DID HUMANS EVOLVE FROM APES, OR DO MODERN APES AND HUMANS HAVE A COMMON ANCESTOR?

Modern research techniques allow biologists to compare the DNA that codes for certain proteins and to make predictions about the relatedness of the organisms from which they took the DNA. Students will use the models of these techniques to test their hypotheses and determine which one is best supported by the data they develop.

Materials (per group of 4)

- 4 sets of black, white, green and red paper clips, each set with 35 clips

****

PROCEDURE (PART 1)

Step 1: Working in groups of four, "synthesize" strands of DNA according to the following specifications. Each different color of paper clip represents one of the four bases of DNA:

Black= adenine (A) **Green= guanine (G)**

White= thymine (T) **Red= cytosine (C)**

Students should synthesize DNA strands by connecting the paper clips in the proper sequence according to specifications listed for each group member. When you have completed the synthesis, attach a label to Position 1 and lay your strands on the table with Position 1on the left.

Group Member 1: Synthesize a strand of DNA that has the following sequence:

Position1 **Position 20**

A-G-G-C-A-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A

Label this strand "human DNA". This strand represents a small section of the gene that codes for human hemoglobin protein.

Group Member 2: Synthesize a strand of DNA that has the following sequence:

Position 1 **Position 20**

A-G-G-C-C-C-C-T-T-C-C-A-A-C-C-G-A-T-T-A

Label this strand "chimpanzee DNA". This strand represents a small section of the gene that codes for chimpanzee hemoglobin protein.

Group Member 3: Synthesize a strand of DNA that has the following sequence:

Position 1 **Position 20**

A-G-G-C-C-C-C-T-T-C-C-A-A-C-C-A-G-G-C-C

Label this strand " gorilla DNA". This strand represents a small section of the gene that codes for the gorilla hemoglobin protein.

Group Member 4: Synthesize a strand of DNA that has the following sequence:

Position 1 **Position 20**

A-G-G-C-C-G-G-C-T-C-C-A-A-C-C-A-G-G-C-C

Label this strand "common ancestor DNA". This strand represents a small section of the gene that codes for the hemoglobin protein of the common ancestor of the gorilla, chimpanzee and the human.

Step 2: Students should compare the human DNA to the chimpanzee DNA by matching the strands base to base (paper clip to paper clip).

Step 3: Students should count the number of bases that are not the same. Record the data in the table (copy from overhead). Repeat these steps with the human DNA and the gorilla DNA.

Evaluate

1. How do the gorilla DNA and the chimpanzee DNA compare with the human DNA?

2. What do these data suggest about the relationship between human, gorillas, and chimpanzees?

3. Does the data support any of your hypotheses? Why or why not?

4. What kinds of data might provide additional support for your hypotheses?

****

PROCEDURE (PART 2)

Step 1: Assume that the common ancestor DNA synthesized in Part 1 represents a section of the hemoglobin gene of a hypothetical common ancestor.

Step 2: Compare this ancestor DNA to all 3 samples of DNA (gorilla, human and chimpanzee), one sample at a time.

Step 3: Record the data in the table.

Data Charts

Hybridization data for human DNA

Human DNA compared to:	Number of matches	Unmatched bases
Chimpanzee DNA		
Gorilla DNA		

Data for common ancestor DNA

Common ancestor DNA compared to:	Number of matches	Unmatched bases
Human DNA		
Chimpanzee DNA		
Gorilla DNA		

Evaluate

1. How do the gorilla DNA and the chimpanzee DNA compare with the human DNA?

2. What does this data suggest about the relationship between humans, gorillas, and chimpanzees?

3. What other kinds of data (evidence) might help to support the relationship shown with this DNA?

4. Which DNA is most similar to the common-ancestor DNA?

5. Which two DNAs were most similar in the way that they compared to the common-ancestor DNA?

6. Based on the data gathered in this activity, which of the following statements is most accurate? **Explain your answer in a short paragraph. Be sure to use data for support of your choice.**

   (a) Chimpanzees and humans have a common ancestor.

   (b) Chimpanzees are the direct ancestors of humans.