Lightweight or Party Animal? Sexual Dimorphism of Ethanol Tolerance in *Drosophila melanogaster*

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Similarly to humans, male and female flies exhibit different degrees of ethanol tolerance (Devineni, 2012).

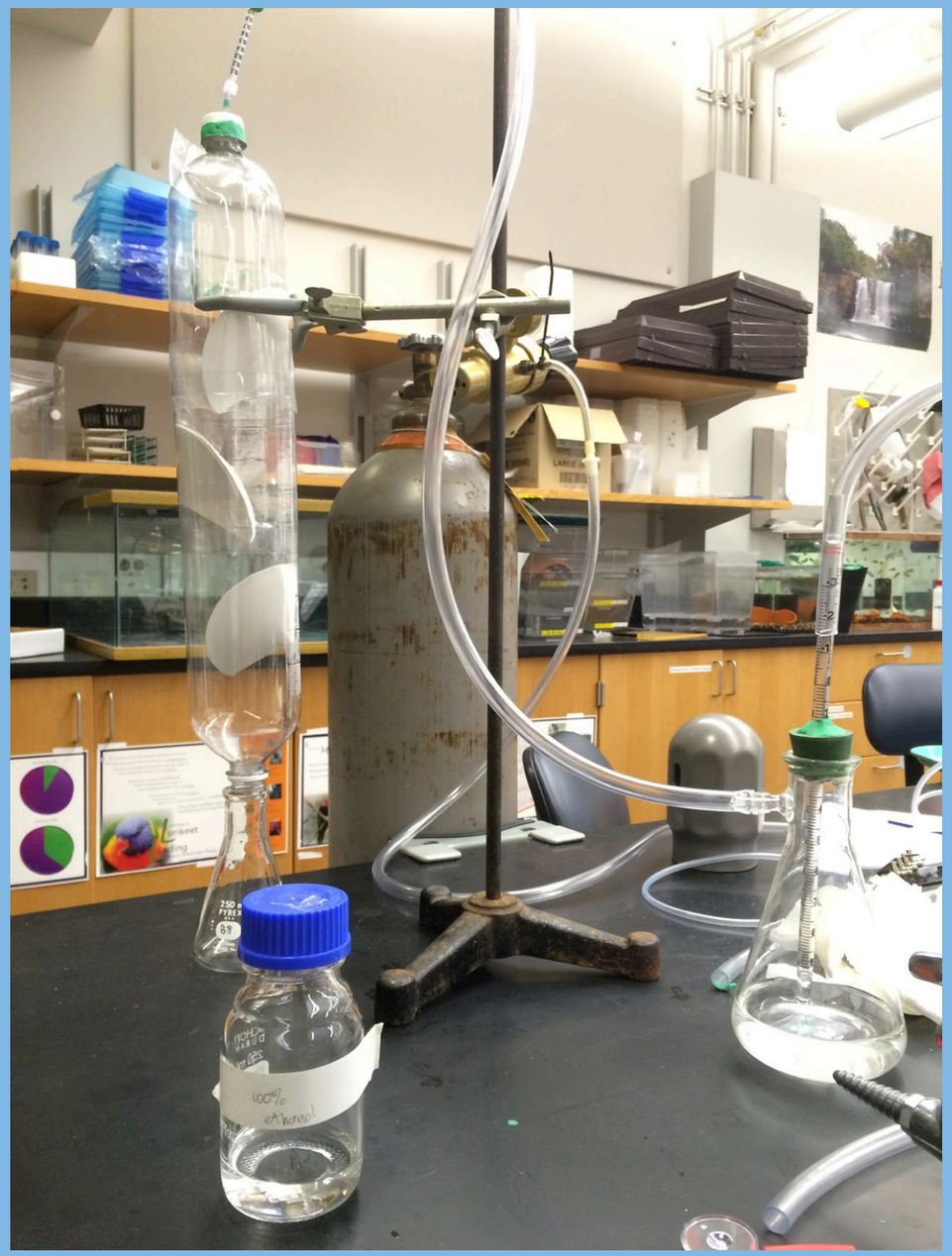
By breeding high and low tolerance flies, we hoped to emphasize this difference.

Sexual Dimorphism is a difference in the expression of a certain trait between the sexes within a given species.

http://en.wikipedia.org/wiki/Drosophila#mediaviewer/File:Drosophila_repleta_lateral.jpg

Can sexual dimorphism of ethanol tolerance in *D. melanogaster* be a potential model for sexual dimorphism of ethanol tolerance in humans?

Experimental Design



Assay: Groups of 50 flies were introduced to the top of an **Inebriometer** filled with ethanol vapor at the beginning of each trial.

- Trial 1 was divided into groups of male flies and female flies.
- At the end of every minute, the cumulative number of flies that had fallen into the collection chamber below were counted.
- The 10 **highest tolerance** and the 10 **lowest tolerance** female and male flies were then separated from the population.
- The **high tolerance males** were bred with **high tolerance females**, and the **low tolerance males** were bred with **low tolerance females**, creating our 2nd generation.
- Trial 2 was run using these 4 groups, and the flies were separated by the same standards to create a 3rd generation.

Figure 1. The Inebriometer consists of a vertical column of platforms filled with ethanol vapor over a collection jar

Results

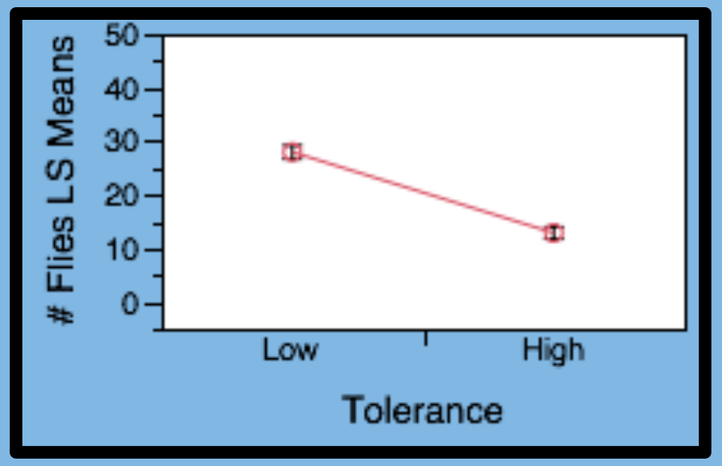


Figure 2. Between the High and Low Tolerance populations of second generation flies, the Low Tolerance group showed an obviously higher number of inebriated flies than the High Tolerance group.

- By the 2nd generation, high tolerance flies exhibited significant sexual dimorphism in ethanol tolerance with respect to time elapsed in the apparatus.
- This first round of selection successfully demonstrates the heritability of ethanol tolerance and its correlation with sexual dimorphism!

High Tolerance Flies Show Stronger Sexual Dimorphism

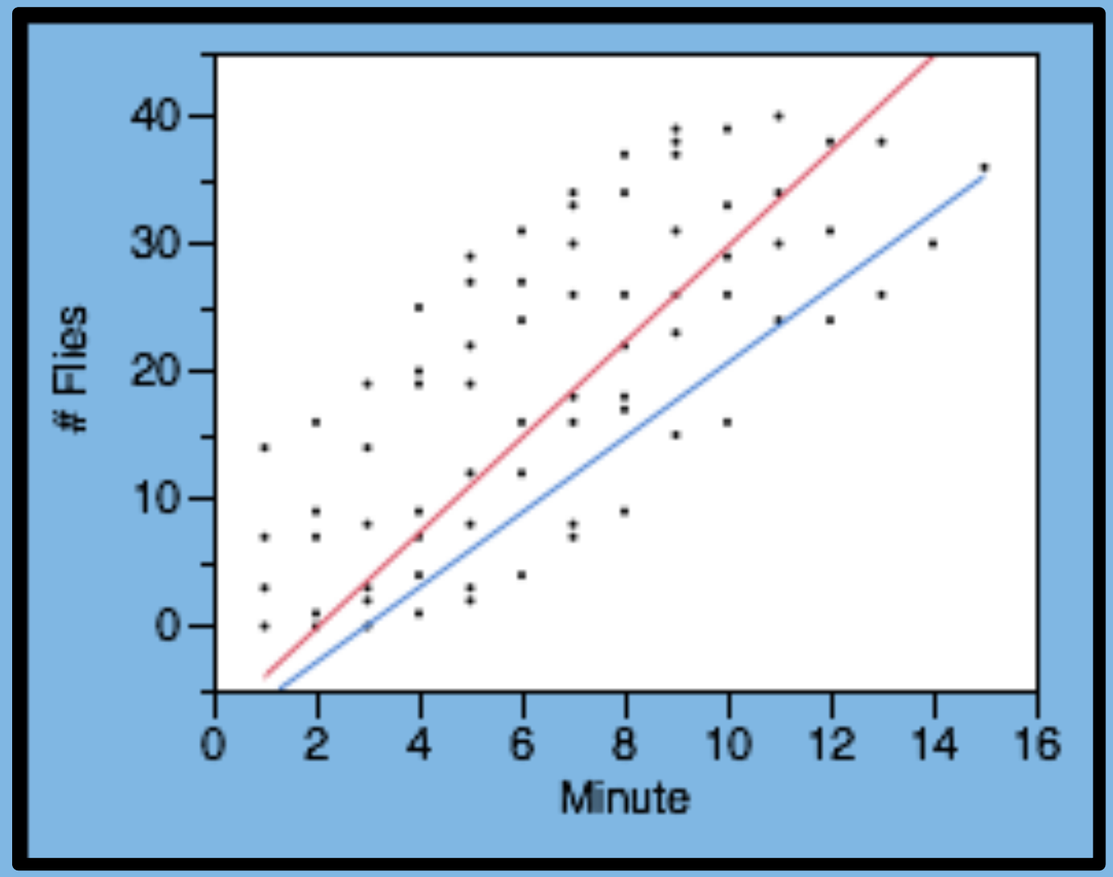


Figure 3. Simple linear regression of High Tolerance flies with respect to time. Within the High Tolerance population, the females (red) showed a steeper average rate of inebriation than the males (blue). Two groups of n=50 for each sex were tested. **(p>0.0073)**

Conclusion

Flies exhibit a sexually dimorphic response to the heritable trait of ethanol tolerance. We successfully pronounced this difference by breeding them for high ethanol tolerance.

Future Research

Our experiment was cut short by a faulty incubator that killed the fourth generation of flies. We hypothesize that, had this not happened, our results would show a shockingly distinct difference between male and female responses to ethanol. In order to use *D. melanogaster* as a model organism for human responses to ethanol, more has to be understood about their sexually dimorphic response to ethanol.

References:
(1) http://heberleinlab.ucsf.edu/Protocols/Inebriometer%20instructions.pdf
(2) http://www.pnas.org/content/109/51/21087.full
Devineni, A.V., Heberlein, U. *Acute ethanol responses in Drosophila are sexually dimorphic.* 16 August, 2012
Heberlein, U. *Inebriometer Assembly*. 2006

Fly picture courtesy of wikipedia

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