

Genome Comparison of Chimpanzee and Human

Group members:

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Target Audience:

Grade level: 9th-12th

Courses: Honors Biology, Genetics, AP Biology, Independent Study, Graduation Project

Objectives:

- 1) Use bioinformatics databases to explore the evolutionary relationships between species.
- 2) Examine chromosomal differences in closely-related species.
- 3) Identify genes close to chromosome breakpoints.

Description of project:

Genomics provides the largest amount of data for the relationships between species. The vast majority of the data are freely available over the internet. Use of these databases will increase for medicine, environmental science and the study of evolutionary processes and relationships.

The initial activity is off-the-shelf and provides clear step-by step instructions for searching the gene sequence database at National Center for Biotechnology Information. Students are assigned diverse starting sequences and each looks at the kinds of information available at NCBI.

The second activity is the first step in examining a specific case in molecular evolution. Chimpanzee and human chromosomes are easily recognizable as homologous. However, there are specific differences. In this activity students use colored pencils to color-coded the several types of chromosomal differences in side-by-side diagrams of human and chimpanzee chromosomes.

Finally, students use the University of California, Santa Cruz genome browser to focus in on and identify the genes closest to the chromosomal breakpoints. Students are asked to hypothesize how a change in the expression of a gene close to a chromosome break could account for a phenotypic difference in the two species.

Specific activities:

Introduction to bioinformatics with worksheet and tutorial

[BLASTing through the kingdom of life](http://www.digitalworldbiology.com/BLAST/62000sequences.html)

(<http://www.digitalworldbiology.com/BLAST/62000sequences.html>)

Compare chimpanzee and human chromosomes

[Comparison of Human and Chimpanzee Chromosomes](http://www.indiana.edu/~ensiweb/lessons/chromcom.html)

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Identify breakpoints associated with chimpanzee-human pericentric inversions

[Pan-Homo Chromosome Breaks](#)

(<http://jordanghhs.pbworks.com/>)

References:

Jordan, Kevin. (2008). Pan-Homo Chromosome Breaks. Retrieved July 1, 2009, from <http://www.jordanghhs.pbworks.com>
PanHomoBreaksWithSettingsandExample.rtf

Kramer, Beth. (1999). Comparison of Human and Chimpanzee Chromosomes. *Evolution and the nature of Science Institute*. Retrieved July 1, 2009, from <http://www.indiana.edu/~ensiweb/lessons/chromcom.html>

Porter, Sandra. (2007?). BLASTing through the kingdom of life. *Digital World Biology*. Retrieved July 1, 2009, from <http://www.digitalworldbiology.com/BLAST/62000sequences.html>.

Resources:

Internet-access
Colored pencils
Reproductions of chromosome diagrams
About 150 minutes