Massachusetts Institute of Technology hhmi StarGenetics

Name_____

Fruit Fly Exercise 4

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. Determine whether a phenotype is dominant or recessive relative to another phenotype through the analysis of results from genetic crosses.
2. Design genetic crosses and analyze experimental results to determine whether mutations are in the same or different genes.
3. Analyze experimental results to determine a trait's mode of inheritance.
4. Design an experimental strategy to isolate organisms with a specific genotype.

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 4** file.

You work in a lab that has a large collection of mutant flies with altered body colors. You have been carefully categorizing these body color mutants into complementation groups when disaster strikes. A hurricane causes massive flooding in the building where you have been conducting your research. You lose your laboratory notebooks and most of your mutant fly strains in the flood! After the flood subsides, you are relieved to find that some of your fly vials have survived the flood. You find four vials, each containing a single mutant green-bodied male fly. These vials are labeled **Mutant 1**, **Mutant 2**, **Mutant 3**, and **Mutant 4**, respectively, but you have no further information about these flies because your notebooks were destroyed in the flood.

1 Your ultimate task is to arrange these four mutants into different complementation groups. But before you can do this, you need to determine if it is possible to include all four flies in the complementation test. You obtain a stock of wild type female flies from another lab for this purpose. Diagram and perform the four crosses that will determine whether all four green-bodied flies can be used in a complementation test. Describe the resulting progeny. Can you test all four flies by complementation? Why or why not?

- You can set up a cross by dragging the specific parent flies to the **Mating site** and by clicking on the **Mate** button.
- Mating results can be seen on the **Summary** tab and each resulting offspring can be viewed by clicking on the **Individual** tab.
- To start a new mating experiment, click on the **New experiment** button. Your current experiment will automatically be saved for you. To keep track of your experiments, you can rename the experiment within the **Saved experiments** window.

Answer

2 In order to perform the complementation test, you will need to generate additional flies.

a) Describe the additional flies that you need, including sex and body color phenotype.

Answer

b) Diagram and perform the crosses that will generate these additional flies.

Answer

3 Now you have all of the flies that you need to perform your complementation test. Diagram and perform the crosses for the complementation test itself.

Answer

4 Arrange the flies into complementation groups. How many different genes that cause green body color have you identified in your complementation test?

Answer

5 You find one more fly vial that survived the flood. It is labeled **Mutant 5**, but the fly inside has wild-type brown body color. You suspect that this fly might carry a green body allele. Describe and perform a cross to test your suspicion. What do you find?

Answer

6 Does the mutation carried by Mutant 5 fit into one of your existing complementation groups? Describe and perform the crosses that would answer this question. What conclusion can you draw from each of these crosses?

Answer