

Canine DNA

Background: DNA is in all living things. The DNA of closely related species is similar. Scientists believe this is evidence of a common ancestor. A group of related species has a common ancestor, often an extinct species. Sometimes the common ancestor is a part of the fossil record; sometimes it is not. Often several modern-day species evolved from one common ancestor.

This activity focuses on the canines. The canine family includes domesticated dogs, wolves, coyotes, foxes, dingoes, wild African dogs and jackals.

Hypothesis: The DNA of a dog and a wolf will be more alike than the DNA of 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.

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 _____

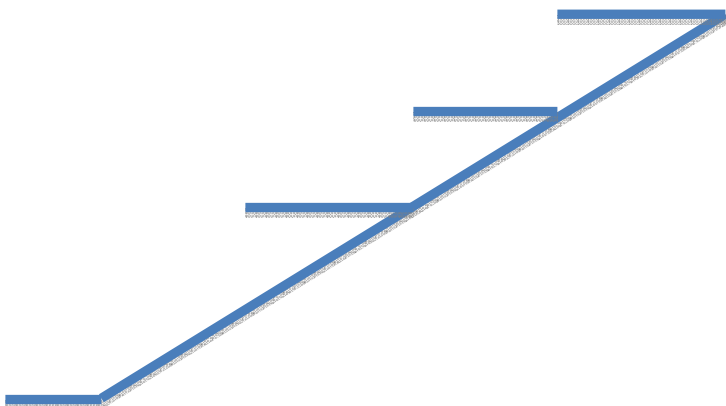
Questions (look at table 2):

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

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

7. 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 _____

8. Put the 3 animals and the common ancestor in the branching diagram (Cladogram) based on how similar they are to one another.



Name _____ Date _____ Period _____

Teacher Resources

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.

Dog DNA: A-G-G-C-A-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A
Grey Wolf DNA: A-G-G-C-**C**-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A
19 Matches, 1 difference

Dog DNA: A-G-G-C-A-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A
Coyote DNA: A-G-G-C-**C**-T-**C**-A-A-C-C-A-A-C-C-G-**G**-T-T-**C**
16 Matches, 4 differences

Dog DNA: A-G-G-C-A-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A
Ancestor DNA: A-G-G-C-**C**-T-**G**-**C**-T-C-C-A-A-C-C-**A**-A-**G**-**C**-**C**
12 Matches, 8 differences

Grey Wolf DNA: A-G-G-C-C-T-A-A-A-C-C-A-A-C-C-G-A-T-T-A
Ancestor DNA: A-G-G-C-C-T-**G**-**C**-T-C-C-A-A-C-C-**A**-A-**G**-**C**-**C**
13 Matches, 7 differences

Coyote DNA: A-G-G-C-C-T-C-A-A-C-C-A-A-C-C-G-G-T-T-C
Ancestor DNA: A-G-G-C-C-T-C-**C**-T-C-C-A-A-C-C-**A**-A-**G**-**C**-**C**
14 Matches, 6 differences

On Overhead!

A = **YELLOW**

G = **GREEN**

T = **BLUE**

C = **RED**