

The Effect of Different Amounts of Potassium Iodide on Asthma in *Drosophila Melanogaster*

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May 2021

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1. Abstract

1.1 Motivations

According to the Centers for Disease Control and Prevention (CDC), 1 in 13 people have asthma. Each day, ten Americans die from asthma (Asthma and Allergy Foundation of America 2018). A previous project that was conducted last year looked at the correlation between zinc deficiency and asthma and yielded positive results meaning that a correlation between additional zinc intake and a better control of asthma could be seen.

1.2 Objective

This project observed whether there is a correlation between iodine deficiency and asthma since iodine has previously been used to treat inflammatory diseases since it has properties that can stabilize thyroid hormone levels as well as reduce bronchial secretions and mediate immune cell responses (Lake 2017). In order to supply the iodine, potassium iodide was used since iodine is more easily absorbed by the body when it is in the form of potassium iodide. A combination treatment of potassium iodide and zinc was also given.

2. Introduction

Asthma is caused when the airways in the lungs become swollen and inflamed due to histamine released by mast cells. These triggers could vary depending on the type of asthma an individual has (McCracken 2017). The main focus of this experiment will be on occupational asthma which is triggered by chemical fumes, gases, or dust, which are especially prevalent in factories.

A link between increased thyroid hormones and a worse asthmatic reaction, also known as hyperthyroidism, has been discovered (Korsager 2020).

This experiment uses Dimethyl Sulfoxide, a chemical that is found in the air in factories which has been known to cause occupational asthma and found to increase thyroid activity (Zhu 2018).

2.1 Previous Experiments

A previously conducted experiment observed the effect of zinc on asthma by looking at how it affected histamine release in the epithelial cells. The results gathered were that an addition of zinc to the diet of *Drosophila melanogaster* results in better controlled asthma. In order to compare if a combination of the two treatments would be more effective in having a better controlled asthmatic response, one experimental group was given both zinc and potassium iodide in order to test whether a combination of the two treatments would result in a better response.

2.2 Project Goal

The objective of this experiment was to investigate whether a correlation between iodine deficiency and a worse asthmatic reaction exists and if iodine supplements could be used as a way to have a better controlled asthmatic reaction. There was reason to believe in this correlation because in humans iodine is commonly used to fight inflammatory diseases and stabilize thyroid hormones. Since iodine is more easily absorbed by the body when it is in the form of potassium iodide, potassium iodide was used in this experiment.

2.3 Predictions

The flies given potassium iodide were hypothesized to have a faster time when crawling up the side of their vial because the potassium iodide would shrink the size of the thyroid gland and decrease the amount of thyroid hormones produced. This would result in better controlled asthma and more physical activity because the inflammation of the thyroid gland has been linked to asthma.

3. Materials and Methods:

3.1 Model Organism:

Drosophila melanogaster is a species of fruit fly that has been found to have thyroid receptors that release thyroid hormones similar to those in humans. It has also been found that Dimethyl Sulfoxide causes an increase in their thyroid hormone production. Due to its ability to closely model the thyroid gland response in humans, it was chosen as the model organism for this experiment (Roeder 2009).

3.2 Procedure:

Ten *Drosophila melanogaster* flies were placed into each vial. Two different amounts of potassium iodide were added to different vials of *Drosophila* food media while the control vial was left with no additives. In the last vial, 0.1 grams of potassium iodide and 0.1 grams of zinc was added. This vial served to indicate whether a treatment that consisted of both zinc and potassium would be more effective than just potassium since a previous experiment showed that zinc was also effective in controlling an asthmatic reaction.

Dimethyl Sulfoxide in the concentration of 5.1×10^{-8} M was pipetted into the vial plugs of each vial because this is the legal limit of Dimethyl Sulfoxide in factories in the US. Putting it into the vial plugs would ensure that they are breathing in the chemical since the vial plugs are how air gets through to the vial. Then after 4 days, the time it took for each *Drosophila* to crawl up the side of the vial was measured.

4. Results

For trials one, two, three, four, five, and six, the control group averaged 41.09, 51.3, 36.55, 37.39, 50.78, and 46.82 seconds respectively. The group that was given 0.1 grams of potassium iodide averaged 31.12, 41.29, 21.77, 29.09, 33.14, 35.67 seconds for each trial respectively. The group that was given 0.2 grams of potassium iodide averaged 23.98, 27.18, 20.88, 25.58, 27.29, 28.06 seconds for each trial respectively. The group that was given both 0.1 grams of potassium iodide and 0.1 grams of zinc averaged 11.73, 24.71, 10.68, 17.79, 19.85, 16.89 seconds for each trial respectively. The control group showed the slowest times for each trail. The group given both 0.1 grams of potassium iodide and 0.1 grams of zinc showed the fastest times for each tria. I used an ANOVA test to analyze my data and it was statistically significant for all experimental groups.

4.1 Graphs and Figures

(Each vial contained 10 *Drosophila* for all of the trials.)

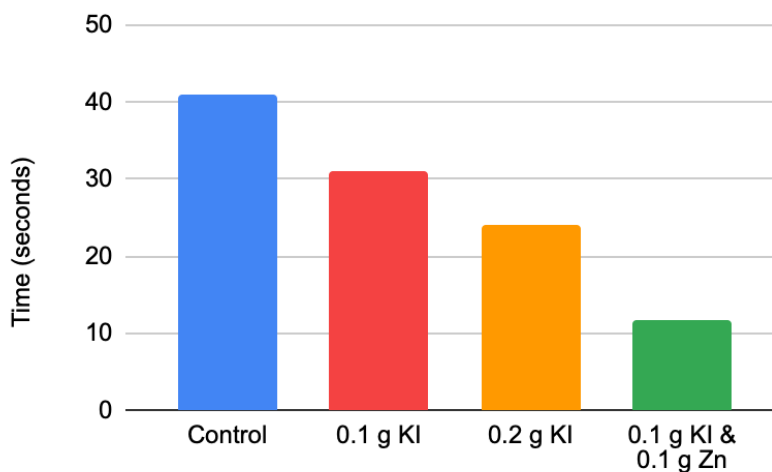


Figure 1. Trial One. The above graph shows the first trial for the average amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment.

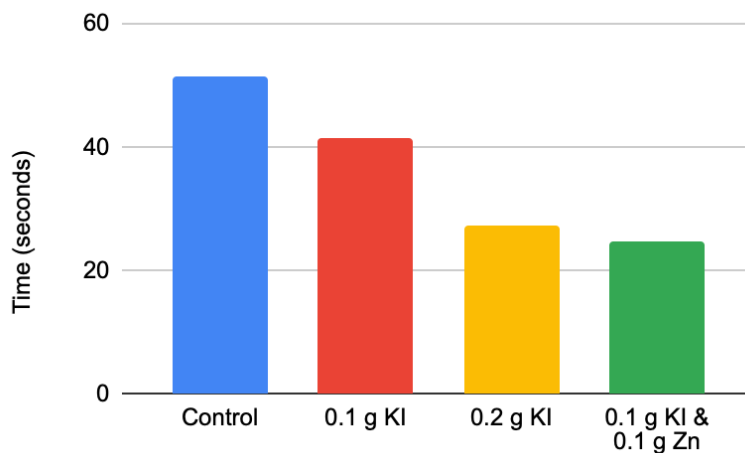


Figure 2. Trial Two. The above graph shows the second trial for the average amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment.

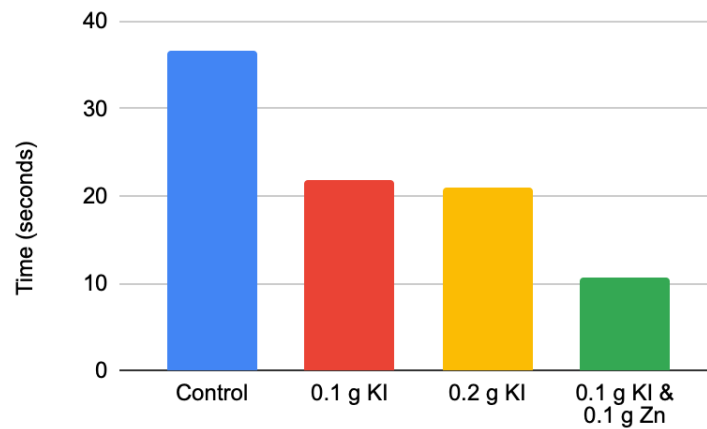


Figure 3. Trial Three. The above graph shows the third trial for the average amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment.

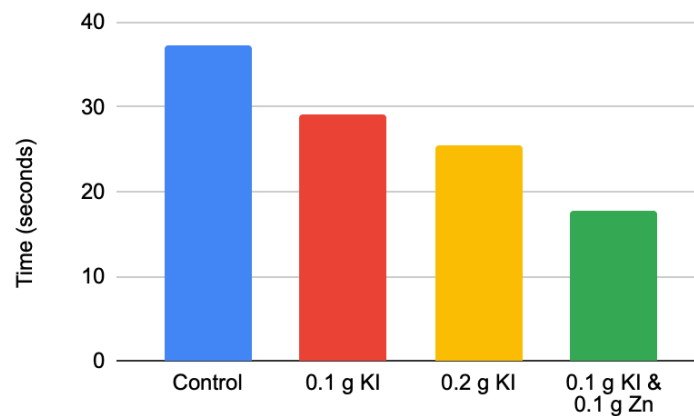


Figure 4. Trial Four. The above graph shows the fourth trial for the average amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment.

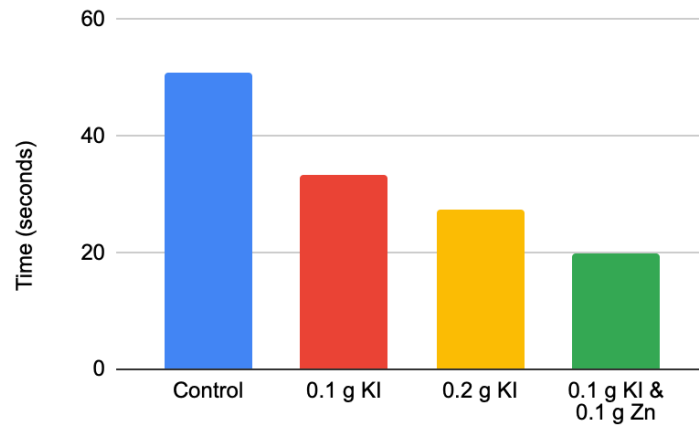


Figure 5. Trial Five. The above graph shows the fifth trial for the average amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment.

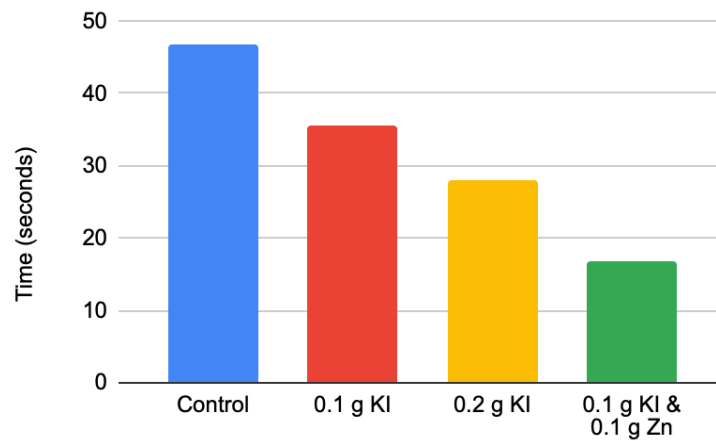


Figure 6. Trial Six. The above graph shows the sixth trial for the average amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment.

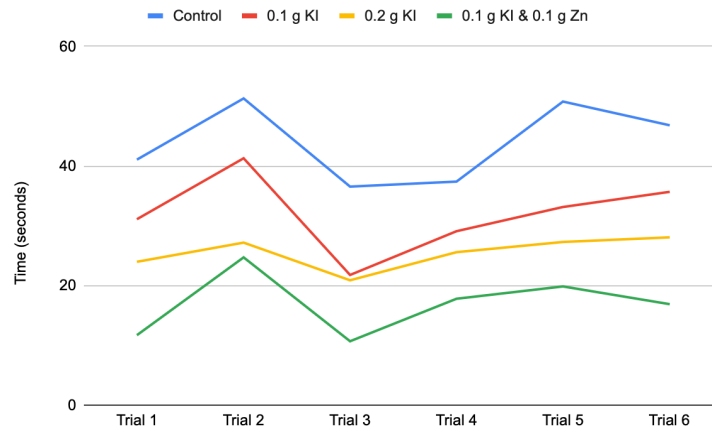


Figure 7. Amount of Added Compound vs. Time taken to crawl up vial for all Six Trials.

The above graph shows the amount of time that the *Drosophila* took to crawl up the side of their vials for each treatment across all six trials.

5. Discussion

Potassium iodide appears to mitigate the effect of Dimethyl Sulfoxide on thyroid hormones and physical activity which supports my hypothesis. It can be concluded that iodine deficiency may increase the effects of asthma, and potassium iodide may be a viable treatment for controlling asthmatic reactions. The most effective treatment for controlling asthmatic reactions is a combination of potassium iodide and zinc as it had the lowest average time for each trial. The potassium iodide lowered the average time needed to crawl up the vial in each trial but not to the extent that the combined treatment did.

6. Application and Recommendations for Future Research

The application of zinc and potassium iodide treatments could be helpful for finding long term ways in which to build up resistance to control asthmatic reactions. Further research that could be done would be to observe the effect of potassium iodide in different types of asthma.

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