Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab: How do traits change over time?**

In this lab, you will investigate how natural selection can lead to changes in a species over time. You’ll explore how both genetic and environmental factors play a part in natural selection.

**Materials:** *Playing cards*

|  |  |
| --- | --- |
| **Mouse Cards** | |
| **Number** | **Label** |
| 25 | W - **Dominant allele for white fur** |
| 25 | w - **Recessive allele for brown fur** |

**Procedure:**

1. Count to make sure you have 25 “W’s” and 25 “w’s”.
2. Mix up the mouse cards. Start with them all turned over in a stack so you cannot see the letters.
3. Imagine that you are in a white, sandy environment. Predators can easily spot any mouse who does not blend into the environment therefore light colored mice are camoflauged.
4. Deal out two cards randomly from the mouse pile. Turn them over.

* If you pull out WW or Ww, you produced a **white** mouse
* If you pull out a ww, you produced a **brown** mouse.

1. Find data table 1 on the next page. Mark what color mouse was “born” using a tally mark for the 1st generation.
2. Now use the table below to make sure you have the correct number of Event Cards.

|  |  |
| --- | --- |
| **Event Cards** | |
| **Number** | **Label Meaning** |
| 5 | S – Mouse survives |
| 1 | D – Disease kills mouse |
| 1 | P – Predator kills mice of all colors |
| 18 | C – Predator kills mice that does not blend in |

1. Spread out your event cards and randomly choose 1. Use the meaning of the card to determine if the mouse lives or dies. If the mouse lives, place the two cards into a “living” pile. If the mouse dies, mark your data table in the appropriate column and place the two cards into a “died” pile.

1. Return the event card to the group to be used again.

**It is very important to keep all living mice and dead mice in separate piles!!**

**Always record your results in your data table!!**

1. Continue playing the game until you have run out of mouse cards.
2. Start the game again, however this time use only the “living” pile of mouse cards. Follow the same rules and directions as before.
3. Continue the game for 4 generations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Table 1** | | | | |
| **Type of Environment: White Sand** | | | | |
| **Generation** | **Births** | | **Deaths** | |
| **White Mice** | **Brown Mice** | **White Mice** | **Brown Mice** |
| **1** |  |  |  |  |
| **2** |  |  |  |  |
| **3** |  |  |  |  |
| **4** |  |  |  |  |

**Part 2**

1. Mix your mouse cards together once again and organize your event cards.
2. You will now play the same game as before, however the color of the environment has now changed. Instead of a white, sandy environment, our simulation will take place in a dark forest.
3. Make a prediction in the space provided to explain what color mice will have a higher survival rate in this new environment.

**Prediction:**

**Remember that a “C” card now means that a mouse with white fur will die.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Table 2** | | | | |
| **Type of Environment: Dark Forest Floor** | | | | |
| **Generation** | **Births** | | **Deaths** | |
| **White Mice** | **Brown Mice** | **White Mice** | **Brown Mice** |
| **1** |  |  |  |  |
| **2** |  |  |  |  |
| **3** |  |  |  |  |
| **4** |  |  |  |  |

**Answer the following questions in complete sentences:**

1. In each generation, which color mouse had the higher death rate?

To calculate the death rate of each generation:

Divide the number of Dead White mice by the number of White Mice Born, and then multiply by 100.

Divide the number of Dead Brown mice by the number of Brown Mice Born, and then multiply by 100

White Death Rate = Number of Dead White Mice ÷ Number of White Mice Born

Brown Death Rate =Number of Dead Brown Mice ÷ Number of Brown Mice Born

|  |  |  |  |
| --- | --- | --- | --- |
| **Generations** | **White Death Rate** | | **Brown Death Rate** |
| **White Sand** | | |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| **Forest Floor (Brown)** | | |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |

Who had the higher death rate? What was the color, what was the generation, and what was the environment?

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1. According to your simulation, does it matter more if you inherit the dominant trait as much as it matters what environment you live in? Explain your answer.

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1. If the simulation that occurred in Part I were to actually take place, what would you predict would occur with regards to mouse color?

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1. Using what you’ve learned about inheritance and genetics, how can you explain the way an organism adapts to its environment?

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1. How would it affect either simulation if you increased the number of “C” cards? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Why do you think it was important to put a “used” event card back into the master pile to be reused?

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1. In your own words, does this lab model the theory of evolution (change over time)? How does it represent natural selection?

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