

## Fruit Fly Exercise 3

### Goal

In this exercise you will use StarGenetics, a software tool that simulates mating experiments, to analyze the nature and mode of inheritance of specific genetic traits.

### Learning Objectives

After completing this exercise, you will be able to:

1. Identify the phenotype of a fruit fly within StarGenetics.
2. Determine whether a phenotype is dominant or recessive relative to another phenotype through the analysis of results from genetic crosses.
3. Infer and assign genotypes of individual organisms using proper nomenclature of alleles.
4. Analyze experimental results to determine a trait's mode of inheritance.
5. Design an experimental strategy to isolate a true-breeding strain.

### Getting started with StarGenetics

- To get to StarGenetics, please navigate to: <http://star.mit.edu/genetics/>.
- Click on the **Start** button to launch the application.
- Click **Trust** when a prompt appears asking if you trust the certificate.
- Click on **File → New** on the main menu.
- Click on the **Fruit Fly Exercise 3** file.

You are just about to throw away a nearly rotten banana that your roommate abandoned on your kitchen counter when you notice a peculiar pair of fruit flies sitting there on it. You catch the flies and take them into the genetics lab to get a better look at them. Under the microscope, you see that one of these flies is male and the other is female. Both flies turn out to have a very unusual phenotype: blue eyes and white body color. You feed the flies and keep them in the lab, and when you return several days later, you discover a vial full of blue-eyed, white-bodied flies. It turns out that the two flies are true breeding for the alleles that determine blue eyes and white body color. You have just learned about sex linkage in your genetics course, and you can't help but wonder if the genes that determine these traits may be located on the X chromosome. You decide to find out! But before you can perform the experiments, all except one of your blue-eyed, white-bodied flies have died. You are determined to learn more about these traits though. You would first like to learn about the mode of inheritance of the white body color and blue eye color traits using your one remaining blue-eyed, white bodied female fly, called **Parent 1**, and a male fly from a common laboratory stock, called **Wildtype M**, with a well-characterized genetic background. Then you would like to design a strategy to develop a true-breeding strain of flies with white bodies and blue eyes.

**1** Describe the sex and phenotype of the two flies available for your initial cross:

Flies	Sex	Body color & eye color phenotype
Parent 1		
Wildtype M		

**2** To learn more about the white body and blue eye traits, you set up a cross between the two available flies.

- You can set up a cross by dragging the parent flies to the **Mating site** and then clicking on the **Mate** button.



- Mating results are summarized on the **Summary** tab, and all individual progeny resulting from your cross can be viewed by clicking on the **Individual** tab.

**a)** Describe the different phenotype(s) that you observe among the 50 F1 progeny and indicate how many of each type you observe.

**Answer**

**b)** Based on your answer to part (a), do the mutant white body color and blue eye color alleles confer dominant or recessive phenotypes to wild type?

**Answer**

**c)** Are the blue eye color and white body color mutations located on the X-chromosome and/or on an autosomal chromosome? Explain your answers and show your work.

**Answer**



d) Indicate genotypes for the following flies. Use the letters “E” and “e” for eye color alleles. Use the letters “B” and “b” for body color alleles. For each gene, use the upper case letter to represent the allele associated with the dominant phenotype and the lowercase letter to represent the allele associated with the recessive phenotype. If a gene is located on the X chromosome, then use “X” followed by the allele configuration written as a superscript (ex:  $X^BX^B$  for females or  $X^BY$  for males).

**Answer**

Parent 1: \_\_\_\_\_

Wildtype M: \_\_\_\_\_

Male F1 progeny: \_\_\_\_\_

Female F1 progeny: \_\_\_\_\_

e) Are the two genes (the eye color and body color genes) linked on the same chromosome? Explain your answer.

**Answer**

3 Design a cross (or a series of crosses) that will allow you to generate more flies with white bodies and blue eyes. Indicate the genotypes and phenotypes of the flies that you will cross along with the expected genotypes and phenotypes of the progeny.