

Please do not write on the lab handout
Allele Frequency Lab

Objectives:

- To see how natural selection acts on the phenotype rather than the genotype of an organism.
- To discover that alleles that are lethal in a homozygous individual may be carried in a heterozygous and thus maintained in a gene pool.
- To determine that variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.
- To explain the effects of a genetic drift on the diversity of organisms in a population.

Purpose: In this lab you will be attempting to show how giraffe necks may become longer in response to selective pressures in their environments. Assume that during a long drought food has become scarce where the giraffes are living. Genes (symbolized by beans) control the length of the giraffe neck: red beans represent long necks and white beans represent short necks.

Guidelines:

1. A giraffe receiving two "long neck" alleles (two red beans) from his parents has a longer neck than the medium necked giraffe. These giraffes would be able to feed on the choice of leaves higher up on the trees.
2. A giraffe receiving one "long" allele and one "short" allele (one red bean and one white bean) would have a medium neck length and would only be able to feed on the old, tough lower branches that have been picked over by the other giraffes.
3. A giraffe receiving two "short" alleles (two white beans) would have a shorter neck than the medium necked giraffe. This giraffe would not be able to reach over the lowest branches. A giraffe with this neck length variation would die from starvation.

Materials: red beans, white beans, a paper bag.

Procedure:

1. Count out 60 white beans and 40 red beans and put them in a paper bag. The beans in the bag will represent the **gene pool** of the giraffe population: these are all of the possible alleles in the population. We will study the offspring from those giraffes by removing beans two at a time from the bag. Each pair removed represents a young giraffe.
2. Gently shake the bag before each choice. Select 25 pairs of beans at random from the bag. DO NOT peek. Set aside these beans, keeping them in pairs. These beans represent the giraffes in the first generation.
3. Correctly record the number of pairs in each group under "Generation 1".
4. Place all of the "short neck" combinations (two white beans) in the morgue- DO NOT return them to the paper bag.
5. Return all of the remaining beans to the paper bag.
6. Starting at step 2, repeat the process for another 7 generations. Record the results in your data table as seen below.
7. When all of your data is collected construct a line graph. Label the x axis "Generation" and the y axis "Number of giraffes". Use a different color for each giraffe neck length and don't forget to include a key.

Data Table:

Generation	1	2	3	4	5	6	7	8
Long Neck								
Medium Neck								
Short Neck								

Discussion Questions:

1. How do you think the allele for "long necks" originally appeared in the giraffe population?
2. Why was the homozygous white bean combination taken out of the gene pool?
3. Describe what happened to the overall appearance of EACH neck type as each new generation of giraffes occurred.
4. What was the **selective pressure** in the environment acting on the giraffe population? What other pressures might a population face?
5. What might have happened to the giraffe population if there wasn't a drought and food was not scarce?
6. What is adaptation? What is the adaptation that evolved in this population of giraffes?
7. What type of **natural selection** was acting on this lab scenario?