**Genetic crosses in fruit flies and their statistical analysis STUDENT**

**Introduction**

Fruit flies have been used in genetics experiments for more than a hundred years. Their small size and short lifecycle make them convenient model organisms for investigations where large numbers of individuals and several generations might be necessary to gather meaningful results. By observing the frequency with which two genes are inherited together in the next generation of flies it is possible to infer whether these two genes are located on the same chromosome, and if so how far apart.

**Aim**

To design and carry out a short investigation into genetic linkage in the fruit fly *Drosophila melanogaster.* This will involve studying the inheritance patterns of alleles of at least two genes and statistical testing of the resulting data.

**Intended class time**

* 3 - 4 hours spread over 3 weeks

**Chemicals**

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| --- | --- |
| Ethoxyethane | Extremely flammable. The liquid vaporises very readily and the heavy vapour may spread over a long distance and ‘flash back’ from a source of ignition. Do **not** use in the same room as naked flames, (eg, spirit burners, Bunsen burners).  Harmful if swallowed.  HSE warning symbolHarmful if inhaled at high concentration. |

**Equipment available (per group)**

* True-breeding stocks of fruit flies with mutant alleles for various genes
* Stock tubes containing cornmeal food and sealed with foam bungs
* Etherisers
* Ethoxyethane
* White tile
* Paintbrush
* Hand lens
* Low power binocular dissection microscope

**Health and Safety**

* Ethoxyethane is extremely flammable so ensure there are no naked flames in the room. The liquid vaporises very readily and the heavy vapour may spread over a long distance and ‘flash back’ from a source of ignition. Keep the lids securely on the bottles when not in use.
* Ethoxyethane is harmful if inhaled at high concentrations so ensure the room is well ventilated or work in fume units when etherising flies.

**Procedure**

1. First, conduct some research on the true-breeding mutant stocks provided.
2. Decide which two (or more) genes you will investigate.
3. Working individually, or in a small group, develop the method you will use to investigate possible linkage between your chosen genes.
4. Carry out your experiments using the apparatus available and record your data appropriately. Each student in a group should take turns to make crosses, sort flies and record data.
5. Process and present your data appropriately.
6. Finally, write up your experiments as a short investigation. Include an introduction, aim, hypothesis, procedure, results, conclusion and evaluation. References should be clearly cited. This may be done using a word processor.

**Extension questions**

Your teacher will tell you whether you should answer these questions separately or include consideration of these issues within your investigation write up.

1. What would be the consequences for your investigation if some of the females you used in your first crosses had already mated with males from the same stock (before being crossed with males from the other stock)? Could you identify that this had happened and could you do anything to maintain the validity of your investigation?
2. What statistical test could be used to assess the significance of your results?
3. What improvements could you make to your method to increase accuracy or validity?

**To submit**

For this piece of work to count towards Practical Activity Group 12 of the Practical Endorsement, you need to have evidence of the research you conducted and the raw data collected from your experiment. You also need to have written this experiment up as a short investigation, including an introduction, aim, hypothesis, procedure, results, statistical test, conclusion and evaluation. References should be clearly cited. This may be done using a word processor. Consideration of the above questions will aid you in preparation for your written examinations.