

Breeding Bunnies Make-Up

Mechanisms of Evolution

Introduction: In this activity, you will examine *natural selection* in a small *population* of wild rabbits. *Evolution*, on a genetic level, is a change in the frequency of *alleles* in a population over a period of time. Breeders of rabbits have long been familiar with a variety of genetic traits that affect the survivability of rabbits in the wild, as well as in breeding populations. One such trait is the trait for furless rabbits (naked bunnies). This trait was first discovered in England by W.E. Castle in 1933. The furless rabbit is rarely found in the wild because the cold English winters are a definite selective force against it. You will be investigating the ability of this trait to be passed on to the offspring along with two other traits, ear length and color.

Note: In this lab, the dominant allele for normal fur is represented by *F* and the recessive allele for no fur is represented by *f*. Bunnies that inherit two *F* alleles or one *F* and one *f* allele have fur, while bunnies that inherit two *f*'s have no fur. The chart below shows a breakdown of three traits' genotypes and phenotypes.

	Fur Red = F Blue = f	Ear Length Green = E Brown = e	Color Yellow = C Orange = c
Homozygous Dominant	Has fur	Long ears	Black
Heterozygous	Has fur	Middle length ears	Spots
Homozygous Recessive	No fur	Short ears	White

Procedures

1. You will be working in pairs, which is the person sitting next to you.
2. Each group will receive a cup containing your initial population (they look like m&ms, but they are really genes).
3. Grab three small cups. Label each of these either "Fur," "Ears," or "Color." Then, divide up your genes into the appropriate cup. (For example, the red and blue go into the "Fur" cup...)
4. You will be selecting the traits for Bunny #1 first. Without looking, take two m&ms from the cup labeled "Fur." Record your genes in the Data chart using the Gene Trait table above. Then, take two m&ms from the "Ears" cup, then two from the "Color" cup. Record these traits on the Data chart as well.
5. Put all of your m&ms back into their cup. Repeat step 4 for Bunny #2 through Bunny #5.
6. Oh no! A very bad storm has come through the Bunnies home! All of your bunnies with no fur die. Cross them out on your data sheet using a single line (you still need to be able to read the information).
7. The bunnies continue to reproduce after the horrible storm. Repeat step 4 for Bunny #6 through Bunny #10.
8. Add up your trait totals for your bunny populations. Not every population will have 10 bunnies!

Data:

The genotype has already been decided for you. Now you need to refer to the data table on the first page to find the phenotype.

	Fur		Ear Length		Color	
	Genotype	Phenotype	Genotype	Phenotype	Genotype	Phenotype
Bunny #1	FF		EE		Cc	
Bunny #2	Ff		EE		cc	
Bunny #3	FF		Ee		cc	
Bunny #4	ff		Ee		CC	
Bunny #5	FF		ee		Cc	
(go back and read step 6 of your procedure)						
Bunny #6	FF		ee		CC	
Bunny #7	FF		EE		CC	
Bunny #8	ff		EE		cc	
Bunny #9	Ff		EE		cc	
Bunny #10	Ff		Ee		Cc	

How many of your bunnies survived? _____

	# of Bunnies w/trait	# of Bunnies total	Percent (# of bunnies w/trait)/(# of bunnies total)
Fur			
No Fur			
Short Ears			
Medium Ears			
Long Ears			
White			
Spots			
Black			

Assessment Questions:

1. Define the following words:
 - a. Natural Selection:

 - b. Evolution:

 - c. Population:

 - d. Fitness:

 - e. Genotype:

 - f. Phenotype:

 - g. Allele:

2. In Unit 3, Genetics, we talked about the relationship of Dominant and Recessive genes, Incomplete Dominance, and Codominance. Each of these relationships was expressed in this activity. Label each trait with the appropriate type of expression:
 - a. Fur:

 - b. Ear Length:

 - c. Color:

3. In step 6 of this procedure a storm came by and killed some bunnies. Was this an example of Genetic Drift, Survival of the Fittest, or Sexual Selection? Defend your answer.

- Some of your bunnies died in this simulation. Which bunnies had the higher fitness?
- Compare your results to two other groups. Record their percentages in the chart below with your results.

	Your Group	Group 1	Group 2
Fur		50%	88%
No Fur		50%	12%
Short Ears		30%	45%
Medium Ears		10%	15%
Long Ears		60%	40%
White		78%	65%
Spots		0%	5%
Black		22%	30%

- Compare and contrast all three group's results.
- Remembering that all three of these populations started out with the exact same genes, why do you think some of the numbers are different?
- If all three of these groups were to start a new population and not interbreed with any other bunnies, would you expect them to become more similar or different? Explain.
- What is it called when a small group of individuals leave and start their own population?
- How does gene flow stop new species from being created?