



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

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Project Title
The Effect of Deuterium Oxide on Senescence in Drosophila melanogaster

Abstract

Objectives/Goals
The objective of this project was to test the effect of ingestion of deuterium oxide on the lifespan of Drosophila melanogaster. My initial idea was that with the use of the non-radioactive heavy isotope deuterium oxide, which is known to stabilize singlet oxygen, cells may be able to resist the free-radical oxidation, which would allow a longer lifespan. My hypothesis is the consumption of lower concentrations of D2O will increase the lifespan of the fruit fly, while the toxicity of high concentrations will considerably decrease the lifespan.

Methods/Materials
Drosophila melanogaster were placed in culture vials varying from 0% (control) to 100% D2O mixed within their feeding medium. A total of 10 different H2O/D2O concentrations were tested, each with 5 trials. Each trial consisted of 10 newly emerged virgin female D. melanogaster for a total of 500 flies. The flies were kept at a constant temperature and humidity, and the dry medium, habitat, light, methods, and procedures across each trial were constant. Observations were made, and lifespan data was collected daily, then recorded, graphed, and analyzed.

Results
Data analysis showed that my hypothesis was partially correct. Concentrations of 15%, 20%, and 25% increased the lifespan by 18%, 15% and 10% respectively, while concentrations of 5% and 10% D2O decreased the lifespan of D. melanogaster by 5% and 13% . At concentrations above 30%, the toxic effects of D2O outweighed its health benefits, and dramatically reduced the lifespan of D. melanogaster, becoming lethal within a few days at 100% D2O.

Conclusions/Discussion
Certain concentrations of D2O showed a statistically significant increase in survivability over the control (0% D2O). The data shows that in the case of 15% D2O, an increase in average lifespan of 18% was observed over the established baseline control. The exact mechanism that is responsible for increasing the lifespan at certain concentrations while reducing the lifespan at others is still unclear. While this preliminary data seems promising, further research, including expanding the scope to include other invertebrates, effect on males vs. female, different temperatures, effects on reproduction, generational effect, and finally, research on a molecular level to analyze how deuterium oxide influences lifespan and senescence in mammals would shine light on the mechanisms of aging and the potential benefits of D2O.

Summary Statement
I tested the effect of feeding different concentrations of deuterium oxide and water to Drosophila melanogaster and found that certain concentrations statistically increased their lifespan.

Help Received