Teaching Guide for: Hardy-Weinberg Equilibrium

Speaker: Youreka Science
Video link: https://www.ibiology.org/evolution/hardy-weinberg-equilibrium/

Major topics

- Evolution
- Genetics

Overview

Hardy-Weinberg equilibrium combines the concepts of Darwinian evolution and Mendelian genetics to explain and study population genetics. This Youreka Science video provides an overview of allele and genotype frequency, and explores the criteria that make a population be in Hardy-Weinberg equilibrium. This video will help you understand how to use Hardy-Weinberg equilibrium to solve population genetic problems.

Sub topic

- Allele/genotype frequency calculations

Multiple-choice questions

1. Why is a large population a requirement for Hardy-Weinberg Equilibrium?
    a. It reduces the change in genotype frequencies caused by immigration
    b. It increases the likelihood of random mating
    c. It reduces the impact of genetic drift
    d. It increases the number of phenotypes on which natural selection can act
    e. It increases the likelihood of beneficial mutations

2. The video discussed a population of squirrels in a forest, which have two alleles for fur color, black (*B*) and white (*b*). The study calculates allele and genotype frequencies across two generations and determines the population is in Hardy-Weinberg Equilibrium. What is the frequency of heterozygotes in this population?
    a. 0.55
    b. 0.495
    c. 0.45
    d. 0.3025
    e. 0.2025

For the next two questions, imagine that, in the second generation of the squirrel example, a mutation arose for a new allele, b which produces brown fur and is recessive to both *B* and *b*. This mutated allele arose randomly in one of the 200 squirrels of the second generation and this squirrel's fur is white.

3. What is the frequency of *b*b heterozygotes in this population?

a. 0.0025
b. 0.005
c. 0.025
d. 0.05
e. 0.1

4. What is the frequency of the b allele in this population?

a. 0.0025
b. 0.005
c. 0.025
d. 0.05
e. 0.1

5. The video also considers eye color in the squirrels, calculating frequencies for the brown and blue alleles and the frequency of heterozygotes and homozygous recessive squirrels. How could you determine the frequency of homozygous dominant squirrels?

a. 1 - 0.04 - 0.32
b. 1- 0.8 - 0.2
c. $(0.8)^2$
d. $(0.2)^2$
e. Both A and C
f. Both B and D

Related resources

This video is included in Session 4 of iBiology's Evolution Flipped Course, which has additional downloadable teaching guides and recommended videos. We encourage educators seeking more materials to visit the course page.

Acknowledgments

We thank Dr. Laci Gerhart-Barley for sharing her multiple-choice questions for this video. For more information on how to implement this video in your teaching through homework assignments, check out Dr. Gehart Barley's publication and webinar with Dr. Brittany Anderton, Associate Director of iBiology.