NAME _____ DATE _____

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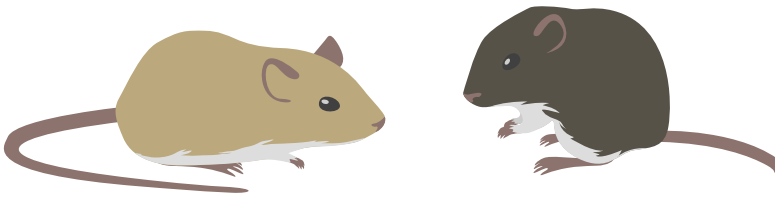
Mutation in Rock Pocket Mice

Background

A mutation is a permanent change in an organism's DNA. Most mutations originate as copying errors. If a mutation happens in a reproductive cell (e.g., egg or sperm), it can be passed to offspring. This is a source of new alleles.



Some rock pocket mice have light fur, and others have dark fur.

Question

In a population of light-colored mice, how often will a pup be born with dark fur?

Instructions

Watch the video *How Often Do Mutations Happen?* on Learn.Genetics.utah.edu
Fill in the numbers as you follow along:

FOR ANY GIVEN BASE:

$$\frac{\square \text{ pup with mutation in that base}}{\square \text{ mouse pups}} \times \square \text{ pups with dark fur mutation} =$$

$$\frac{\square \text{ pups with dark fur mutation}}{\square \text{ mouse pups}} \Big/ \square = \frac{\square \text{ pup with dark fur mutation}}{\square \text{ mouse pups}}$$

♀ POPULATION SIZE:

$$\square \text{ female mice} \times \frac{\square \text{ new mice pups}}{\square \text{ year}} = \frac{\square \text{ mouse pups}}{\square \text{ year}}$$

REPRODUCTIVE RATE:

$$\frac{\square \text{ mouse pups}}{\square \text{ year}}$$

MUTATION RATE:

$$\times \frac{\square \text{ pup with dark fur mutation}}{\square \text{ mouse pups}} = \frac{\square \text{ pups with dark fur mutation}}{\square \text{ years}}$$

$$= \frac{\square \textbf{ pup with dark fur mutation}}{\square \textbf{ years}}$$

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How many times could a dark fur mutation have occurred in rock pocket mice?

YEARS ROCK POCKET MICE HAVE BEEN IN NEW MEXICO:

[ ] years X

HOW OFTEN DARK FUR PUP IS BORN:

[ ] pup with dark fur mutation
[ ] years

= [ ] pups with NEW dark fur mutation

QUESTIONS:

1. How many total locations are there in the MC1R gene where a single-base mutation will make a new dark fur allele?

2. What is the estimated **mutation rate** you calculated specifically for dark fur mutations in the MC1R gene?

3. What is the **reproductive rate** you calculated for rock pocket mice?

4. Based on our estimate, how often will a pup be born with dark fur due to a mutation in the MC1R gene?

5. Since rock pocket mice first established themselves in New Mexico, what is the estimated number of times a pup has been born with a new dark fur mutation in the MC1R gene?

6. In the last 500,000 years, how likely do you think it is that a mouse pup with dark fur could have been born in a population of light-colored rock pocket mice?