# Lab 2: Genome Analysis

In this lab, we will use a myriad of public interfaces that allow us to learn and explore specific genes.

## Terms to know before Starting

Some important keywords that will help you understand this lab more clearly are listed below.

1. Define each of these terms:

- Single Nucleotide Polymorphism (SNP)
- Coding Sequence
- Transcript
- RNA-sequencing (RNA-seq)

# Part 1: Using the UCSC Genome Browser to explore the HLA class I histocompatibility antigen, alpha chain E (HLA-E) Gene

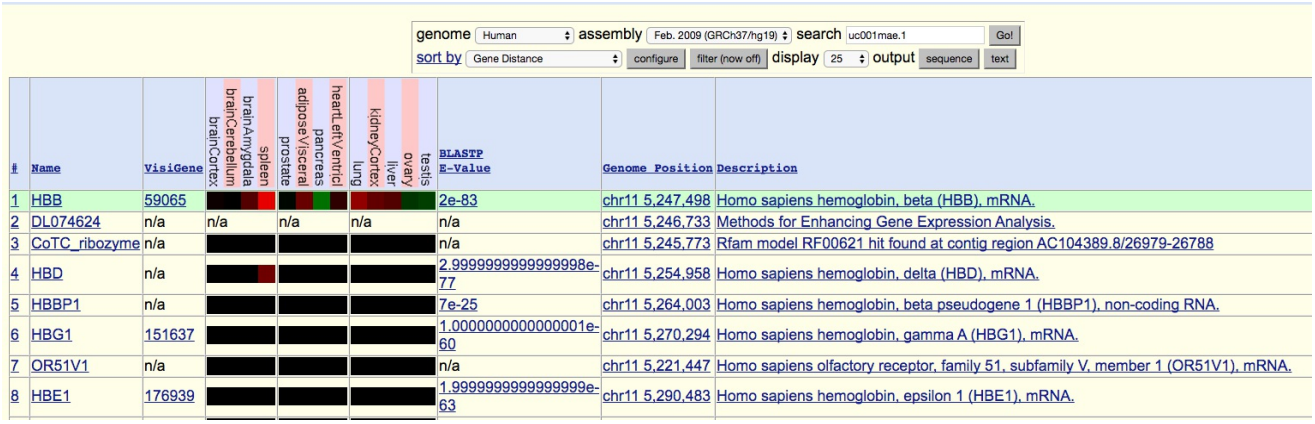
Follow instructions from UCSC Genome Browser Exercise: HLA class I histocompatibility antigen, alpha chain E (HLA-E) Gene. Answer the questions throughout the tutorial.

# Part 2: Exploring HLA-E

For this part of lab, we will be using UCSC Gene Sorter to compare genes based on certain traits, specifically by distance and expression. Genes of interest for this portion of the lab include HLA-A, HLA-C and HLA-E.

# Search for HLA-E by distance:

1. Navigate to UCSC Gene Sorter.
2. Search for HLA-E in the search box, sorting by **GTEx Expression** in the **Sort By** dropdown menu. Here you will see a list of gene names and their position, description and BLASTP E-Value.


genome Human assembly Feb. 2009 (GRCh37/hg19) search uc001mae.1 Go!
sort by Gene Distance configure filter (now off) display 25 output sequence text

| # | Name | VisiGene | brainCortex | brainCerebellum | brainAmygdala | spleen | prostate | adiposeVisceral | pancreas | heartLeftVentricl | lung | kidneyCortex | liver | ovary | testis | BLASTP E-Value | Genome Position | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HBB | 59065 | | | | | | | | | | | | | | 2e-83 | chr11 5,247,498 | Homo sapiens hemoglobin, beta (HBB), mRNA. |
| 2 | DL074624 | n/a | n/a | | | | n/a | | | | n/a | | | | | n/a | chr11 5,246,733 | Methods for Enhancing Gene Expression Analysis. |
| 3 | CoTC_ribozyme | n/a | | | | | | | | | | | | | | n/a | chr11 5,245,773 | Rfam model RF00621 hit found at contig region AC104389.8/26979-26788 |
| 4 | HBD | n/a | | | | | | | | | | | | | | 2.9999999999999998e-77 | chr11 5,254,958 | Homo sapiens hemoglobin, delta (HBD), mRNA. |
| 5 | HBBP1 | n/a | | | | | | | | | | | | | | 7e-25 | chr11 5,264,003 | Homo sapiens hemoglobin, beta pseudogene 1 (HBBP1), non-coding RNA. |
| 6 | HBG1 | 151637 | | | | | | | | | | | | | | 1.0000000000000001e-60 | chr11 5,270,294 | Homo sapiens hemoglobin, gamma A (HBG1), mRNA. |
| 7 | OR51V1 | n/a | | | | | | | | | | | | | | n/a | chr11 5,221,447 | Homo sapiens olfactory receptor, family 51, subfamily V, member 1 (OR51V1), mRNA. |
| 8 | HBE1 | 176939 | | | | | | | | | | | | | | 1.9999999999999999e-63 | chr11 5,290,483 | Homo sapiens hemoglobin, epsilon 1 (HBE1), mRNA. |

## Exercises

6A. What is the BLASTP E-value represent?

6B. What are the 2 most similarly expressed genes to HLA-E?

6C. Using the gene descriptions, are there any similarities between HLA-E and these closest genes? What are they?

6D. In this view, is there any way to gain information of how this gene is expressed? What can you learn about HLA-E expression from this view?

Now, search for HLA-E in the search box, sorting by **Protein Homology** in the **Sort By** dropdown menu.

6E. What does homology mean?

6F. What genes have similar homology to HLA-E? Is this list of genes surprising? Why or why not?

## Search for HLA-E by expression:

1. Search for HBB, sorting by gene expression (GTEx). List the 2 most similar expressed genes.
2. Search for HBB, sorting by gene expression (GNF Atlas 2). Are there any differences in expression from searching in GTEx? If so, why would these be different?