NAME _____

DATE _____

Gene Interaction with Drosophila

In this activity you will investigate how two gene loci interact to produce a phenotype. The eye color of wild-type *Drosophila* is a brick red, resulting from the mixture of brown and red pigments. You will use two *Drosophila* stocks as parents. One parent stock is homozygous for the brown mutation, which blocks the transport of red pigments into the developing eyes. Since only brown pigments are transported into the eyes, these flies have brown eyes. The other parent has a mutation that blocks transport of brown pigments into the eyes, so these flies have scarlet (bright-red) eyes. What happens when brown-eyed and scarlet-eyed flies are crossed? How do these genes interact in producing eye color?

Observing and Crossing Parent Flies

Materials

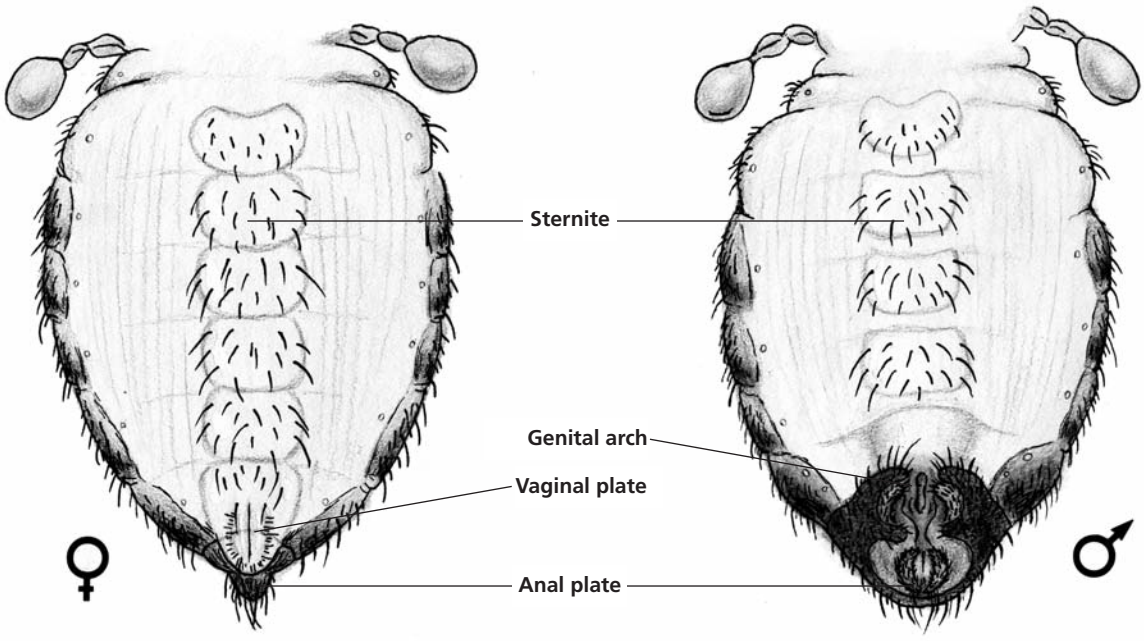
- vial of brown *Drosophila*
- vial of scarlet *Drosophila*
- vial with medium and plug
- vial label
- FlyNap® Kit
- sorting brush
- index cards
- stereomicroscope

Procedure

Mark one card for use with the brown culture and another for the scarlet culture.

Anesthetize the brown-eyed flies and dump them onto an index card.

Place the index card with flies under a dissecting microscope for observation. Use the illustration of the ventral surfaces of the abdomen of the male and female to separate the males from the females. Mature males have darker, blunter abdomens than females. Also, males have sex combs on the uppermost joint of their forelegs; females lack these sex combs.



Repeat this procedure for the scarlet-eyed flies. Be certain you can reliably distinguish the phenotypes of these flies.

Choose 6–8 female flies of one eye color and an equal number of male flies of the other; transfer these flies into your vial of medium and plug the vial. Label the vial with the date, your initials or group number, and the cross made, indicating which is male and which is female. Leave the vial in the place indicated by your instructor.

1. Using this information, fill in the genotypes and phenotypes of the parent flies of your cross.

   There are two gene loci involved in this cross and two alleles at each locus.

   bw allele for brown

   bw+ wild-type allele at the brown locus

   st allele for scarlet

   st+ wild-type allele at the scarlet locus

Parent Fly	Genotype	Phenotype
Female		
Male		

2. Give the expected genotype of the F_1 flies.

3. What additional information would you need in order to predict the phenotype of the F_1 flies?

Clearing Parents from the F_1 Vials

Seven to 10 days after the F_1 vials are set up, remove the parent flies.

Materials

FlyNap® Kit with morgue

sorting brush

index card

Procedure

Anesthetize the flies and dump them out of the vial onto an index card. Drop them into the morgue.

4. Why is it necessary to remove the parent flies?

Observing F_1 Flies and Setting Up F_2 Cultures

F_1 flies will begin emerging about 12–14 days after the cultures are set up.

Materials

vial with medium and plug
vial label
FlyNap® Kit with morgue
sorting brush
index card
dissecting microscope

Procedure

Anesthetize the F_1 flies and examine them under a dissecting microscope. Record your observations below.

5. What does this tell you about the alleles *bw* and *st*?

Select six to eight male and female F_1 flies; transfer these flies into your vial of medium and plug the vial. Label the vial with the date, your initials or group number, and "F_2 *bw* □ *st*." Leave the vial in the place indicated by your instructor.

6. Why is it not necessary to select virgin female flies from the F_1 to make this cross?

7. In the space below, diagram the F_1 cross. Assuming that brown and scarlet are not linked, create a Punnett square and give the expected F_2 phenotypes and their ratios.

bw/ bw+, st+/ st □ *bw+/ bw, st+/ st*

F_2 Ratio	Phenotype
_____	_____
_____	_____
_____	_____

Clearing F_1 Parents from the F_2 Vials

Seven to 10 days after the F_2 vials are set up, the F_1 flies need to be removed from the F_2 cultures.

Materials

FlyNap® Kit with morgue
sorting brush
index card

Procedure

Anesthetize the flies and dump them out of the vial onto an index card. Drop them into the morgue.

Scoring Phenotypes

Begin scoring (counting and categorizing) phenotypes of the F_2 on the day after they first begin emerging. For scoring the phenotypes, you will need your vial of F_2 flies and the following materials.

Materials

FlyNap® Kit with morgue
sorting brush
index card
stereomicroscope

Procedure

Anesthetize the flies and dump them onto an index card. Place the card under the stereomicroscope and sort the flies according to their phenotypes. Record your counts in the Data Table.

Data Table for brown □ scarlet F_2

F_2 Phenotypes and Numbers of Flies				
Date Counted	**Phenotype 1**	**Phenotype 2**	**Phenotype 3**	**Phenotype 4**
Total				
Expected Ratio				

8. Are your results compatible with your expected ratios? Explain.

9. In humans the ability to taste the chemical PTC is inherited. This trait is often presented as a case of inheriting a dominant allele for tasting or a pair of recessive alleles for nontasting of PTC. Based on your experience with eye color in *Drosophila*, would you be skeptical of this explanation? If so, why?

10. Is this a monohybrid or dihybrid cross? Explain your answer.

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