



Developing an Explanation for Mouse Fur Color

Activity
Student Handout

INTRODUCTION

Rock pocket mice are interesting in many ways. They make a living in the intense heat of the desert. They also come in different fur colors, from tan to black. Scientists have a good understanding of what causes fur color in *individual* mice. The amount, type, and distribution of a pigment molecule called melanin gives fur its color. But why are almost all the mice in some *populations* black and those in other populations mostly tan? What determines these patterns?

The American Southwest is a fantastic place to study rock pocket mice with different coat colors. Lava flows created patches of dark rock among the surrounding light-colored sand. Researchers noticed that black rock pocket mice were more common on the dark lava flows, whereas the tan rock pocket mice were more common on the light-colored sand. They suggested that these patterns could be explained by evolution by natural selection. But what is the evidence for this claim?

MATERIALS

- Evolution by Natural Selection Explanation Table
- Transcript from the short film *The Making of the Fittest: Natural Selection and Adaptation*
- Additional Evidence for an Explanation handout

PROCEDURE

1. Begin watching the short film *The Making of the Fittest: Natural Selection and Adaptation* up to the 2:37 time mark. Pause the video when Dr. Nachman says, “Almost all of them.”
2. On your own, write your best answers to the following questions.
 - a. How would biologists explain how the mice on the lava flow evolved black fur? Include all the elements you think are needed for a full explanation.
 - b. Would biologists say that the mice changed because they wanted or needed to change? Why or why not?

3. Review the activity table handout “Evolution by Natural Selection Explanation Table.” This table can help you summarize the evidence needed for a full explanation for changes in a trait in a population based on the process of natural selection. You can use this table to help you analyze any specific case of natural selection.
4. Watch the rest of the short film *The Making of the Fittest: Natural Selection and Adaptation*. As you watch the video, record evidence you see or hear in the film that supports each condition for natural selection for the change in fur color in some rock pocket mouse populations. Record the evidence in your Evolution by Natural Selection Explanation Table.
5. After watching the video, add more evidence to your table from your memory and the transcript of the video.
6. Read the activity supplement handout “Additional Evidence for an Explanation” and analyze the data and figures in the handout. Use the handout to answer the questions below.

DATA SET 1

7. Calculate the percentage of tan mice in each population from the data in Table 1.
 - a. Enter your calculations in the last row in Table 1.

Table 1. Percentage of tan mice in different populations. (This is the same data as shown in Figure 2 of the activity supplement “Additional Evidence for an Explanation” recorded in a table format.)

Population →	Christmas Pass	Tule Well	Lava (West)	Lava (Mid)	Lava (East)	O’Neill Pass
Soil color	Light	Light	Dark	Dark	Dark	Light
Number of tan mice	6	80	0	0	3	34
Number of dark mice	0	5	7	5	42	43
Total number of mice (tan and dark)						
Percentage of tan mice	____%	____%	____%	____%	____%	____%

- b. Which populations show evidence for variation in fur color? Add the evidence to your Evolution by Natural Selection Explanation Table as needed.
 - c. Describe how the evidence you collected relates to one or more of the major principles of natural selection.

DATA SET 2

8. What pattern or patterns do you see on the graph in Figure 3?
 - a. Make a claim about whether differences in fur color are inherited. Support your claim with evidence from Figure 3. Add the evidence to your Evolution by Natural Selection Explanation Table as needed. Also, describe how the evidence relates to the major conditions of evolution by natural selection.

DATA SET 3

9. Make a claim about whether the frequencies of alleles that affect fur color are different in populations on light or dark backgrounds. Support your claim with evidence from Figure 4. Add the evidence to your Evolution by Natural Selection Explanation Table as needed. Again, describe how the evidence relates to the major conditions of evolution by natural selection.
10. Review your answer to Step 2a after watching the video and analyzing additional evidence. Describe the number of conditions for natural selection you used in your initial answer. Also describe the changes you would make to your answer based on what you've learned.

APPLY WHAT YOU LEARNED

1. Oldfield mice (*Peromyscus polionotus*, also called beach mice) in the southeastern United States belong to a different genus than rock pocket mice (*Chaetodipus intermedius*). Oldfield mice from the mainland live in areas with dark soils. These mice mostly have dark fur. Populations of the same species that live on the white beaches of Florida and Alabama have light fur. Describe the evidence you would need to collect to support the claim that the differences in color in these populations are due to natural selection.
2. Describe the types of evidence you would need to collect to support the claim that differences in skin color among humans are the result of natural selection.
3. Humans also have an *MC1R* gene, and scientists have discovered that it's one of the genes that determines the type and amount of melanin in a person's skin. If you wanted to study whether skin color, like mouse fur color, has evolved by natural selection, what additional challenges do you imagine in collecting data or designing experiments to explore skin color evolution in humans? Make a list of at least three additional challenges.