3. *In a population of 1,000 rock pocket mice, 360 have dark-colored fur. The others have light-colored fur. If the population is at Hardy-Weinberg equilibrium, what percentage of mice in the population are homozygous dominant, dark-colored mice?*

p^2 = 0.04, or 4%

Explanation: q^2 = 640/1,000 = 0.64, so, q = 0.8; because $p + q = 1$, p = 0.2 and p^2 = (0.2)(0.2) = 0.04

PART 2: APPLYING HARDY-WEINBERG TO POCKET MOUSE FIELD DATA

1. *Calculate the overall frequencies of light-colored mice and dark-colored mice caught on light-colored substrates.*

frequency = number of mice of one color/total number of mice

Frequency of light-colored mice = 120/168 = 71%; Frequency of dark-colored mice = 48/168 = 29%

2. *Calculate the overall frequencies of light-colored mice and dark-colored mice caught on dark-colored substrates.*

frequency = number of mice of one color/total number of mice

Frequency of light-colored mice = 3/57 = 5%; Frequency of dark-colored mice = 54/57 = 95%

3. *Using the Hardy-Weinberg equation and data from the table above, determine the number of mice with the* DD *and* Dd *genotypes on the light, rocky, granite substrate.*

Frequency of mice with the *dd* genotype on light-colored substrate = 71%

Frequency of mice with the *DD* genotype on light-colored substrate = 3%

Frequency of mice with the *Dd* genotype on light-colored substrate = 26%

4. *Using the Hardy-Weinberg equation and data from the table above, determine the number of mice with the* DD *and* Dd *genotypes on the darky, rocky lava substrate.*

Frequency of mice with the *dd* genotype on dark-colored substrate = 5%

Frequency of mice with the *DD* genotype on dark-colored substrate = 61%

Frequency of mice with the *Dd* genotype on dark-colored substrate = 34%

5. *Which fur color seems to have the greatest overall selective advantage? Use data collected from both dark-colored and light-colored substrates to support your answer.*

Dark fur color seems to have the greatest selective advantage. On the light-colored substrate, 29% of the mice have dark fur, while only 5% of the mice on the dark-colored substrate have light fur. Also, at collecting site no. 6, where there is a light-colored, rocky substrate, 43 out of 77 mice collected had dark-colored fur—over half of the sampled population. Dark-colored fur seems to have a selective advantage over light fur color.

6. *According to the film, what environmental change gave a selective advantage for one coat color over another?*

The color of the landscape changed so that some members of the population were more visible to predators than other members were. That is what happened in the film. When sections of the landscape became dark, the light-colored mice were at a selective disadvantage.

7. *In a separate study, 76 rock pocket mice were collected from four different, widely separated areas of dark lava rock. One collecting site was in Arizona. The other three were in New Mexico. Dr. Nachman and colleagues observed no significant differences in the color of the rocks in the four locations sampled. However, the dark-colored mice from the three New Mexico locations were slightly darker than the dark-colored mice from the Arizona population. The entire* Mc1r *gene was sequenced in all 76 of the mice collected.*

The mutations responsible for the dark fur color in the Arizona mice were absent from the three different populations of New Mexico mice. No Mc1r *mutations were associated with dark fur color in the New Mexico populations. These findings suggest that adaptive dark coloration has occurred at least twice in the rock pocket mouse and that these similar phenotypic changes have different genetic bases. How does this study support the concept that natural selection is not random?*