The influence of environmental conditions on lifespan and alcohol intake in *Drosophila melanogaster*

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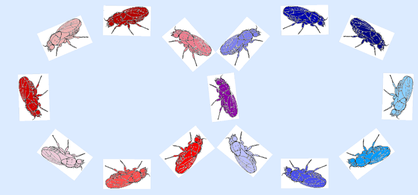


Abstract

The environment that one experiences is often a major determinant of many health-related phenotypes, however, we do not fully understand these effects and how they differ depending on the genotype of an individual. Here, I describe two experiments designed to better understand how the environment influences key health-related phenotypes, both using the model system Drosophila melanogaster. First, we will test how different diet environments affect the lifespan of D. melanogaster. Previous studies have shown that diets of high sugar cause a reduction in life span in flies, and a dietary restriction diet causes a longer lifespan in flies. We show that the flies on the high sugar treatment had a shorter lifespan than the control and dietary restriction groups. Second, we plan to test the relationship between social isolation and alcohol intake in D. melanogaster. Research has shown that using perceived social isolation can decrease lifespan in fruit flies, increase obesity in rats, and cause humans to have a faster cognitive decline (Hawkley & Cacioppo, 2009). We expect social isolation will cause flies to consume more alcohol-containing food than fruit flies that are not isolated. The purpose of these experiments is to increase our understanding of how environmental conditions influence behaviors and life history traits, with the broader goal of connecting this model to human health.

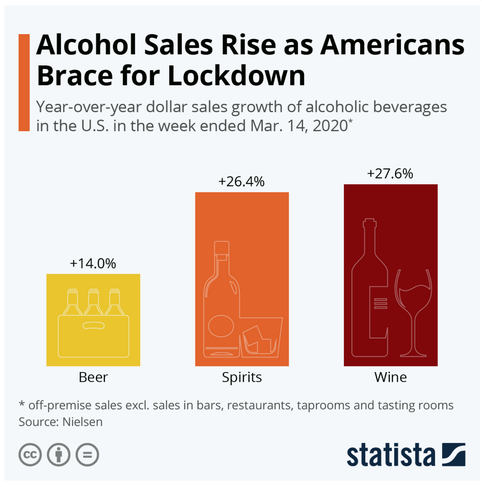
Goals

<u>The effect of lifespan on different diet environments</u>

- Determine how different diet environments effect the female lifespan of flies.
- Determine how different diet-based selection regimes effect the female lifespan of flies.

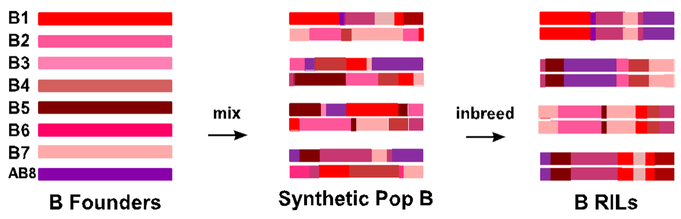
<u>Influence of social isolation on alcohol intake</u>

- Determine if there is a link between alcohol addictions and social isolation.
- Determine if social isolation influences alcohol intake.



Drosophila Synthetic Population Resource (DSPR)

The Drosophila Synthetic Population Resource (DSPR) is a multiparental population (MPP) consisting of a large collection of recombinant inbred lines derived from an 8-way 50 generation intercross. This design creates a panel of lines whose genomes are a mosaic of the original 8 founder lines, allowing for unprecedented mapping resolution for a linkage-based panel.



Acknowledgments

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References

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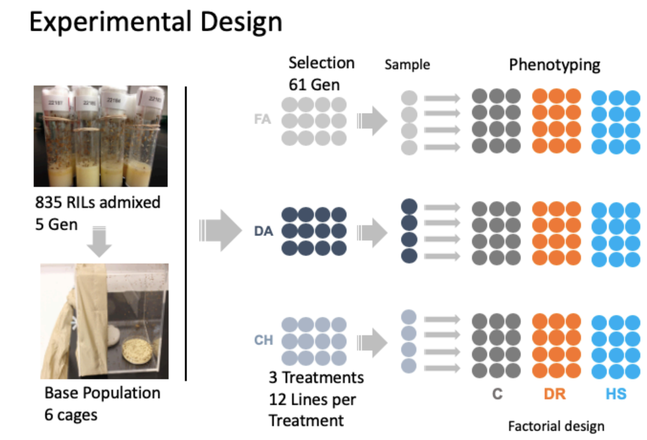
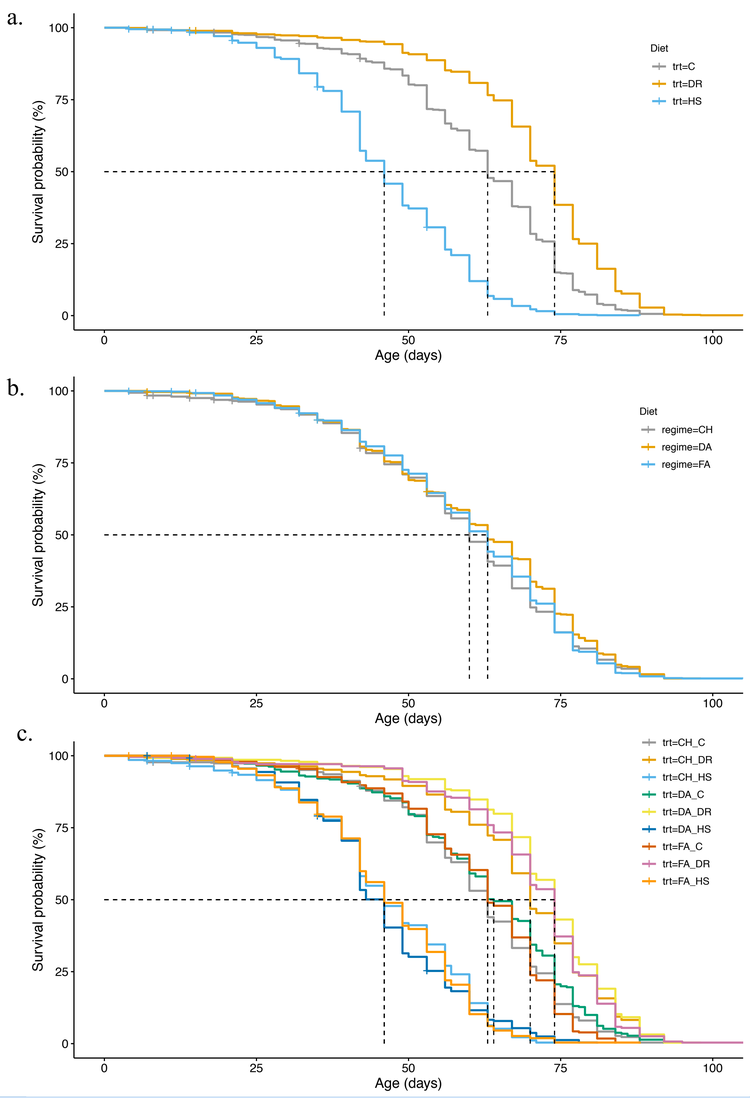
2. King, E.G., et al. 2012. Genome Research 22: 1558 – 1566.
3. King et al. (2012) Genetics. 191:935-949
4. https://www.jove.com/t/54910/a-simple-way-to-measure-alterations-reward-seeking-behavior-using
5. Cacioppo, J. T., & Hawkley, L. C. (2009). Perceived social isolation and cognition. Trends in Cognitive Sciences, 13(10), 447–454.

Method



Results

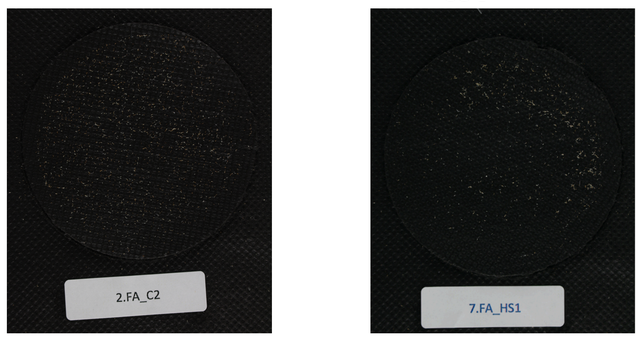


Conclusion

- High sugar diet is associated with a shorter lifespan in female fruit flies, while dietary restriction is associated with a longer lifespan in female flies.
- The selection regime does not seem to affect the lifespan in female fruit flies.

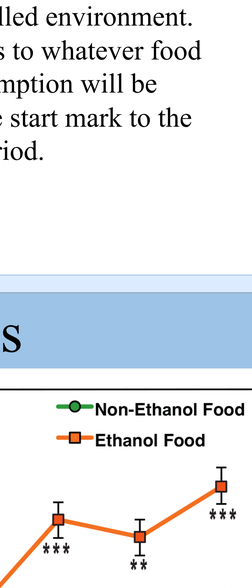
Future Directions

- How does different diet environments effect egg production over time?



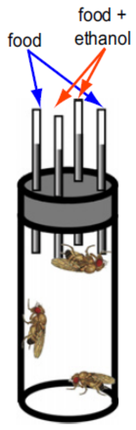
Method

1) 100 newly emerged D. melanogaster will be put into an experimental group and a control group and they will be served the same food from the Capillary Feeder (CAFE) Assay.
2) After 2 weeks, the control group will be be separated and put into isolation like the experimental group and will be given the option of two different foods using the Capillary Feeder.
3) They will be on the food one day at a time 3 times a week and the days where they will not be going through this process, the control group of flies will be put back together with the same flies as before. The test period will be 6 weeks long.



Modified from Devineni & Heberlein, 2009

Research Design

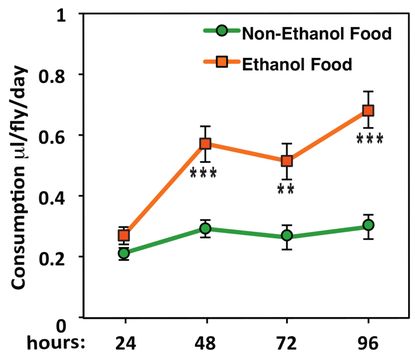


Modified from Devineni & Heberlein, 2009

The CAFE Assay consists of two marked glass capillaries filled with liquid food through pipette tips on top of a vial and flies will be able to eat from the bottom end of the pipette. The starting level will be marked on both capillaries to measure the food and will be stored in a controlled environment. The flies have free access to whatever food they choose. Food consumption will be tracked by comparing the start mark to the level at the end of the period.

Expectations

- Isolated fruit flies will consume more alcohol-containing food than fruit flies which were not isolated.
- Isolated male fruit flies will consume more alcohol-containing food than female isolated fruit flies.



Future Directions

- How does alcohol-containing food influence lifespan in fruit flies?
- How does fly behavior change after consuming alcohol-containing food?