

Name:

Nature at Work

Question: How does variation of color in a species affect natural selection?

Hypothesis: Review the procedure for this lab activity and write a prediction for the outcome of Part 1.

Materials:

Mouse cards: 25 W dominant allele for white fur; 25 w recessive allele for brown fur
Event cards: 5 S survival cards; 1 D disease card; 1 P predator card; 18 C contrast cards
Live Mice identifier
Dead Mice identifier

Procedure:

PART 1: A White Sand Environment

1. Mix up the mouse cards.
2. Begin by using the cards to model what might happen to a group of mice in an environment of white sand dunes. Choose two mouse cards. Allele pairs WW and Ww produce a white mouse. Allele pair ww produces a brown mouse.
3. Choose an event card. An "S" card means the mouse survives. A "D" or a "P" card means the mouse dies. A "C" card means the mouse dies only if its color contrasts with the white sand dunes. (only brown mice would die when a "C" card is drawn for this first environment since brown fur contrasts with white sand).
4. Record each live or dead mouse with tally marks in the data table.
5. If the mouse lives put the two mouse cards in the "live mice" pile. If the mouse dies put the two mouse cards in the "dead mice" pile. Place the event cards at the bottom of the stack.
6. Repeat steps 3 through 5 with the remaining mouse cards to study the first generation of mice. Record your results. Add the tallies for the total number of live white dead white and brown mice.
7. Place the dead mice in the baggie but mix up the gene pool from the live mice pile. Mix up the events cards.
8. Repeat steps 3 through 7 for the second generation. Then repeat steps 3 through 6 for the third generation.

| Data Table | | | | |
|---------------------------------|------------------------|------------|---------------|------------|
| Type of Environment: WHITE SAND | | | | |
| Generation | Population (live mice) | | Deaths (died) | |
| | White Mice | Brown Mice | White Mice | Brown Mice |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

PART 2: A Forest Floor Environment

9. How would the data differ if the mice in this model lived on a dark brown forest floor? Record your prediction:

10. Repeat steps 3 through 8 to test your prediction. Remember that a “C” card now means that any mouse with white fur would die. White fur contrasts with the dark forest environment.

| Data Table | | | | |
|-----------------------------------|------------------------|------------|---------------|------------|
| Type of Environment: FOREST FLOOR | | | | |
| Generation | Population (live mice) | | Deaths (died) | |
| | White Mice | Brown Mice | White Mice | Brown Mice |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

Analyze and Conclude:

Calculate the death rate for each mouse color in each generation. (Hint: to calculate death rate for white mice you divide the number of dead white mice by the total number of white mice in that generation). Record both ratio and percentage in the data table. *Round to whole percentage.*

| Analysis of data | | |
|---------------------------------|-------------------------|-------------------------|
| Type of Environment: WHITE SAND | | |
| Generation | Death rate (white mice) | Death rate (brown mice) |
| 1 | | |
| 2 | | |
| 3 | | |

| Analysis of data | | |
|-----------------------------------|-------------------------|-------------------------|
| Type of Environment: FOREST FLOOR | | |
| Generation | Death rate (white mice) | Death rate (brown mice) |
| 1 | | |
| 2 | | |
| 3 | | |

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Analyze and Conclude (continued):

1. If the events in Part 1 (the outcome of the white sand model) occurred in nature, how would the group of mice change over time?

2. How did the results from Part 2 differ from those in Part 1?

3. What are some ways in which this investigation models natural selection?

4. After many more generations, the population of white mice in the white sand environment also developed advantageous mutations for large ears and small eyes (large ears allowed cooling of their body and small eyes protected from reflecting light off the sand) but the brown mice in the forest environment did not develop these same mutations. Let's assume the white mice and brown mice were put together after all these generations and can no longer produce fertile offspring. Explain how natural selection due to variation and selection can lead to the evolution of new species. Be sure to include the term "adaptation" in your explanation.

