Lab 3 – PSI-BLAST
September 14, 2012

Introduction

PSI-BLAST stands for Position Specific Iterated BLAST. It helps to look in detail into the database for sequences that match the query by utilizing a scoring matrix exclusively formulated for the query.

Procedure


2. Select PSI-BLAST in the algorithm field

   ![BLAST interface](image)

   i) PSI-BLAST search can identify even weak (subtle) homologies to
annotated entries in the database;

ii) The user interface of PSI-BLAST is the same as BLAST, as shown above.

iii) Select “PSI-BLAST” instead of “BLAST” at the “Program Selection” section for a PSI-BLAST search;

3. Similar to your last week’s exercise, go to PDB website to copy the FASTA sequence of “1fjm”.

4. **Tune PSI-BLAST parameters**
   The algorithm Parameters interface for PSI-BLAST is as follows, and it’s a little different from BLAST parameters.
Note for the above figure:

i) Except that PSI-BLAST E value threshold usually is set at 0.005 or even 0.001, setting up as PSI-BLAST search is very similar to BLAST.

ii) Do the same experiments as in BLAST search to observe the dependence of PSI-BLAST output on the algorithm parameters;

5. Understand the PSI-BLAST output

i) A typical output of PSI-BLAST search from the first iteration is very similar to BLAST output, except that there are some newly found entries, labeled with a shaded yellow “new” as follows:

Legend:

NEW - means that the alignment score was below the threshold on the previous iteration

NEW - means that the alignment was checked on the previous iteration

Run PSI-Blast iteration 2

Run the next PSI-BLAST iteration

Hit list size 100

Distance tree of results

New findings compared to the previous iteration

Related Structures

New findings compared to the previous iteration

ii) All the “new” findings should be given extra attention.

iii) After examining the output from each of PSI-Blast iterations, press a button “Run PSI-Blast Iteration 2” (or 3, 4, 5…) until
you can’t find and “new” labeled sequences, in which cases a PSI-Blast search is finished.

iv) Usually 3-5 iterations are more than enough.

**Deliverables:**
1. Compare the initial PSI-BLAST output and the BLAST output, and explain the difference between them. Keep your threshold and all other parameters to their default values.
2. How many iterations did it take to complete psi-blast with the default values?
3. Do you observe a change in the initial output with word size = 2 and E value = 0.001? Why/why not?

**Acknowledgement**
This handout is a guide of using BLAST and PSI-BLAST tools for EECS 730 students at KU only. All information above is taken from NCBI online education section “BLAST guide”, “BLAST tutorial”, and “PSI-BLAST tutorial”, and some other related internet sources.