Purpose

The purpose of this lab was to observe the e ects of di erences in nutrients in the diet on developmental timing of *Drosophila melanogaster. Drosophila* were given food either low in yeast concentration (1%) or high in yeast concentration (5%). Developmental timing was measured by the time it took for *Drosophila* to eclose. We expected that the *Drosophila* which was given food with higher yeast concentration, would enclose faster than those who were given the low-yeast concentration foods, suggesting a possible relationship between the developmental timing of *Drosophila* and diet.

Methods

Food and Mating Vial Preparation

Prior to the collection of *Drosophila* for this experiment, we prepared vials with 5% yeast concentrated food, or 1% yeast concentrated food. Food consisted of agar, sucrose, dextrose, cornmeal, propionic acid, Tegosept, and deionized water. Foods were prepared the same, except for the yeast concentration as the independent variable. Once food was prepared, we collected a total of 20 virgin female *Drosophila* and 20 male *Drosophila*.

Mating vials and egg plates were then prepared. Egg plates were made up of grape juice agar, of which a small dot of yeast and water paste was pipetted in the middle. Once the yeast paste was dried, three males and three virgin female *Drosophila* were placed into each mating vial, sealed with the egg plate at the base. Mating vials were then placed in the incubator at 25 degrees Celsius for 24 hours. The ýrst round of mating vials was prepared on February 1st, and eggs laid in those vials were counted the next day (February 2nd). On the ýrst day of egg collection, more mating vials were prepared with only two virgin female *Drosophila* and two male *Drosophila*, which were sealed with egg plates at the base. We prepared a total of eight mating vials over the course of two days.

Egg Collection and Measuring Eclosion

The next day, egg plates were removed, and eggs were carefully collected in groups of 30. Eggs were then placed in vials with low yeast concentrated food or high yeast concentrated food. We collected a total of 27 vials over the course of two days. On February 2nd, we collected enough eggs to be placed in eight 5% yeast vials and eight 1% yeast vials. On February 3rd, we collected more eggs to be placed in anht 1%

. *Drosophila* were counted each day exceu

were collected on February 3rd. Because of the di erence in post mating days, average þies per vial per day post mating were graphed separately to represent the di erence in eclosion times (Figure 2). Here, there was a slight overlap between the end of *drosophila* eclosion from the group with food with 5% yeast and the start of the eclosion of the group with food with 1% yeast in both graphs from Figure 2 on the 16th day. The number of þies per vial di ered between the two groups in terms of the timing of eclosion as well as the amount of þies present in each vial. It should be noted that *Drosophila* were not counted on days 17 and 18, so there is no data present.

Eggs in vials 1-16 were collected on February 2nd, while vials 17-27

6.21 eggs hatch and eclose (Figure 2; $p<0.05$; $a=0.05$). The highest number of eggs to hatch and eclose in the 1% yeast vials was 15 (vial #6).

Discussion

The results from our experiment support the hypothesis that *Drosophila* given food with a higher yeast content will have a faster eclosion rate and an overall higher amount of anlosion Q I o nt%rime ~ Q "

slower eclosion rates as well as produce o spring that are smaller than usual (Tu and Tatar, 2003). While not the main focus of our experiment, the o spring in the lower yeast concentrated food did have þies that were much smaller than the o spring in the higher yeast concentrated food. In *Drosophila*, a nutrient rich diet is critical for metamorphosis, and a low nutrient diet slows down metamorphic development and results in slower eclosion rates (Reis, 2016; Quan and Eisen, 2018). While the 1% yeast food was lower in nutrients, the þies were still able to reach a critical mass at which they begin ¾ ₵ A D M

this study had enough to sustain eclosion, but most of the þies that eclosed ended up being relatively smaller than the þies given the nutrient rich food. With lower nutrient availability, *Drosophila* are prone to infertility, diseases, and other external stressors (Klepsatel et al., 2019; Colinet and Renault, 2014). A next step to this experiment could be to study the fertility of the smaller female o spring and how changes in diet could have an impact. Additionally, with the smaller þies, I would be curious to observe the stress tolerance of the þies when exposed to external factors such as temperature changes, nutrient availability later in life, or exposure to infection, and how a poor diet during early development can ripple through an organismîs life.

In understanding what is necessary for proper development in *Drosophila*, we can hopefully apply this knowledge to other organisms. For instance, just as nutrient intake is important for *Drosophila* larvae, nutrient intake is important for humans in utero. In addition, we can use this information to possibly identify what exactly is the most important nutrient in terms of development, and if timing has any relevance for when the nutrients are received.

Appendix

Figure 1. Figure 1 shows the average eclosion times of the *Drosophila* given either the 1% yeast food, or the 5% yeast food. p<0.05, a=0.05, t=27.7.

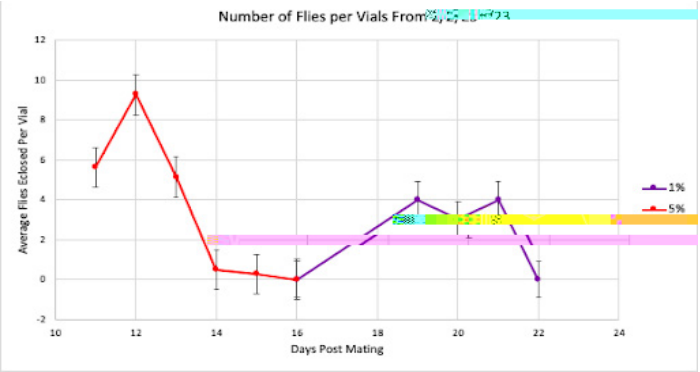

Figure 2. Figure 2 shows two scatterplots depicting the average number of þies per vial per day post-mating. The graph on the left plots the average number of þies per vial from eggs collected on 2/2/23. The graph on the right plots the average number of þies per vial from eggs collected on 2/3/23. Red represents the *Drosophila* given the 5% yeast food while the purple represents the *Drosophila* given y %