

Hardy Weinburg Equilibrium, Founder Effect and Evolution



Do you have Widows Peak? If you do, you may have a hairline like one of the “Munsters” instead of a straight hairline. It is caused by a dominant allele at the hairline gene site. We will call it W. But you have two hairline gene sites in each cell because you have a pair of homologous chromosomes, each with the same gene sites. Anyone who has a W on either of their chromosomes will have some form of peaked hairline such as do the Munsters. Although the Munster hairline is a rather extreme form of widow’s peak, it is easy to recognize in most humans as opposed to the straight-across hairline caused by genotype ww. How many of your classmates have widow’s peak? How many are heterozygous for the trait? In this activity you will use class data to find answers to these questions and be able to make predictions for future populations.

Procedure:

1. Observe each individual in the class and determine how many have a straight hairline and how many have widow’s peak. Determine the percentage of those in the class with straight hairline. Convert this percentage to a decimal number.
2. The mathematicians Hardy and Weinburg proposed that, in the case of the hairline trait, all of the genes for hairline in a defined population would equal 100% (W and w equal 100) of the hairline alleles. This can be written:

$$W + w = 1$$

They also proposed that all three possible genotype combinations of these alleles (homozygous dominant, heterozygous, and homozygous recessive) equal to 100% represented by

$$W^2 + 2Ww + w^2 = 1$$

These two equations can be used to calculate for a given point in time both the frequencies of W and w alleles for a single trait in the population and also the frequencies of the three different genotype combinations. All one has to do to

determine all genotypes is observe the percentage of homozygous recessives in a population then use these two equations to calculate all other frequencies.

3. Substitute the value for the w for your class data into equation 1 and determine W .

4. Using Equation 2, calculate the percentages of all three phenotypes in your class.

Now break into four groups. Recalculate in each of these groups. Explain the change in frequencies you calculate and share from group to group. Explain how this can show the founder effect.

Do the same thing with your family at home with tongue rolling. Compare your family and our class.