Lab 23: BLASTing Through Evolutionary Relationships

Introduction:

The Basic Local Alignment Search Tool (BLAST) is an online program created by National Center for Biotechnology Information (NCBI). With this tool, scientists can take DNA sequences they have isolated from different organisms and enter them into the Search Tool. The program then compares the DNA sequence to all known sequences in the database (it's like Google for DNA sequences!). The scientist can then identify what protein(s) can be transcribed and translated from the DNA sequence. The scientist can also compare the DNA sequence to sequences in related organisms. In this activity, you will explore the basics of this tool and how to use it. Follow the steps listed to explore how NCBI's BLAST system works!

Getting Started:

1. Go to our website: www.BiologyWithMrsH.com
2. Across the top of the page are our class links. Click on the "BLAST" tab.
3. On the Lab 23: BLAST page, click on the website link "NCBI BLAST" and this will take you to blast.ncbi.nlm.nih.gov
4. Click on the large box called "Nucleotide BLAST". This will take you to the Standard Blast search tool where you will copy and past in a DNA sequence into the search box.
5. Underneath the NCBI BLAST link on our website there are a series of DNA sequences. You will highlight, copy, and paste each sequence into the BLAST program.
6. On the right of the BLAST link are pictures to help you complete the program below.
7. **Once you receive your query or search results, use the possible results on the back of this page to match the sequence with its organism and its protein!**

Practice With Example Sequence:

1. Under the BLAST link are six DNA sequences. The first is the "example" sequence. Highlight this sequence and copy it (Command-C).
2. Open the BLAST program and paste (Command-V) the DNA sequence into the query (search) box.
3. Scroll down and click BLAST. Don't change any other options.
4. The screen will change and may take a couple of seconds to complete the search. Remember, this program is comparing your DNA sequence to ALL KNOWN sequences in the database (that's billions of nucleotides to compare!).
5. The results page comes up after a few seconds. Use the screen shots on the BLAST page on our website to be able to answer the questions for the sequence. For example:

    ### Example Sequence:
    a. How many nucleotides are in the searched sequence? 840 nucleotides
    b. How many blast hits resulted from this query? 100 BLAST hits
    c. Use one of the sequence results with a query cover of 100% to answer the following:
        1) What organism is this from? (*Note: the organism is named scientifically in Latin. This will be a two-word name. Search the two-word name to see what the common name of the organism is!) ***Homo sapiens* aka humans**
        2) What protein is made from this DNA sequence? Tyrosinase
        3) What does this protein do for this organism? Controls the production of melanin

To return to the "query box", at the top of the page, click "blastn suite" and it will return to the query page

Possible Query/Search Outcomes:

Possible Organisms
A. australis
Streptococcus pyogenes
Mus musculus
Homo sapiens

Possible Proteins
DNA Ligase
Salivary amylase
Neurotoxin
Streptokinase