

## Codominance Activity

Codominant alleles are both expressed in a person's phenotype. A heterozygote will have the traits associated with both alleles. In this lab, you will explore codominance by analyzing the results of tests for sickle cell disease within a family.

### Background

Sickle cell disease is caused by a change in the gene for hemoglobin, which is the oxygen-carrying protein in red blood cells. Individuals who are homozygous for the sickle cell trait often cannot endure exercise. Individuals who are heterozygous for the trait can have sickle cell attacks under extreme conditions. Normal individuals ( $H^S H^S$ ) have only normal hemoglobin. Homozygous sickle cell individuals ( $H^S H^S$ ) have only sickle cell hemoglobin. Heterozygous individuals ( $H^S H^S$ ) have both normal hemoglobin and sickle cell hemoglobin.

Jerry Smith collapsed while running a race for his track team. A doctor said that he had a sickle cell attack. Genetic tests were run on several family members. The test results are shown below. An X indicates that form of hemoglobin in red blood cells.

**Problem:** How can you determine the genotypes of people in a family?

TABLE 1. FAMILY PHENOTYPES

<u>Subject</u>	<u>Normal Hemoglobin</u>	<u>Sickle Cell Hemoglobin</u>
Jerry Smith	X	X
Jerry's brother	X	
Jerry's younger sister	X	X
Jerry's youngest sister	X	
Jerry's father	X	
Jerry's grandfather	X	
Jerry's grandmother	X	X

### Procedure

Use the background information and the genetic test results to answer questions 1–4.

### Analyze and Conclude

1. Are any of Jerry's siblings homozygous for the sickle cell trait? Are any of Jerry's siblings heterozygous for sickle cell disease?
2. What genotype is Jerry's father?
3. What genotypes are Jerry's grandparents?
4. What is the genotype of Jerry's mother? Explain.
5. Predict: If Jerry marries a female who is heterozygous for the sickle cell trait, what would be the possible genotypes and phenotypes of their children? Use a Punnett square to find your answer. Fill in the top boxes with Jerry's genotype; fill in the side boxes with Jerry's wife's genotype. Fill in the square with all possible genotypes for their children.