SN EDUCATOR GUIDE

November 19, 2022

Plague Immunity Left a Lasting Mark

Student Discussion Worksheet

Directions: Read the *Science News Explores* article "Explainer: What are genes?" and answer the first set of questions as instructed by your teacher. Then read the online *Science News* article "Black Death immunity came at a cost to modern-day health" and answer the second set of questions. A version of the *Science News* article, "Plague immunity left a lasting mark," appears in the November 19, 2022 issue.

An individual's genes

When we talk about genes and inheritance, we often focus on the individual. These questions will get us started by reviewing some basic concepts.

1. What is DNA and how is it organized? Where did you get your DNA?

2. What are genes? What are alleles?

3. Define the terms genotype and phenotype. How are they related?

4. With a partner, use the *Science News Explores* article "Explainer: What are genes?" to create a diagram that shows the relationships among the following terms: DNA, nucleotide, gene, allele, chromosome, nucleus and cell. Note: Some of the terms are linked to *Science News Explores* "Scientists Say" articles that will give you more information.

Zooming out to species evolution

When we talk about evolution, we often zoom out from the individual to the species level. These questions will introduce the study of population genetics as a way of bridging the two.

1. Give an example of a population, then come up with a biological definition for population that includes the terms "individual" and "species."

2. Based on your understanding of genetics, your definition of population and the story you read, how would you define population genetics? What do population geneticists try to understand?

3. What factors could change what gene variants, or alleles, are present within a population and their frequency?

4. What was the Black Death? According to the article, how did it influence the frequency of alleles within the human population in Europe? How does the change relate to a factor you listed in your answer to the previous question?

5. Define adaptation and evolution in the context of the article. How are they related?

6. Draw a diagram that represents the change in relative frequency of the standard *ERAP2* gene and its variant (the beneficial allele) in the European population before and after the Black Death.

7. What are the advantages to this adaptation? Are there disadvantages? How could the disadvantages cause the population to evolve in a different direction, and what would that look like for allele frequency?