

# Sex-Linked Inheritance

## Background:

The relationship between genotype and phenotype in sex-linked genes differs from that in autosomal genes. A female must have two recessive alleles of a sex-linked gene to express a recessive sex-linked phenotype. However, just one recessive allele is needed for the same trait to be expressed in a male.

In this activity, you will model the inheritance pattern of a sex-linked gene.

## Objective(s):

- ✓ to understand the patterns of sex-linked inheritance
- ✓ to determine how probability explains sex-linked inheritance

## Materials:

- ✓ labeled tokens
- ✓ scratch paper (students who receive “male” tokens)

## Procedure:

1. Obtain a labeled token. For the purpose of this activity your sex is irrelevant. Blue tokens represent males (XY), and white tokens represent females (XX).
2. If you receive a blue token, you'll be responsible for keeping track of the offspring that are produced in this simulation.
3. Find a student in class with the opposite color token as you. NOTE: Do NOT tell anyone your genotype!
4. Each “parent” should flip their token at the same time, then the male parent will record the resulting offspring's genotype on his scratch paper.
5. Repeat step 4 with the same person three times to generate three simulated offspring. Each time, the male parent must record the genotype of the offspring produced on his scratch paper.
6. You will continue this process until you've created a total of 30 simulated offspring – 3 different offspring with 10 different mates.
7. Once all males in the class have 30 simulated offspring, class data will be collected by your instructor to be used in the **Analysis** section below.

## Analysis:

*Answer the following questions using complete sentences. You must either write out the question, or phrase your answer to include the question.*

1. List each of the different offspring phenotypes produced, then how many of each. Use a RULER to create an appropriate graph to illustrate the results.
2. Looking at the list you just created, what is the gender breakdown (answer using a percentage)?
3. Looking at the list you just created, what were the two most common phenotypes produced? ... the least common?
4. On what chromosome are the genes that allow humans to see color?
5. What does the term “sex-linked” mean?
6. What are the possible phenotypic combinations for a female? ... for a male?
7. Is it possible for a male to be a carrier for a sex-linked disorder? Explain.
8. In which gender are sex-linked disorders more likely to occur? Explain.
9. In terms of probability, why do you think we simulated the creation of hundreds of offspring, rather than just a few?