BCH 463 - Exercises

Question 1: Homology

Given are two proteins. Find out whether or not they are homologs. Test different algorithms for pairwise sequence comparisons. Do you find them by homology searches in the protein database, and if yes, support your answer?

Protein 1 *(HrpB7* from *Xanthomonas campestris pv. vesicatoria)*

Protein 2 *(HrpD* from *Ralstonia solanacearum)*

Question 2: Global Alignment

Constructing a pairwise global alignment for ***bovine*** **chymotrypsin**, ***bovine*** **trypsin**.

1- Display Uniprot page of ***bovine*** **chymotrypsin** to determine location of active site **His, Asp** and **Ser.**
2- Obtain sequences of ***bovine*** **chymotrypsin (gi 157831162)** and **trypsin (gi 60593450)** in FASTA format from the **NCBI protein database**.
3- Make sure that the active site **Ser, His,** and **Asp** of chymotrypsin is aligned with those of trypsin.
4- Based on their sequence alignment, determine the residues for trypsin that corresponds with chymotrypsin residues **189, 190,** and **228** that line the specificity pocket of the enzyme and name them.

Question 3: Restriction enzymes

Given is a gene sequence analyze-it as stated below:

```
atgacagggtgggggatccagagcttatataaggatgcaatcgagggatccaaggcaataaaat
cagttccaaaggttaaaggagttctcctaggctataacacaaacatagatgccataaaatacct
agactctaaggatctcgaagggatccagagaatagagaaagtcggtaaggaggaagtaggatcc
ttaaagtactccgaagaggatccgcttccagaaaaaatcacggatccttcaatcccgcagcttc
tcggttcaattctctggagcattaggagggatccgggcaaagctgcggagctatttgttgaaag
ttgtcctgtcagggatccattctatatgaagagatggggctggaatgggatccagctcaggagg
atcctgggaggtcaggtagggataggatccatggccaacctcttaggtggagtttacggcgtgc
ctgttatagctcatgtcccccagatttcaaggttacaggcgagcctggatcccttcctcgatgg
gccaataggatcctacgtccccaaagttggatccgaagatggcaaggttaag
```

1-Open a DNA cutter tool and analyze the restriction sites. (Show image, linear)

2-Which are signal cutter (unique cutter)? multi cutter enzymes?

3-How many restriction sites are present?

4-Make a custom digest using 2 single cutters and show the band pattern on the gel?

Question 4: Human Genome Resources at NCBI

1-How many hits will you get if you search genes associated with **colorectal cancer** in human genome?

2- What are the alternative names of **TP53**?

5- How many of these genes are of **mitochondrial** source?

6- How many of these genes are **protein coding/ non-coding**?