAACTTCTGACTAC
341        AlaIleGlnGlyArgValAlaGlnIleArgGlnGlnIleGluGluAlaThrSerAspTyr
```

FIG. 3A

```
1081        GACCGTGAAAAACTGCAGGAACGCGTAGCGAAACTGGCAGGCGGCGTTGCAGTTATCAAA
361         AspArgGluLysLeuGlnGluArgValAlaLysLeuAlaGlyGlyValAlaValIleLys

1141        GTGGGTGCTGCTACCGAAGTTGAAATGAAAGAGAAAAAAGCACGCGTTGAAGATGCCCTG
381         ValGlyAlaAlaThrGluValGluMETLysGluLysLysAlaArgValGluAspAlaLeu

1201        CACGCGACCCGTGCTGCGGTAGAAGAAGGCGTGGTTGCTGGTGGTGGTGTTGCGCTGATC
401         HisAlaThrArgAlaAlaValGluGluGlyValValAlaGlyGlyGlyValAlaLeuIle

1261        CGCGTAGCGTCTAAACTGGCTGACCTGCGTGGTCAGAACGAAGACCAGAACGTGGGTATC
421         ArgValAlaSerLysLeuAlaAspLeuArgGlyGlnAsnGluAspGlnAsnValGlyIle

1321        AAAGTTGCACTGCGTGCAATGGAAGCTCCGCTGCGTCAGATCGTATTGAACTGCGGCGAA
441         LysValAlaLeuArgAlaMETGluAlaProLeuArgGlnIleValLeuAsnCysGlyGlu

1381        GAACCGTCTGTTGTTGCTAACACCGTTAAAGGCGGCGACGGCAACTACGGTTACAACGCA
461         GluProSerValValAlaAsnThrValLysGlyGlyAspGlyAsnTyrGlyTyrAsnAla
1441        GCAACCGAAGAATACGGCAACATGATCTGCATGGGTATCCTGGATCCAACCAAAGTAACT
481         AlaThrGluGluTyrGlyAsnMETIleCysMETGlyIleLeuAspProThrLysValThr

1501        CGTTCTGCTCTGCAGTACGCAGCTTCTGTGGCTGGCCTGATGATCACCACCGAATGCATG
501         ArgSerAlaLeuGlnTyrAlaAlaSerValAlaGlyLeuMETIleThrThrGluCysMET

1561        GTTACCGACCTGCCGAAAAACGATGCAGCTGACTTAGGCGCTGCTGGCGGTATGGGCGGC
521         ValThrAspLeuProLysAsnAspAlaAlaAspLeuGlyAlaAlaGlyGlyMETGlyGly

1621        ATGGGTGGCATGGGCGGCATGATGTAA
541         METGlyGlyMETGlyGlyMETMET***
```

FIG. 3B

```
1       ATGGCAGCTAAAGACGTAAAATTCGGTAACGACGCTCGTGTGAAAATGCTGCGCGGCGTA
1       METAlaAlaLysAspValLysPheGlyAsnAspAlaArgValLysMETLeuArgGlyVal

61      AACGTACTGGCAGATGCAGTGAAAGTTACCCTCGGTCCGAAAGGCCGTAACGTAGTTCTG
21      AsnValLeuAlaAspAlaValLysValThrLeuGlyProLysGlyArgAsnValValLeu

121     GATAAATCTTTCGGTGCACCGACCATCACCAAAGATGGTGTTTCCGTTGCTCGTGAAATC
41      AspLysSerPheGlyAlaProThrIleThrLysAspGlyValSerValAlaArgGluIle

181     GAACTGGAAGACAAGTTCGAAAACATGGGTGCGCAGATGGTGAAAGAAGTTGCCTCTAAA
61      GluLeuGluAspLysPheGluAsnMETGlyAlaGlnMETValLysGluValAlaSerLys

241     GCGAACGACGCTGCAGGCGACGGTACCACCACTGCAACCGTACTGGCTCAGGCTATCATC
81      AlaAsnAspAlaAlaGlyAspGlyThrThrThrAlaThrValLeuAlaGlnAlaIleIle

301     ACTGAAGGTCTGAAAGCTGTTGCTGCGGGCATGAACCCGATGGACCTGAAACGTGGTATC
101     ThrGluGlyLeuLysAlaValAlaAlaGlyMETAsnProMETAspLeuLysArgGlyIle

361     GACAAAGCTGTTACCGCTGCAGTTGAAGAACTGAAAGCGCTGTCCGTACCGTGCTCTGAC
121     AspLysAlaValThrAlaAlaValGluGluLeuLysAlaLeuSerValProCysSerAsp

421     TCTAAAGCGATTGCTCAGGTTGGTACTATCTCCGCTAACTCCGACGAAACCGTAGGTAAA
141     SerLysAlaIleAlaGlnValGlyThrIleSerAlaAsnSerAspGluThrValGlyLys

481     CTGATCGCTGAAGCGATGGACAAAGTCGGTAAAGAAGGCGTTATCACCGTTGAAGACGGT
161     LeuIleAlaGluAlaMETAspLysValGlyLysGluGlyValIleThrValGluAspGly

541     ACCGGTCTGCAGGACGAACTGGACGTGGTTGAAGGTATGCAGTTCGACCGTGGCATCCTG
181     ThrGlyLeuGlnAspGluLeuAspValValGluGlyMETGlnPheAspArgGlyIleLeu

601     TCTCCTATCTTCATCAACAAGCCGGAAACTGGCGCAGTAGAACTGGAAAGCCCGTTCATC
201     SerProIlePheIleAsnLysProGluThrGlyAlaValGluLeuGluSerProPheIle

661     CTGCTGGCTGACAAGAAAATCTCCAACATCCGCGAAATGATCCCGGTTATCGAAGCCGTT
221     LeuLeuAlaAspLysLysIleSerAsnIleArgGluMETIleProValIleGluAlaVal

721     GCCAAAGCAGGCAAACCGCTGCTGATCATCGCTGAAGATGTAGAAGGCGAAGCGTTCGCA
241     AlaLysAlaGlyLysProLeuLeuIleIleAlaGluAspValGluGlyGluAlaPheAla

781     ACTCTGCTTTTCAACACCATGCGTGGCATCGTGAAAGTTGCTGCAGTTAAAGCTCCGGGC
261     ThrLeuLeuPheAsnThrMETArgGlyIleValLysValAlaAlaValLysAlaProGly

841     TTCGGCGATCGTCGTAAAGCTATGCTGCAGGATATCGCAACCCTGACTGGCGGTACCGTA
281     PheGlyAspArgArgLysAlaMETLeuGlnAspIleAlaThrLeuThrGlyGlyThrVal
901     ATCTCTGAAGAGATCGGTATGGAGCTGGAAAAAGCAACCCTGGAAGACCTGGGTCAGGCT
301     IleSerGluGluIleGlyMETGluLeuGluLysAlaThrLeuGluAspLeuGlyGlnAla

961     AAACGCGTTGTGATCAACAAAGACACCACCACCATCATCGATGGCGTGGGCGAAGAAGCT
321     LysArgValValIleAsnLysAspThrThrThrIleIleAspGlyValGlyGluGluAla

1021    GCAATCCAGGGCCGTGTTGCTCAGATCCGTCAGCAGATTGAAGAAGCAACTTCTGACTAC
341     AlaIleGlnGlyArgValAlaGlnIleArgGlnGlnIleGluGluAlaThrSerAspTyr
```

FIG. 4A

```
1081    GACCGTGAAAAACTGCAGGAGCGCGTAGCGAAACTGGCAGGCGGCGTTGCAGTTATCAAA
361     AspArgGluLysLeuGlnGluArgValAlaLysLeuAlaGlyGlyValAlaValIleLys

1141    GTAGGTGCTGCTACCGAAGTTGAAATGAAAGAGAAAAAAGCACGCGTTGAAGACGCCCTG
381     ValGlyAlaAlaThrGluValGluMETLysGluLysLysAlaArgValGluAspAlaLeu

1201    CACGCGACCCGTGCTGCGGTAGAAGAAGGCGTGGTTGCTGGTGGTGGTGTTGCGCTGATC
401     HisAlaThrArgAlaAlaValGluGluGlyValValAlaGlyGlyGlyValAlaLeuIle

1261    CGCGTAGCGTCTAAACTGGCTGACCTGCGTGGTCAGAACGAAGACCAGAACGTGGGTATC
421     ArgValAlaSerLysLeuAlaAspLeuArgGlyGlnAsnGluAspGlnAsnValGlyIle

1321    AAAGTTGCACTGCGTGCAATGGAAGCTCCGCTGCGTCAGATCGTCCTGAACTGCGGCGAA
441     LysValAlaLeuArgAlaMETGluAlaProLeuArgGlnIleValLeuAsnCysGlyGlu

1381    GAACCGTCTGTTGTTGCTAACACCGTTAAAGGCGGCGACGGCAACTACGGTTACAACGCA
461     GluProSerValValAlaAsnThrValLysGlyGlyAspGlyAsnTyrGlyTyrAsnAla

1441    GCAACCGAAGAATACGGCAACATGATC**TGC**ATGGGTATCCTGGACCCAACCAAAGTAACC
481     AlaThrGluGluTyrGlyAsnMETIle**Cys**METGlyIleLeuAspProThrLysValThr

1501    CGTTCTGCTCTGCAGTACGCGGCTTCTGTGGCTGGCCTGATGATCACCACCGAATGCATG
501     ArgSerAlaLeuGlnTyrAlaAlaSerValAlaGlyLeuMETIleThrThrGluCysMET

1561    GTTACCGACCTGCCGAAAAACGATGCAGCTGACTTAGGCGCTGCTGGCGGCATGGGTGGC
521     ValThrAspLeuProLysAsnAspAlaAlaAspLeuGlyAlaAlaGlyGlyMETGlyGly

1621    ATGGGTGGCATGGGCGGCATGATGTAA
541     METGlyGlyMETGlyGlyMETMET***
```

FIG. 4B

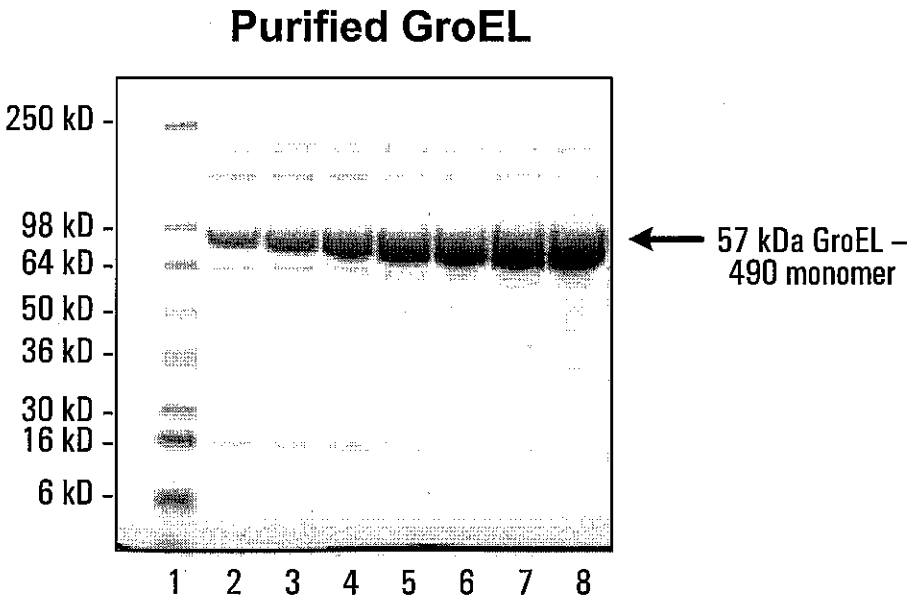

Purified GroEL
250 kD
98 kD
64 kD
50 kD
36 kD
30 kD
16 kD
6 kD
57 kDa GroEL –
490 monomer
1 2 3 4 5 6 7 8

FIG. 5

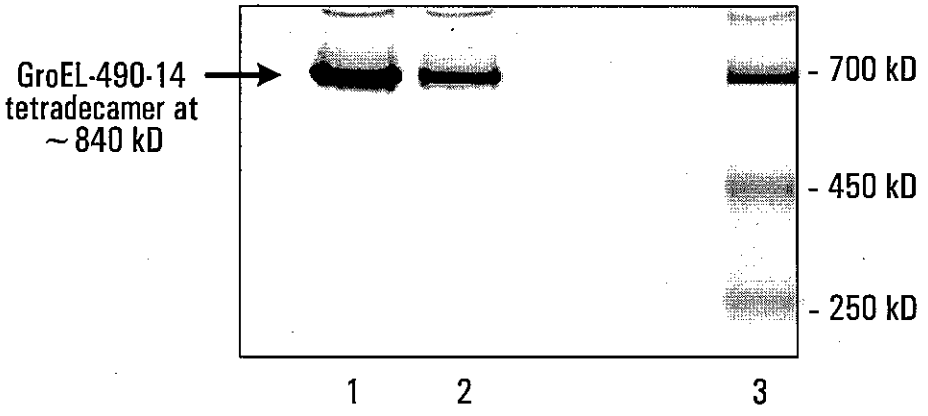

GroEL-490-14
tetradecamer at
~840 kD
700 kD
450 kD
250 kD
1 2 3

FIG. 6

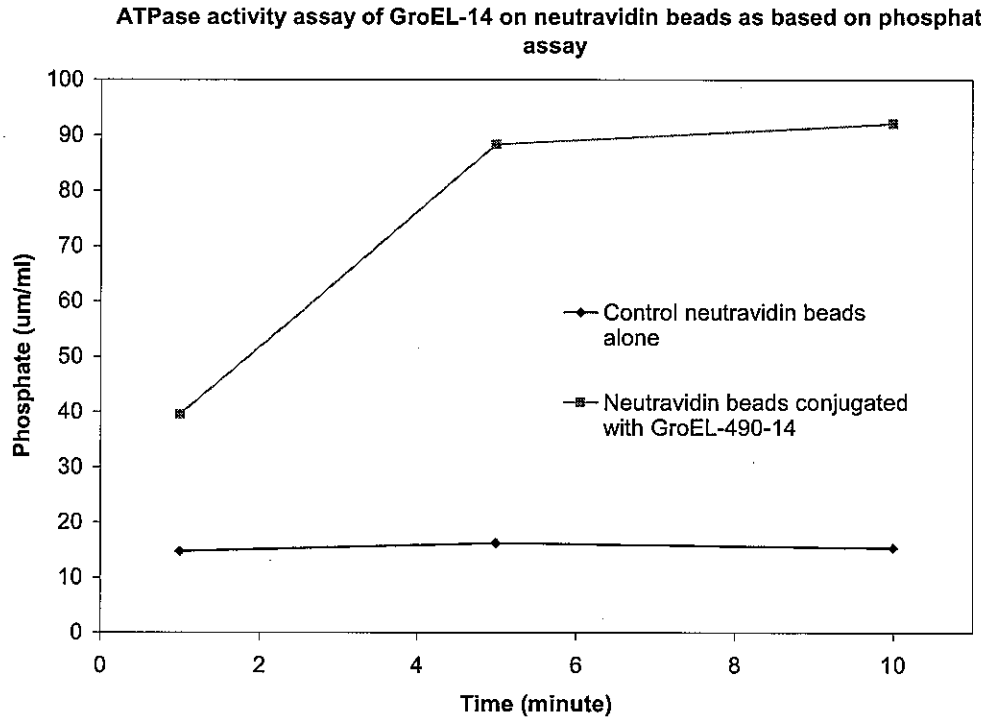

ATPase activity assay of GroEL-14 on neutravidin beads as based on phosphate assay
Phosphate (um/ml)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
Time (minute)
Control neutravidin beads alone
Neutravidin beads conjugated with GroEL-490-14

FIG. 7

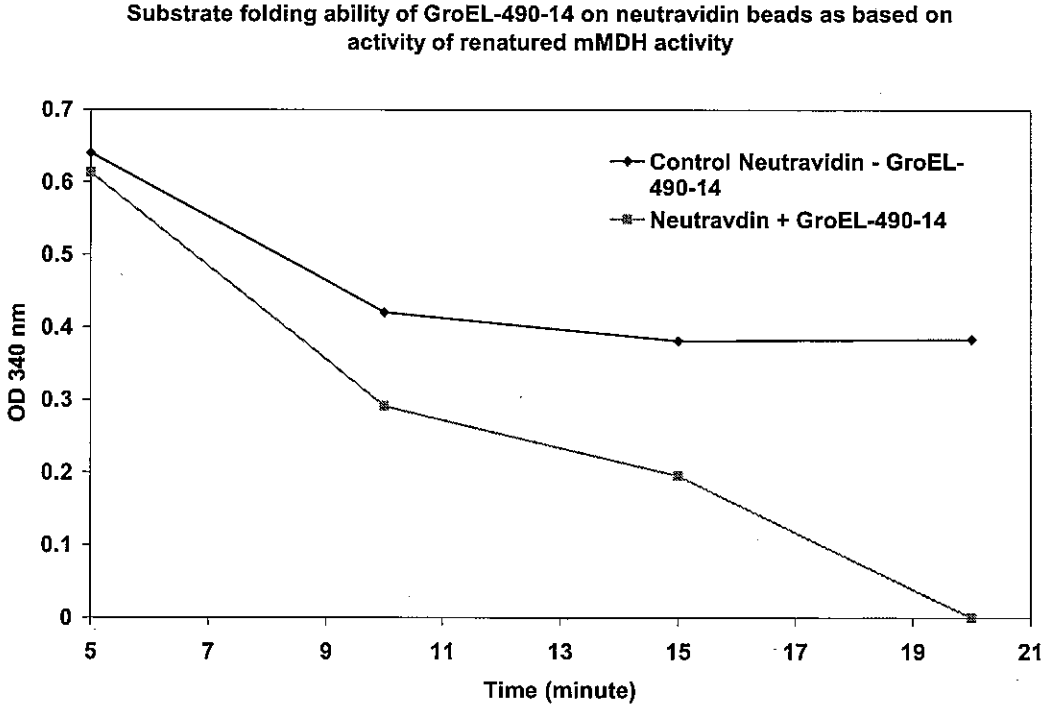

Substrate folding ability of GroEL-490-14 on neutravidin beads as based on activity of renatured mMDH activity
OD 340 nm
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
5
7
9
11
13
15
17
19
21
Time (minute)
Control Neutravidin - GroEL-490-14
Neutravdin + GroEL-490-14

FIG. 8

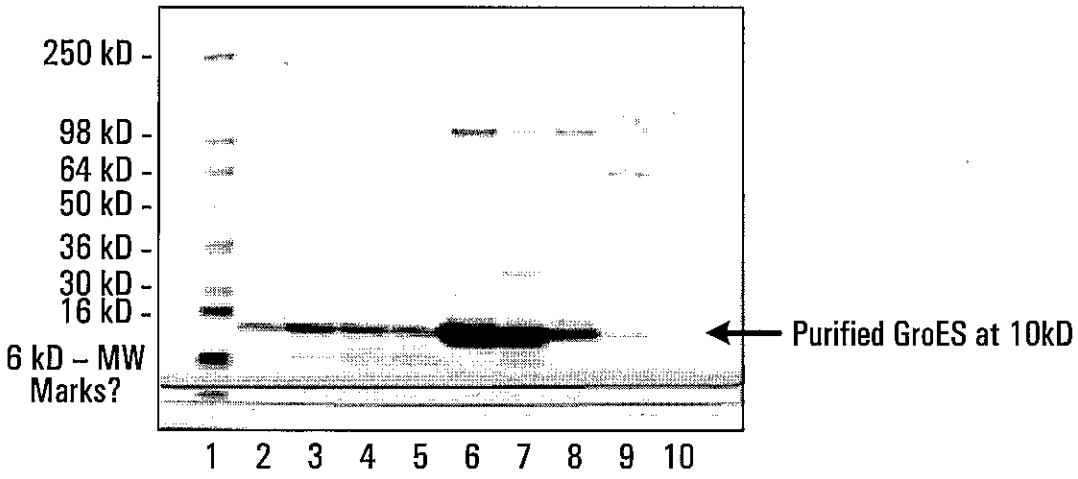

250 kD -
98 kD -
64 kD -
50 kD -
36 kD -
30 kD -
16 kD -
6 kD – MW Marks?
1 2 3 4 5 6 7 8 9 10
Purified GroES at 10kD

FIG. 9

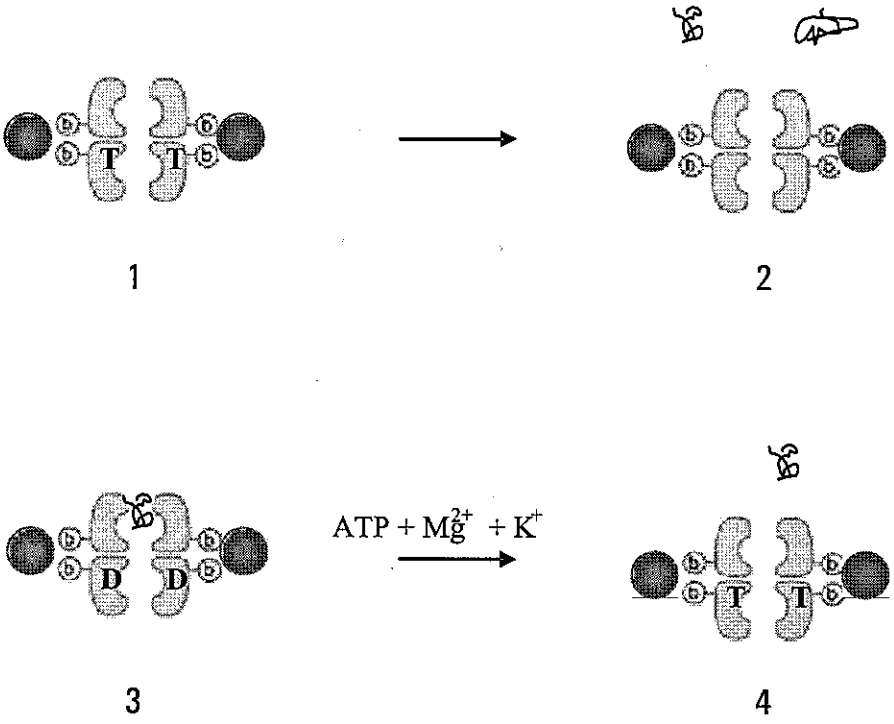


FIG. 10