Part 1 -- Journey to Diptera Island: Genetic Decoding Mission

BioControl Corp. is a company that uses natural methods to control pests and disease. Scientists at BioControl recently discovered a fly species that has the potential to solve the West Nile virus crisis – but they need your help. You're entire class has been flown to a remote island in the Galapagos Archipelago. The small tropical Island of Diptera will be the incubator for genetic research of a newly discovered species of fly called Musca carnivorousa. Although small in size it is a ferocious beast that devours mosquitoes by decapitating them in a single bite and then quickly devouring the rest of their bodies in several efficient chomps.


Diptera Island

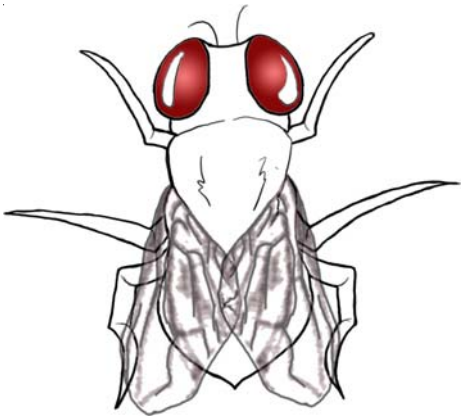
It is vital to the health of the United States and the world that you complete your research in a timely and efficient manner. As soon as the genome of Musca carnivorousa is mapped, scientists will pick the best specimens to breed in order to produce mass quantities of the fly. These flies will be imported to areas of the country that have been hard hit with the West Nile Virus. This deadly virus is carried by mosquitoes and transmitted to victims by a sharp blood-sucking proboscis. In recent years the population of mosquitoes who carry the deadly virus have exploded – your research is critical. Musca carnivorousa feeds exclusively on this type of mosquito. Mosquitoes are vectors for other diseases throughout the world. This project could have a profound and immense impact on the health of millions. BioControl is anxious to complete this project and as an incentive the corporation will award ownership of the lush tropical Island of Diptera to the student scientist who can engineer the most robust breed of Musca carnivorousa.

Scientists at BioControl have cracked half of the genetic code. They have discovered five genes that code for physical characteristics but the remaining five genes continue to be elusive. In order for you to get familiar with Musca carnivorousa and the genome decoding process, you will breed several generations of the fly and observe the results.

After you are familiar with the process you will be ready take on a more challenging task. You will employ the technology of the BioControl Genome Decoder to determine the identity of five more genes. These genes code for characteristics not as readily observable. It will take several rounds of breeding and keen scientific deduction methods to determine a pattern that can help you decode the elusive genome of Musca carnivorousa.

Musca carnivorousa

Kingdom: Anamalia
Phylum: Arthropoda
Class: Insecta
Order: Diptera
Family: Muscidae
Genus: Musca
Species: Carnivorousa



Instructions

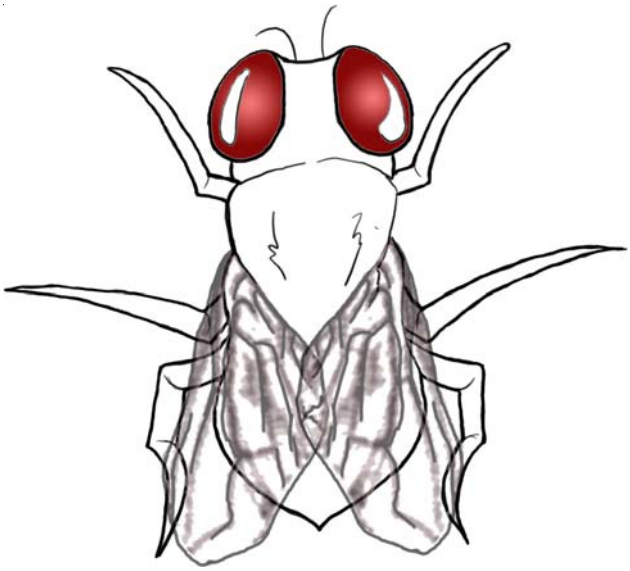
For Phase 1 Coin Flipping

Heads = dominant allele (ex. "A")
Tails = recessive allele (ex. "a")

1) Flip the coin and record genotype and phenotype for each of the five known characteristics for one fly – this is your primary breeder fly and first generation.
2) Use the Generational Data Chart to record your fly's genotype.
3) Find a desirable "mate" for your fly. Record that genotype in the second column on the Generational Data Chart.
4) Your fly has two alleles for each gene. When it mates with another fly it can only contribute one of those alleles to the new generation since sex cells contain only half the needed genetic information to form the complete organism.

Phase 2 Coin Flipping

5) Next, take turns flipping coins with your mate to determine the characteristics of a new fly – this will produce the second generation of offspring. Use the Mating Datasheet as a guide.
6) Repeat this mating process at least three times. Hopefully you have chosen mates wisely and will have a superior fly to take to the next phase of genetic research.



Musca carnivorousa

Kingdom: Anamalia
Phylum: Arthropoda
Class: Insecta
Order: Diptera
Family: Muscidae
Genus: Musca
Species: Carnivorousa

AA = homozygous dominant
Aa = heterozygous
aa = homozygous recessive

Phase 1: Record the results for your first generation fly here. Use the genotype information to color and draw in the correct features to express the phenotype.

eye color
(genotype ____ phenotype_____)
RR = red
Rr = red
rr = orange
(So for this trait R=heads, r=tails)

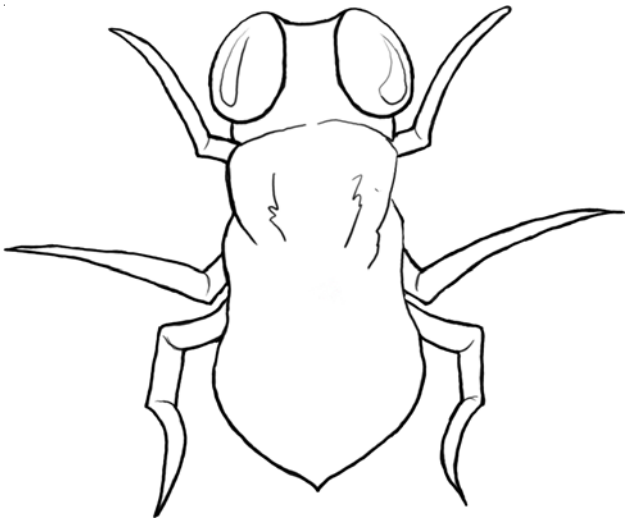
Heads = dominant allele (ex. "A")
Tails = recessive allele (ex. "a")

venemous poison pinchers
(genotype ____ phenotype_____)
PP = no pinchers
Pp = no pinchers
pp = pinchers

wings (see example)
(genotype ____ phenotype_____)
WW = normal healthy
Ww = normal healthy
ww = deformed shriveled

hairy legs
(genotype ____ phenotype_____)
HH = no hair on legs
Ha = no hair on legs
hh = very hairy legs

body color
(genotype ____ phenotype_____)
BB = blue
Bb = blue
bb = yellow



Color or draw in appropriate features to express the phenotype for your first generation fly.

Write the first generation genotype here
(for 5 known traits)

_____

transfer this data to the Generational Data Sheet
row (G1)

genotype = the genes of an organism;
for one specific trait we use two letters to represent the genotype. A capital letter represents the dominant form of a gene (allele), and a lowercase letter is the abbreviation for the recessive form of the gene (allele).

phenotype = the physical appearance of a trait in an organism

Great site for review of Mendelian Genetics http://www.borg.com/~lubehawk/mendel.htm

Mating Datasheet

Phase 2

- Fill columns with alleles for your fly and your mates' fly.
- To the left of the chart draw a Punnett Square for each monohybrid cross.
- Calculate the percentages of each possible genotype and phenotype.
- Now flip a coin to determine the actual genotype of the next generation.
- You will need to flip once to determine which allele your fly will contribute and once to determine which allele your mate will contribute. Do this for all five traits. Write the results in the appropriate columns.
- This generation now becomes your new fly – the old one dies after mating. Record the results on your Generational Data Chart.

your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

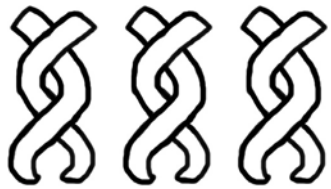
your fly		mate		new genotype	phenotype
heads	tails	heads	tails		

Generational Datasheet

During Phase 2 of Coin flipping you will create a new fly with characteristics that could be different from the parents. Write the genotype of the new fly in the column titled "new generation". Also write this same genotype in the next row in the first column labeled "your fly". The fly you created now becomes generation 2 and your old fly dies after mating. You will mate your 2nd generation fly with another fly to create the 3rd generation and so on....

Generations	Genotype (your fly)	Genotype (mate)	Genotype (new generation)
ex. G1	*RR pp Ww Hh bb*	*Rr Pp ww HH bb*	*info from mating datasheet*
G1			

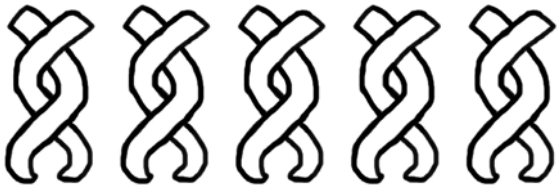
KEY:



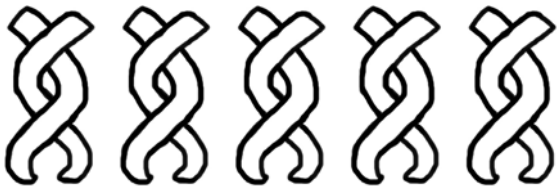
Develop your own key to represent homozygous dominant, homozygous recessive and heterozygous. You can use different colors or different shading and patterning techniques to create the key. Use this key to code each generation of the fly you produce. Record your results for each generation in the blank genes (right).

R P W H B

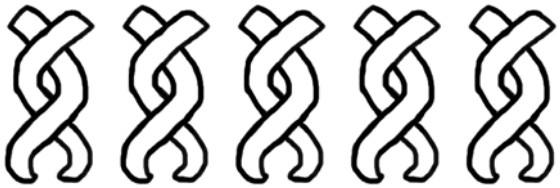
G1



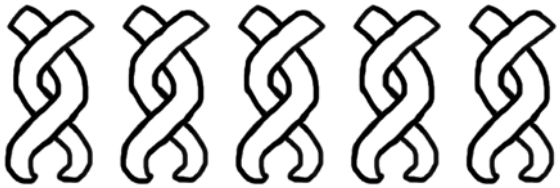
G2



G3



G4



G5