

Create a summary of and a list of learning objectives for the BRCA1/BLAST activity. (Linda LeBard and Susan Russell)

Summary:

Students will use a case study about a woman and her extended family who have a family history of breast cancer. Students will learn to navigate BLAST (Basic Local Alignment Search Tool), a tool from the National Center for Biotechnology Information (NCBI) website. They will explore the DNA and protein databases to compare and analyze BRCA1 DNA and protein sequences in this family to determine which members of the family have a mutation in BRCA1 elevating risk of cancers.

Learning Objectives:

Students will know that:

- Databases such as BLAST (Basic Local Alignment Search Tool) can be used to compare DNA or protein sequences, either by comparing two or more sequences to each other or by comparing a sequence to the database.
- The BRCA1 gene encodes a protein involved in DNA repair. Mutations in BRCA1 can interfere with the protein's normal tumor suppressor function which can lead to cancer.
- BRCA1 mutations can be inherited.

Students will be able to:

- Navigate BLAST to compare DNA sequences to a reference sequence.
- Navigate BLAST to compare protein sequences to a reference sequence.

NGSS Standards

Performance Expectations (PE's)

- HS-LS1-1.** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells.
- HS-LS3-1.** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

DCI's

LS1.A: Structure and Function

All cells contain genetic information in the form of DNA molecules. Genes are regions in the DNA that contain the instructions that code for the formation of proteins, which carry out most of the work of cells.

LS3.A Inheritance of Traits

Each chromosome consists of a single very long DNA molecule, and each gene on the chromosome is a particular segment of that DNA. The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used (expressed) by the cell may be regulated in different ways. Not all DNA codes for a protein; some segments of DNA are involved in regulatory or structural functions, and some have no as-yet known function. (HS-LS3-1)