



ADDITIONAL EVIDENCE FOR AN EXPLANATION

Use the following data sets to better understand how the researchers used evidence to build an argument for natural selection. Fill in your “Evolution by Natural Selection Explanation” table as you analyze each data set.

Data Set 1

Biologists knew from museum specimens that rock pocket mice of different colors had lived in southern Arizona for a long time. Figure 1 shows mice with different fur colors against both light and dark backgrounds.



Figure 1. Two main classes of fur color are seen in rock pocket mice in southern Arizona.

The researchers collected rock pocket mice in traps from a number of different sites in southern Arizona, some from dark-colored environments and some from light-colored environments (Hoekstra, Drumm, & Nachman, 2004). The frequency of light and dark colors in different sites is shown in Figure 2 and Table 1.

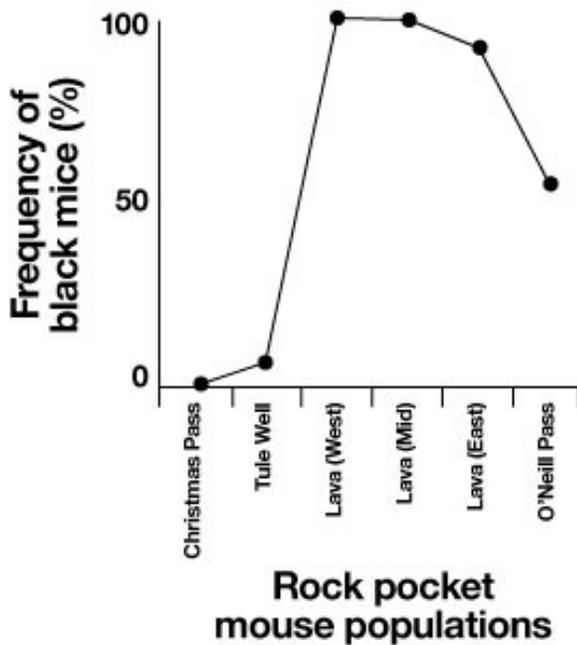
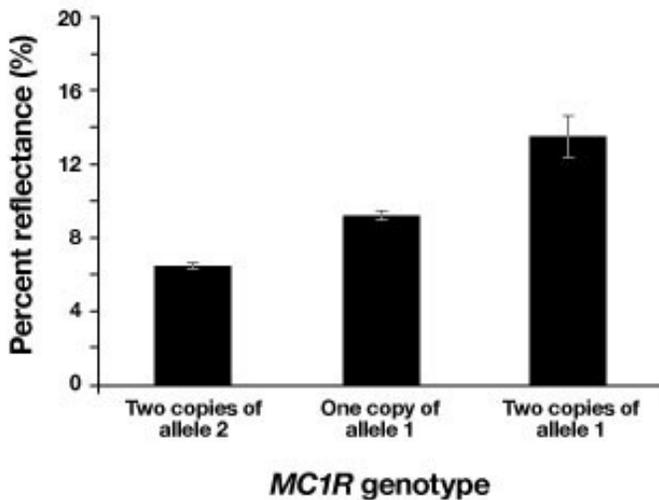


Figure 2. The x-axis shows six different sites where rock pocket mice were collected. The locations on the lava flow (west, mid, east) have dark soil. The other three locations (Christmas Pass, Tule Well, and O'Neill Pass) have light soil. The y-axis shows the frequency of black mice. (Adapted from Hoekstra, Drumm, & Nachman, 2004.)

Data Set 2

Researchers wanted to quantify fur color instead of just using color categories. They used a spectrophotometer to measure the reflectance of dark and light rock pocket mice across six sites (Hoekstra, Drumm, & Nachman, 2004). A lower value for reflectance means darker fur.

The researchers knew that the determination of fur color in mice is influenced by the action of many genes. However, they had evidence that alleles for one particular gene caused most of the differences between dark and light mice in these populations. The gene is called *MC1R*, and it codes for a protein in the membrane of certain cells.



Within these populations of rock pocket mice, two forms (or alleles) of the *MC1R* gene were found. Allele 1 differs from allele 2 by four amino acids. Figure 3 shows the relationship between reflectance and *MC1R* genotype (Hoekstra, Drumm, & Nachman, 2004).

Figure 3. The relationship of genotype of rock pocket mice for the *MC1R* gene and fur color. A higher value for reflectance means lighter fur. (Adapted from Hoekstra, Drumm, & Nachman, 2004).

Data Set 3

Researchers next measured the frequency of the two alleles for the *MC1R* gene from rock pocket mice living on light- and dark-colored backgrounds (Hoekstra, Drumm, & Nachman, 2004). The results are shown in Figure 4. Though researchers did not measure predation rates in this experiment, previous experiments in deer mice suggested that dark-colored mice had a lower risk of predation from owls when they were on a dark background.

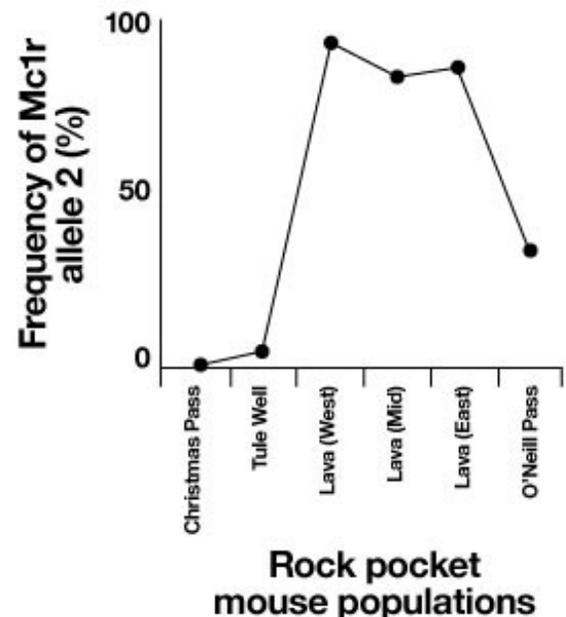


Figure 4. The genotype of rock pocket mice for the *MC1R* gene is different when the main background color of the environment changes. (Adapted from Hoekstra, Drumm, & Nachman, 2004.)

REFERENCES

Hoekstra, H. E., Drumm, K. E., & Nachman, M. W. (2004). Ecological genetics of adaptive color polymorphism in pocket mice: Geographic variation in selected and neutral genes. *Evolution*, 58(6), 1329–1341.

Nachman, M. W., Hoekstra, H. E., & D'Agostino, S. L. (2003, April 18). The genetic basis of adaptive melanism in pocket mice. *Proceedings of the National Academy of Sciences of the United States of America*, 100(9), 5268–5273.