

eol-f-seq1  
SEQUENCE LISTING

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<150> 61/943,710  
<151> 2014-02-24  
<160> 15  
<170> PatentIn version 3.5  
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<212> DNA  
<213> E. Coli

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eof-seq1

<212> DNA  
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ccacataact ctgccttaa tacagaaaaa tttcagcaga actttgcgct tgtcttgctt 840  
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<213> E. Coli

<220>  
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ctctctacac tgatgttagc gggatttcgc gatattctga ttatcagtag accacaggat 180  
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ggtggtgatg attgtgcttt ggtacttggt gataatatct tctacggcca cgacctgccg 360  
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gaagaaaaac cgctggaacc aaaaagtaac tatgcggtta ctgggcttta tttctatgac 540  
aatgacgttg tggaaatggc gaaaaacctt aagccttctg cccgaggtga actggaaatt 600  
accgatatta accgtattta tatggaacaa ggacgtttgt ctgtcgtat gatggggcgt 660

eof-seq1

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| ggctatgcat ggctggatac agggacgcat caaagtctta ttgaagcaag caacttcatt | 720 |
| gccaccattg aagagcgcca gggactaaag gtttcctgtc cggaagaaat tgcttatcgt | 780 |
| aaagggttta ttgatgctga gcaggtaaaa gtattagccg aaccgttgaa gaaaaatgct | 840 |
| tatggtcagt atctgctcaa aatgattaaa ggttattaa                        | 879 |

<210> 4  
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<220>  
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| gatgaacgtg gcttcttttt tgagagtttt aatcagagga tttttgaaga agcagtaggt  | 120 |
| cgtaagggtg agtttgttca ggataaccat tctaagtcca gtaaagggtgt tttacgtggt | 180 |
| cttcattatc agttagaacc ttatgctcaa ggaaaactgg tgcgctgtgt tgttggcgag  | 240 |
| gtttttgatg ttgcggttga ttttcgtaaa tcgtcaccta cttttgggaa atgggttggg  | 300 |
| gtgaatttgt ctgctgagaa taagcgtcag ttgtggattc ctgagggatt tgcacatggt  | 360 |
| tttttgggtg tgagtattt agcagaagtt ttatataaaa cgaatcaata ttatgctcca   | 420 |
| tcacatgaaa aaaatattat atggaatgac ctcttgctta atattaaatg gccgagcaca  | 480 |
| gcactgatca ctctgtctga taaggatgca aatggggaaa gatttgaact aagtgagttt  | 540 |
| tga                                                                | 543 |

<210> 5  
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 <212> DNA  
 <213> E. coli

<220>  
 <223> wzx (upec138)

|                                                                    |     |
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| gcaattcccc cctttggatt aattgctgagg aaaattggtg tagaactatt tggtttgtat | 120 |
| acgttagcaa tgatttttat agggatgca agtatatttg atgctgggtt aacaagagct   | 180 |
| gttgctgctg aaatagcatt actaaaaaac agagtggacg attgtaatac gataatagta  | 240 |
| acttctatta tcgctgtgat atttttaggg tttatcgag gctggggagt gtttctgctt   | 300 |
| aaaggcgata ttattgaact gttaaatatc tcaccaatat attacgccga ttcgataaag  | 360 |
| tctctagtat tattatcatc tctgatacct gtattcttag tcacgcaaact actattagca | 420 |
| gagcttgagg gtcgggaata ttttgggatt ctaaatatac aaaaaagtgt aggggaattct | 480 |
| ttaattgcag ggttacctgc attatttgtt ttaattaatc aaacgctttt ttctgcaatt  | 540 |
| attggtgtag cgattgcaag agttatatgc ttgtggttaa gctacattat gagcagggaa  | 600 |

eof-seq1

|            |             |             |            |            |            |      |
|------------|-------------|-------------|------------|------------|------------|------|
| agaataacta | tcgatatctc  | atTTTTTTTca | ataactgttt | taaagcggtt | atttagatat | 660  |
| ggcgggtggg | taactataag  | taacataata  | tctcctatat | tagcgagtat | ggatagattt | 720  |
| attctatccc | atatccaggg  | agcatcaaaa  | atatcattct | atacagtccc | taatgagctg | 780  |
| gtaactaggc | ttggaatagt  | tccaggctct  | cttgggaaag | ctgtttttcc | aaaattaagt | 840  |
| catgcaagga | attttacagc  | gtcatatgca  | gagcaaaaaa | aagcttatat | attaatgact | 900  |
| gtcattgtaa | tgccttttgg  | tttatttgta  | tattattacg | caaagtttat | tttaacattg | 960  |
| tggatggggg | ctgagtatgc  | agggatttcg  | gtcgaaatat | tacggattat | gcttataggg | 1020 |
| tatattttta | actgttattc  | acaaatctct  | tttgccaaca | tacaggcctt | tggaaaagca | 1080 |
| aaatacactg | catacatcca  | tatgatggaa  | tttattcctt | atttgataat | gttatatata | 1140 |
| atttcaaagg | aatatggggg  | tattggtggt  | gcgtgggtat | ggacaattcg | agtaataatt | 1200 |
| gattttttga | tgctttttata | tatgagttat  | cgttgtaata | atcttatgaa | aaaagggtag | 1260 |

<210> 6  
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 <212> DNA  
 <213> E. Coli

<220>  
 <223> wekA (upec138)

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| <400> 6    |                                                              |
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| agtttaaatg | atttaaattgt tagcgattat aaaattatca ttgttgataa ctgttctatg 120  |
| gataactcat | atgatactat aaaagaaaat cttaattcat tatatattgc tgataaaagt 180   |
| atcattgagg | tgaagtatga ggatagaaat aaatataaaa ccttagaaaa cgataaaatc 240   |
| atattaatac | aatctccgca aaataatggg tacgcaagtg gtaataatat tggcatagag 300   |
| ttcgctctta | atcaggagaa tatgaaatac gtctgggttc tgaataatga tactgaagtg 360   |
| gataaagagg | ctttaactca ttttaattagt aaatgtgatt cagataaaaag tatagggatt 420 |
| tgcggttctc | gtttagtcta ttttgccgac agagagatgc agcaaggact aggtggggtg 480   |
| cataacaaat | ggttatgcac tacaaaaaat tatgaaatgg gaagattagt ttccaaaaaa 540   |
| tatgatgatg | aagtcattag taatgatata gattatataa ttggcgcatc gatgtttttc 600   |
| tctagagaat | gtttggaaac agttggattg atgaatgaag aatatttttt atactatgaa 660   |
| gagttagata | tttgcctcag agcaaaagca aagaacttta aattaggtat ttgctcagaa 720   |
| agtttggttt | atcataaaat aggtgcaagt actgatgggg gaaagagcat gatggctgat 780   |
| ctttgctcaa | taaaaaatag gctggtcatt acagaaaggt tttatcccca atattattgg 840   |
| acgggtatgg | tgtcactttt tgttgtagca tttaaccgtg ctagaagagg tgagtttaat 900   |
| aagatgaaaa | gatgtttgaa tgttatgttt aacttcaaac gaaacaaagg tagcaaatgc 960   |
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# eolf-seq1

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<213> E. Coli

<220>  
<223> wekB (upec138)

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gtaaatagct atatgatata catgttaaaa gtatataaat taatattaag gtgtttcggg 180  
aaagaatatg attatagtca ttcgaagttg ctttccaggt attacggtag aatattcggt 240  
aggaaattaa aaaaaattga tggtttggtt tttattatcg cacctgcagg ttcctcacia 300  
attgcttttt taaaaacaac cataccaata atatatctat cggatacaac atatgatcaa 360  
ttaaaaagct attatccgaa tttaaataaa aaaacaatta taaatgatga ggatgcaagt 420  
ttaatcgaac gcaaggctat tgaaaaagca acagtagtat ctttcccatc taaatgggca 480  
atggattttt gcaggaatta ttacagatta gattttgata aattagttga aataccatgg 540  
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gttgtcgcta cagatacagg tggagtcagt tctatagtta tcaacgaaag gacggggata 960  
ttaattaaag acccgttaga ctataagcac tttggaaatg caattcataa aataattagt 1020  
tccgtagaga cttatcaaaa ctactcccaa aacgcaagaa ttagatataa taatatattg 1080  
cattgggaca attgggctaa aaagataatt gagattatgt atgagcataa gaatagaaga 1140  
atcaaatag 1149

<210> 8  
<211> 1218  
<212> DNA  
<213> E. Coli

<220>  
<223> wzy (upec138)

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acgataatct caattacatt gctttttgtt tttttaagag ctaaaaatat ttgcaaagat 180  
aattttctaa taatagtagc gttattcata ttgttgtgtt ttaactgttt gttaagtatg 240  
ctatttaata ttgaacaggc ttttaacattt aaagttgtac tttcaatata tagcatctta 300

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|                                                                    |      |
|--------------------------------------------------------------------|------|
| ataatggcat acgtctcctc ttgttatgca cagacgttgt ggttatgttc tgaagaaata  | 360  |
| cttaagagat ccgtctttta ttgttcgca tttctttgcc ttattggcat tataagtatt   | 420  |
| cttttacaga agactgagat tatacatgat aaaagtatga ttctttttcc tgaaccatca  | 480  |
| gcatttgcac tgggtttttat acctatcttt tcattttgtt tatactatac aagagggggg | 540  |
| gggctactat tgctctatat attatctttg ggtattgcgt taggtatcca gaatttaaca  | 600  |
| atgttggttag gcattgtgat tagtggtttt gtgatgaaaa aaataactat aaggcaaact | 660  |
| attgttatac ttttgggggc atggattttt tccatgatat taagtgattt agacatttct  | 720  |
| tactatacat cgcggtttga ttttaaaaaat actacgaacc tatcagtgtt tgtatatctt | 780  |
| tcaggaattg aaagagcttt cttgaatttt attacaagtt atgggtcttg tattggtttt  | 840  |
| caacaaatgg gagtgaatgg ggagatagga atatatcaac aaatttttagc tgaacttgat | 900  |
| gcccctatgt taaatatata cgatggctca tttatttctt ctaagttaat atctgagttt  | 960  |
| ggggttattg gtgcattaat gtgtattttc tttttttttt atttttcccg attttatctg  | 1020 |
| cgtttcaaaa aaagtaagag atattcaccg cagtatatat tagcatatag cttctacatg  | 1080 |
| tgtttcttca tccctctttt tatacgtggt gctgggtata taaacccta tgtgtttatg   | 1140 |
| ttattttcat caatattttt gtgcaaatat cacgctaaaa atatcttgat gaaatcta    | 1200 |
| gtccagatag ctatataa                                                | 1218 |

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 <213> E. Coli

<220>  
 <223> wbbJ (upec138)

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| cttcttaaag atatattctt aacaaaattt ttattttgtt caaatgttag gattattaga          | 120 |
| tttccatgtt atattagaaa agatggaagt gttagttttg gaaaagggtt tacatcagg           | 180 |
| gtaggattac gagttgatgc atttatggat gccgtagttt ccattggaga aaatgttcaa          | 240 |
| attaatgact atgttcacat cgcggtctatt aataatgtca ttattggttag agatacat          | 300 |
| atagcaagta aagtatttat tagtgatcat aatcatggta ttttttctaa atccgatatc          | 360 |
| catagttcac caactattat tccttcgtct agggcccttg aatctgcacc tgtgtatatt          | 420 |
| ggagagcgtg tgtggattgg cgaaaatgtg acaatattac cagggtgcgtg tataggta           | 480 |
| ggtgtagtta ttggcgcaaa cagtgttggt cgtgggtgaga ttcctaataa tgtgatcatt         | 540 |
| gctgggtgtt cagctaaaat tgttaaaaaa tataactatg agcgtatgca atgggaaaga          | 600 |
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<210> 10  
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eof-seq1

<212> DNA  
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gttcatagct ctgctgaact aatggaatta tttccgtggg ttgaatttat agagtatcca 180  
gaagtcaagt cttcgtgggt taaaagatta tatttcgaat atataacttg caatagatta 240  
tctaaggtga ttaaggcaac tcattgggta tgcttacatg atattacagc aaatgttagt 300  
gtaccctata gatttgttta ttgccacaat cctgcaccgt tctataaata ttttaagctat 360  
cgagatatta taggagaacc taaattttat cttttttatc ttttttatgg gctttttatac 420  
aatatcaata taaaaaagaa cacagcagtt tttgttcagc agcagtggct aaaaaaagaa 480  
ttcgaaaaaa aatataagtt aaagaatgtt gttgttagtc gccctgaaga tatttgccct 540  
tttgaaagtg atggtttggg aagaaataat aataaaaagg atgtgaggat attttaccga 600  
gcagtgcacc gtatatttta aaactttgaa gttatcatac gtgctgcaca aatattacaa 660  
gataaaaaata ttcattttta tcttactttt gatgggtactg aaaataagta tgcaaaaaga 720  
atatataaat tagcttccga actgaaaaat gtacatttcc tcgggttacct taatgcaacc 780  
gagatgggta acttttatca agattcagat attatttgtt tcccatcgaa actagaaacg 840  
tggggattac cattatcaga agctaaaaca taaaaaaat ggatatttgc ggcagactta 900  
ccttatgctc atgaagtttt atataactat tcaaaaacta gatattttcc atttgacgat 960  
gagaaaatac ttgttcgcta catattagag tacacaagta aaaatatgca tgaagatata 1020  
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tatatcctca aggggaactg a 1101

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<212> DNA  
<213> E. Coli

<220>  
<223> wbbL (upec138)

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ctttatcgag attttactaa aagcaaactg gattattcaa tacggagttt tccaacttta 180  
tatgattttc tttgttcttt tttattgggg gtgaataaaa gtaaaaattaa gaaggaaaat 240  
atactttctg atactgtagt tgattggtgt gctggctcat ttatgcttat tcatgcttta 300  
agtttcttaa atgtgaatgg ttttgatcaa aaatatttta tgtattgtga agatattgac 360  
ctttgtatgc gtttaaaatt aagtggagta gatctttact atactcccca ttttgatgct 420

eof-seq1

|                                                                   |     |
|-------------------------------------------------------------------|-----|
| attcattatg cgcagcatga aaatagaaga atatttacta aagcatttcg atggcatata | 480 |
| aggagtatta cgcgctacat attacggaaa ccaattcttt cttataaaaa ctatagaaaa | 540 |
| attacatccg aactggtaaa gtga                                        | 564 |

<210> 12  
 <211> 10653  
 <212> DNA  
 <213> E. coli

<220>  
 <223> E. coli rfb(upec138) gene cluster

|                                                                    |      |
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| gtgaagatac ttgttactgg tggcgcagga tttattgggt ctgctgttgt tcgtcacata  | 60   |
| ataaataata cgcaagatag tgttgtaaat gtcgataaat taacatacgc cggaaacctg  | 120  |
| gaatcacttg cagatgtttc tgattctgaa cgctatttct ttgaacatgc ggatatttgt  | 180  |
| gatgcagctg caatggcacg gatttttgct cagcatcagc cggatgcagt gatgcacctg  | 240  |
| gcagctgaaa gccatgttga ccgttcaatt acaggccctg cggcatttat tgaaaccaat  | 300  |
| attgtgggta cttatgtcct tttagaagcg gctcggaatt attggtctgg tctggatgat  | 360  |
| gaaaagaaaa aaaacttccg ttttcatcat atttctactg atgaggtgta tgggtgactta | 420  |
| ccccatccgg atgaagtaaa tagcaatgaa acgttgccgc tatttacgga aacgacagca  | 480  |
| tacgcgcaa gtagtccata ttctgcttct aaagcttcca gcgatcattt ggttcgcgca   | 540  |
| tggaaacgta cttatggttt accgaccatt gtgactaatt gctcgaacaa ctatggctct  | 600  |
| tatcatttcc cggaaaagct tattccactg gttattctta attcactgga aggtaaggca  | 660  |
| ttacctattt atggcaaagg agatcagatc cgcgactggg tgtatgtaga ggatcatgct  | 720  |
| cgagcgttat ataccgtcgt aaccgaagg aaagcgggag aaacttataa cattggtgga   | 780  |
| cacaacgaaa agaaaaacat cgacgtagtg ttcactattt gtgatttggt ggatgagata  | 840  |
| gtcccgaag agaaatctta ccgcgagcaa attacttatg ttaccgatcg tccgggacac   | 900  |
| gatcgccgtt atgcgattga tgctgagaag attggtcgcg aattgggatg gaaaccacag  | 960  |
| gaaacgtttg agagtgggat tcgtaaaacg gtggaatggg acctgtcaa taaaaatgg    | 1020 |
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| ctctggcacc tctgggtaat ttgattgctc ttgatgttca ctccactgat tactgtggtg  | 1200 |
| attttagtaa tcctgaagggt gtagctgaaa ccgtaagaag cattcggcct gatattattg | 1260 |
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| tacaagagca ttgtgcgaag caccttattt tccggaccag ctgggtctat gcaggtaaag  | 1560 |

eof-seq1

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| ctattcgtgt  | ggcactgaat  | aaaccggaag  | tcgcaggcctt | gtaccatctg  | gtagctagt   | 1740 |
| gtaccacaac  | gtggcacgat  | tatgctgctc  | tggtttttga  | agaggcgctc  | aaagcaggca  | 1800 |
| ttccccctgc  | actcaacaag  | ctcaacgcag  | taccaacaac  | agcctatcct  | acaccagctc  | 1860 |
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eof-seq1

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eof-seq1

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eo1f-seq1

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 35 40 45

Pro Ala Ile Ala Asp Thr Asn Gly Gln Gly Val Leu His Tyr Ser Met  
 50 55 60

Val Leu Glu Gly Gly Asn Asp Ala Leu Lys Leu Ala Ile Asp Asn Ala  
 65 70 75 80

Leu Ser Ile Thr Ser Asp Gly Leu Thr Ile Arg Leu Glu Gly Gly Val  
 85 90 95

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 Glu Met Gln Pro<sub>180</sub> Thr Leu Ala Ile Ser<sub>185</sub> His Ala Gly Val Ser<sub>190</sub> Val Val  
 Met Ala Gln<sub>195</sub> Ala Gln Pro Arg Arg<sub>200</sub> Glu Lys Arg Trp Ser<sub>205</sub> Glu Trp Ala  
 Ser Gly<sub>210</sub> Lys Val Leu Cys Leu<sub>215</sub> Leu Asp Pro Leu Asp<sub>220</sub> Gly Val Tyr Asn  
 Tyr<sub>225</sub> Leu Ala Gln Gln Arg<sub>230</sub> Cys Asn Leu Asp Asp<sub>235</sub> Thr Trp Glu Gly Lys<sub>240</sub>  
 Ile Tyr Arg Val<sub>245</sub> Leu Ala Gly Asn Pro Ala<sub>250</sub> Lys His Asp Leu Asp<sub>255</sub> Ile  
 Lys Asp Asn<sub>260</sub> Asn Asn Ser Thr Pro Thr<sub>265</sub> Val Ile Ser His Arg<sub>270</sub> Leu His  
 Phe Pro Glu<sub>275</sub> Gly Gly Ser Leu Ala<sub>280</sub> Ala Leu Thr Ala His<sub>285</sub> Gln Ala Cys  
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 Glu<sub>305</sub> Gln Leu Glu Gln Cys<sub>310</sub> Gly Tyr Pro Val Gln<sub>315</sub> Arg Leu Val Ala Leu<sub>320</sub>  
 Tyr Leu Ala Ala Arg<sub>325</sub> Leu Ser Trp Asn Gln<sub>330</sub> Val Asp Gln Val Ile<sub>335</sub> Arg  
 Asn Ala Leu Ala<sub>340</sub> Ser Pro Gly Ser Gly<sub>345</sub> Gly Asp Leu Gly Glu<sub>350</sub> Ala Ile  
 Arg Glu Gln<sub>355</sub> Pro Glu Gln Ala Arg<sub>360</sub> Leu Ala Leu Thr Leu<sub>365</sub> Ala Ala Ala

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Glu Ser Glu Arg Phe Val Arg Gln Gly Thr Gly Asn Asp Glu Ala Gly  
 370 375 380  
 Ala Ala Ser Ala Asp Val Val Ser Leu Thr Cys Pro Val Ala Lys Asp  
 385 390 395 400  
 Gln Asn Arg Thr Lys Gly Glu Cys Ala Gly Pro Ala Asp Ser Gly Asp  
 405 410 415  
 Ala Leu Leu Glu Arg Asn Tyr Pro Thr Gly Ala Glu Phe Leu Gly Asp  
 420 425 430  
 Gly Gly Asp Val Ser Phe Ser Thr Arg Gly Thr Gln Asn Trp Thr Val  
 435 440 445  
 Glu Arg Leu Leu Gln Ala His Arg Gln Leu Glu Glu Arg Gly Tyr Val  
 450 455 460  
 Phe Val Gly Tyr His Gly Thr Phe Leu Glu Ala Ala Gln Ser Ile Val  
 465 470 475 480  
 Phe Gly Gly Val Arg Ala Arg Ser Gln Asp Leu Asp Ala Ile Trp Arg  
 485 490 495  
 Gly Phe Tyr Ile Ala Gly Asp Pro Ala Leu Ala Tyr Gly Tyr Ala Gln  
 500 505 510  
 Asp Gln Glu Pro Asp Ala Arg Gly Arg Ile Arg Asn Gly Ala Leu Leu  
 515 520 525  
 Arg Val Tyr Val Pro Arg Trp Ser Leu Pro Gly Phe Tyr Arg Thr Gly  
 530 535 540  
 Leu Thr Leu Ala Ala Pro Glu Ala Ala Gly Glu Val Glu Arg Leu Ile  
 545 550 555 560  
 Gly His Pro Leu Pro Leu Arg Leu Asp Ala Ile Thr Gly Pro Glu Glu  
 565 570 575  
 Glu Gly Gly Arg Val Thr Ile Leu Gly Trp Pro Leu Ala Glu Arg Thr  
 580 585 590  
 Val Val Ile Pro Ser Ala Ile Pro Thr Asp Pro Arg Asn Val Gly Gly  
 595 600 605  
 Asp Leu Asp Pro Ser Ser Ile Pro Asp Lys Glu Gln Ala Ile Ser Ala  
 610 615 620  
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Lys Leu Gly Ser Gly Gly Gly Asp Gln Asn Ala Thr  
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