

The Problem: Data is from Terry R. McGuire Ph.D. , Dept. of Genetics, Rutgers University

As a graduate student at the University of Illinois I noticed a number of orange-eyed blow flies (*Phormia regina*) in one of my stocks. Wildtype *Phormia* all have red eyes.

I mated several pairs of *orange-eyed* flies in an attempt to get a pure breeding line. The cross of *orange* x *orange* produced only *orange* offspring. When these *orange* flies were interbred, they only produced *orange* offspring.

The F₁ cross of wildtype (red-eyed) females to *orange* males and the reciprocal F₁ cross of *orange* males to wildtype (red-eyed) females produced only red-eyed progeny.

I continued with the F₂ crosses. The first flies eclosed from the pupa case 12 days after the first instar larvae were placed on fresh pork liver (day one). Many more flies eclosed from the pupal case on day two. Males and females were combined.

Results of the F2 cross	F1 cross was wildtype females to <i>orange</i> males	
	Red Eye	Orange Eye
Eclosed Day 12	1274	64
Eclosed Day 13	485	507

Results of the F2 Reciprocal cross	F1 reciprocal cross was orange females to wildtype males	
	Red Eye	Orange Eye
Eclosed Day 12	972	57
Eclosed Day 13	267	335

Using the information on day of eclosion and eye color, how is eye color inherited? Explain the difference in ratios between Day 12 and Day 13.

The problem is copyrighted by Terry R. McGuire, 2007. It can be freely copied and used for teaching purposes.

Background information about the black blow fly *Phormia regina*. This information is not needed to solve the problem but may prove useful.

Adult *Phormia regina* were obtained from the colony maintained in the University of Illinois Department of Entomology and were used to establish an experimental colony in the University of Illinois Department of Psychology. The flies from the Entomology stock had been maintained in the laboratory at least 25 years although the origin of the line is unknown. Adult *Phormia* were housed in 30.5 cm x 30.5 cm x 30.5 cm metal mesh insect cages (American Biological Materials Co.). Larvae were reared on raw pork liver in 20 cm x 15 cm dia glass battery jars.

The larvae, pupae, and adults were maintained at $25 \pm 1^\circ\text{C}$ on a 16/8 hr light/dark cycle. Flies were reared in a constant environment room with relative humidity at 50%.

Adult flies were given *ad lib* access to water and sugar cubes and were given fresh pork liver daily for a protein source and as an oviposition site. Eggs were collected every day, moistened with distilled water, and kept overnight on liver in covered plastic petri dishes. The next day, 200 to 300 first instar larvae were placed on one-half to three-quarter pounds of fresh pork liver in a battery jar and covered with sawdust. On the fifth or sixth day, the larvae were separated from the liver and placed into fine sawdust for pupation. Separation was achieved by dumping the liver, sawdust, and larvae on a large wire mesh placed over a collection box. The larvae are photonegative and will crawl down through the mesh into the box. They were then easily poured into a box of fine sawdust. After two days in the fine sawdust, the pupae were sieved out and placed into pint paper holding cups for three or four days. At the end of this period, batches of approximately 50 pupae were put into glass bottles, placed into the controlled environment room, and allowed to eclose*.

Flies tend to emerge from the pupa case at dawn (lights on) ± 2 hours. Flies that miss this window generally go into a rest state and do not emerge from the pupa case until the next day. The majority of wildtype flies eclose 12 days after pupation. A few wildtype flies emerge 13 days after pupation.

Definitions:

Eclosé: (v) to emerge from the pupal stage

Eclosion: (n) emergence of an adult insect from the pupal stage

Instar: (n) the life stages of an insect larva. Each instar ends with a molting of the cuticle.