

## Canine DNA

Background: DNA is the code in all living things that makes living things look the way they do. The DNA of species that are similar are more alike than the DNA of species that are not alike. Scientists think this suggests there is a common ancestor to the species in a family. A common ancestor is one that a species (or a group of species) evolved from through evolution. Sometimes scientists can tell what was an ancestor to a species in the fossil record; other times, there is no fossil and scientists have a prediction of what the ancestor was like. Often several modern-day animals evolved from one common ancestor.

Hypothesis: The canine family includes: domesticated dogs, wolves, coyotes, foxes, dingoes and jackals. DNA of a dog and a wolf will be more alike than a dog and a coyote.

Materials: 35 paper clips of 4 colors (red, green, blue and yellow), calculator, clothespin labels

Procedure:

1. Working in groups of four, synthesize (put together) strands of DNA. Hook the paper clips together end to end. Each different color of paper clip represents one of the four bases of DNA: yellow = adenine (A), green = guanine (G), blue = thymine (T) and red = cytosine (C).

Group member 1 - Dog DNA:                   A-G-G-C-A-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A  
 Group member 2 - Grey Wolf DNA:       A-G-G-C-C-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A  
 Group member 3 - Coyote DNA:           A-G-G-C-C-T-C-A-A-C-C-A-A-C-C-G-G-T-T-C  
 Group member 4 - Ancestor DNA:       A-G-G-C-C-T-C-C-T-C-C-A-A-C-C-A-A-G-C-C

2. Compare the dog DNA to the wolf DNA by matching the strands base by base (paper clip by paper clip).
3. Count the number of bases that are not the same. Record the data in the table 1. Repeat steps 3 and 4 with the coyote DNA.
4. Keep track of your strand by putting the clothespin label with the correct name on it.
5. Clean Up: At the end, separate the strands of DNA, then separate the different colors into piles.

Table 1: Comparison to Dog DNA (There are 20 bases/paperclips in each strand.)

	Number of matches	Number of differences
Wolf		
Coyote		

Procedure 2:

1. Assume that the common ancestor DNA represents a section of DNA of a **hypothetical** common ancestor.
2. Compare this common ancestor DNA to all three samples of DNA (dog, wolf, and coyote), one sample at a time. Record the data in a table.

Table 2: Comparison to Common Ancestor DNA (There are 20 bases in each strand.)

	Number of matches	Number of differences
Dog		
Wolf		
Coyote		

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

Questions (look at table 1):

1. How do the wolf DNA and the coyote DNA compare with the dog DNA? \_\_\_\_\_

2. Does the data support the hypothesis? Why or why not? \_\_\_\_\_

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

4. Find the similarity in DNA by percentage (%). (number of matches/total bases x 100)  
Dog and wolf \_\_\_\_\_ Dog and Coyote \_\_\_\_\_

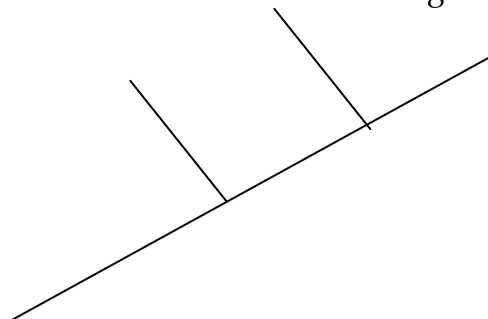
Questions (look at table 2):

1. Which DNA is most similar to the common-ancestor DNA? \_\_\_\_\_

2. According to all the data collected, which of the following statements is most accurate?  
Explain your answer. (a) Dogs and coyotes have a common ancestor.  
(b) Coyotes are the direct ancestors of dogs.

3. Find the similarity in DNA by percentage (%). (# of matches/total bases x 100)  
Dog and Common Ancestor \_\_\_\_\_ Wolf and Common Ancestor \_\_\_\_\_  
Coyote and Common Ancestor \_\_\_\_\_

4. Put the 3 animals in the diagram based on how similar they are to one another.



Common Ancestor

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

Reminders:

1. Double check your DNA strand when you are done.
2. Help each other if needed.
3. Be kind to your paper clips if you want to do the activity: no throwing, no mangling, no necklaces, no paperclips on the floor.