QBIO490 Transcriptomics/RNAseq Worksheet

1. What is mRNA?

mRNA is a transitional form of RNA that is synthesized in the process of DNA transcription. RNA Polymerase reads a DNA strand and generates mRNA (messenger RNA), which continues to the DNA translation process (ultimately producing an amino acid chain to be folded later).

1. Explain how two types of ncRNA function in a multi-omic way. How do these RNA molecules affect/regulate either the genome or the proteome?

rRNA (ribosomal RNA) is one type of ncRNA, and is responsible for interacting with the proteome by facilitating the translation of mRNA into amino acid chains (that eventually become proteins). tRNA (transfer RNA) is another type of ncRNA that also influences the proteome, as it is used by the ribosome in the process of amino acid chain elongation in DNA translation.

1. Explain the steps of RNA-seq in your own words.

The first step of RNA-seq is to prepare a library for the process. To do this, isolate and break RNA into small fragments, convert them to dsDNA, then add adaptors to allow sequencing machines to recognize these fragments. You then use PCR to amplify these sequences, and the library comes from the final result. Next, RNA-seq requires the library to be sequenced, which is done using fluorescent-labelling on a flow cell. Once this sequencing data is generated, it has to be cleaned by filtering out garbage reads and then aligned with a genome. By aligning this data with a genome, the reads per gene can be determined, which reveals the relative expression and presence of each original RNA piece. Lastly, for the purpose of visualization, the results of this analysis may be plotted.