**Natural Selection Simulation**

Learning Goals:

* Determine which mutations are favored by the selection agents of predators and food variety and which mutations are neutral.
* Describe which traits change the survivability of an organism in different environments.
* Experiment with environments which produce a stable population of bunnies, a population that dies out, and a population that takes over the world.
* Track genes through multiple generations.
* Compare how dominant and recessive genes get passed onto offspring.

Click on the following link to get to the simulation

<http://phet.colorado.edu/simulations/sims.php?sim=Natural_Selection>

**Open the Simulation Introduction**

Access the simulation and explore the Introduction first. Once you see how this simulation works, find the settings and answer the following questions.

1. What are all of the VARIABLES that you have control over in the simulation?

2. What do you think happens to the bunny population if a mate is never added? What do you think happens when you add a mate?

3. a. Look at the two food types Tough and normal. What adaptations would be favorable if:

The food was tough?

The food was normal?

b. What would happens to the population if the food was limited?

c. What will happen to the bunny population if you let the wolves into it?

4. What is the difference on the population if you switch between the arctic and equator environment?

5. What is a genetic mutation? What are the three mutations you can add to your bunny population?

**Experiment A – Open the Lab**

Challenge question: How is the fur color trait influenced by natural selection?

6. **Complete the statement**: Natural selection will favor traits that ...

**How to run the simulator:**

1) Add a mate and a brown fur mutation to the bunny population, let the experiment continue to its conclusion.

2) Start over and add brown fur mutation (with mate) but add a selection factor of wolves when your bunnies start to get overpopulated. Let the experiment run until you have a clear idea of what is happening with the rabbit and wolf populations.

3) Change the settings so that you still have brown fur mutations but this time remove the wolves and make the selection factor be food. Let the experiment run until you have a clear idea of what is happening within the population.

4) Reset and change the settings so that you have brown fur mutation in an arctic environment, use wolves as your selection factor.

 7. Based on the four simulations you ran, describe what happened to your population and answer the experimental question, consider what happens in both environments and what happens when there are no predators.

**Question:  How is the fur color trait influenced by natural selection?**Be sure to include the kind of selection that has the most influence (predators or food) and explain why.

Provide **evidence** from the simulation to support your conclusions.

**Experiment B – How is tooth length influenced by natural selection?**

8.  Following the guidelines from Experiment A, determine when long teeth provide an advantage to the bunny population. Run simulations in a variety of settings.

**Question: How is tooth length influenced by natural selection?**Be sure to include the kind of selection that has the most influence (predators or food) and explain why.

   Provide **evidence** from the simulation to support your conclusions.

**Analysis Questions**

**VIDA** →   The process of evolution results from four known factors, for each listed, describe how those factors were observed in the simulation

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| --- | --- |
| **Factors that result in Evolution** | **Observations** |
| **Variation**  (individuals have different traits) |  |
| **Inheritance** (traits are inherited) |  |
| **Differential survival** and reproduction (some individuals have traits that help them survive and reproduce) |  |
| **Adaptation** (the frequency of that trait increases in the population) |  |