



Does Coca-Cola consumption potentiate diabetes development in NOD female mice?



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Introduction:

- Type 1 diabetes (T1D) is an autoimmune condition in which the body's immune system mistakenly destroys its own healthy beta cells in the pancreatic islets of Langerhans. It is known that the Westernized diet in the United States contains excess sugar, which can lead to health impairments like type 2 diabetes. However, insufficient data exist whether the development of T1D may be affected by excessive consumption of soft drinks. Thus, a model for a spontaneous T1D, non-obese-diabetic (NOD) mouse, was used to test the effects of Coca-Cola on the development and severity of the disease.

Hypothesis:

- NOD female mice consuming Coca-Cola will develop T1D rapidly and in a more severe form.



Methods:

- 6-wk-old NOD female mice were randomly separated into the decarbonated Coca-Cola treatment group (n=15), and control groups, that consumed the autoclaved water (n=31), or the sugar-water (SW) treatment group (n=15) until 14 weeks of age.
- At 14 weeks of age, the mice were taken off treatment to continue drinking autoclaved water until 24 weeks of age.
- Blood glycemia levels and body weights were measured weekly from 14 until 24 weeks of age. Blood drops from the veins of the mice were tested with Accu-Check Aviva Plus (Rosche) glucose meter.
- Diabetes onset was diagnosed by the first measurement out of 2 consecutive blood glucose measurements of 250 mg/dL or greater.
- Statistical analysis of body weight data, glucose levels data, and diabetes incidence was done in JMP software.
- A p-value <0.05 was considered statistically significant.

Results:

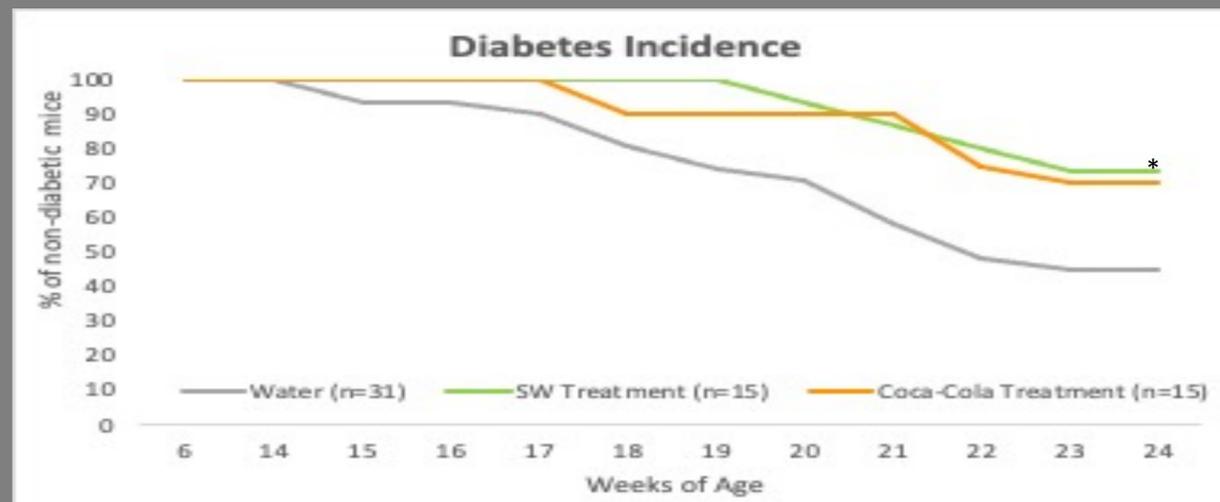


Figure 1: Data are shown as incidence. *p<0.05 comparing the SW to controls using the Survival Table test.

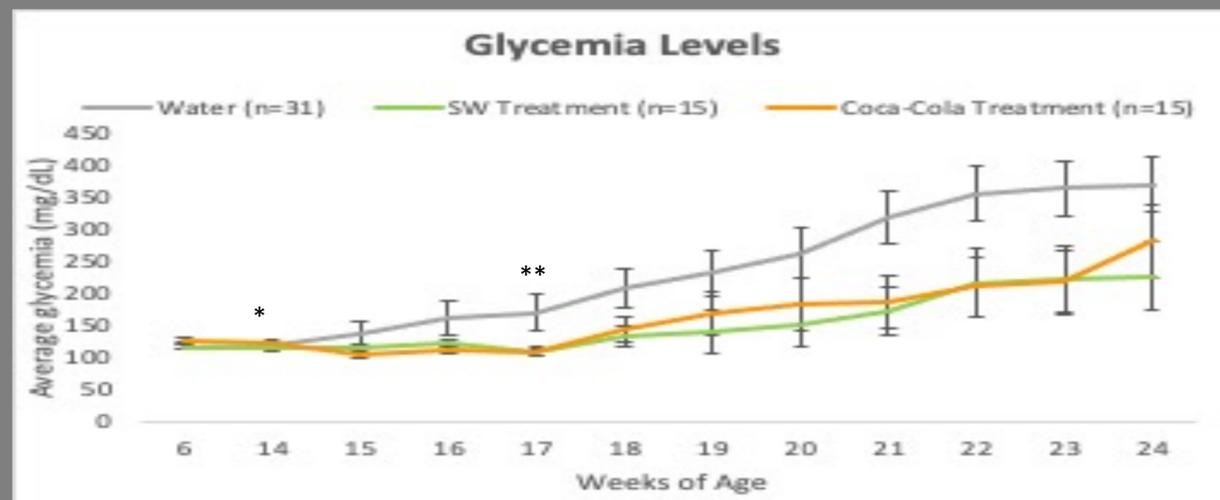


Figure 2: Data presented as average ± SE. *p<0.05 comparing Coca-Cola to controls using the Wilcoxon test. ** p<0.05 comparing SW to controls using the Wilcoxon test.

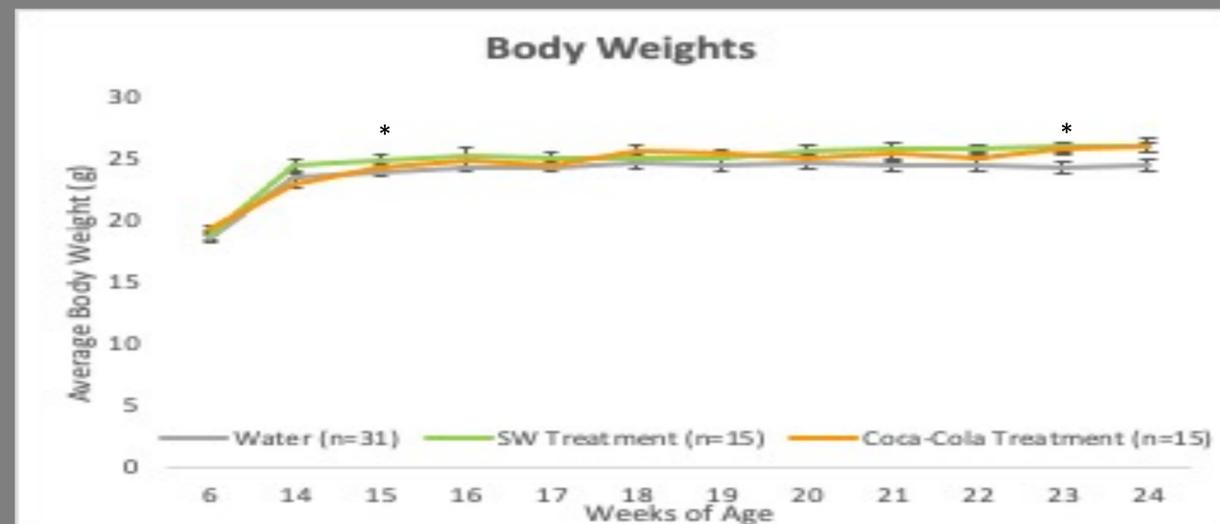


Figure 3: Data is shown as average ± standard error. *p<0.05 comparing body weights of SW to control using the Wilcoxon test.

Summary:

Diabetes Incidence:

- Coca-Cola treatments of NOD females showed a trend of decreased T1D incidence.
- SW treatment statistically decreased the incidence of T1D in female NOD mice.

Glycemia:

- Both Coca-Cola and SW treatments of NOD mice showed a trend of decreased glycemia levels compared to the controls throughout the entire experimental period.

Body Weight:

- There were no statistical differences in body weights of NOD female mice treated with either Coca-Cola or SW when compared to controls. There was a trend of increased body weight in all groups

Conclusion:

- The results of our study do not support the initial hypothesis that Coca-Cola (or SW) will increase T1D incidence. In contrast, both Coca-Cola and SW exhibited protective effects, reflected in decreased disease incidence and lower levels of glycemia throughout the experiment. This intriguing data will require further study to define the mechanism(s) of such protection.
- A study performed on mice drinking only liquid sucrose found increased expression of glucose transporter 2 on beta cells, which would lower blood sugar levels by releasing more insulin into the blood, and potentially decreasing the incidence of T1D.

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Does Coca-Cola Consumption Potentiate Diabetes Development in NOD Mice?
Hunter Harnett and Asma Yusuf
Huskies Showcase Reflection
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Throughout our time in immunology research and preparing our final presentation for the Husky's Showcase, being able to communicate effectively, thinking creatively and critically, and seeking and applying knowledge have all been skills that we have learned and continuously built upon in our year of research. These skills are relevant to our changing world and the application of creative thinking. No matter what path we decide to take after graduation, the skills mentioned above will apply to any situation we may encounter, academically or otherwise. The learning experience will not only suffice the academy arena, but also the global village. As the dimension of the 2021-2022 academic year is communication, that aspect of the Husky Compact will be covered in-depth as it relates to preparing our research and how those skills will translate to future situations. Specifically, our research group has used multiple channels and modes to effectively communicate information and ideas. For example, with our weekly meetings on Fridays, we are all assigned portions of our research project. For example, one of us is responsible for one mouse model's data analysis, so on Fridays, one of us would present in front of our research group our preliminary data and statistical analysis. I primarily show data in our master spreadsheet and project that onto the projector and walk our group through the trends in our data along with the statistical analysis behind the preliminary data. Not only do we communicate with our research group in a presentation format, but we also communicate through e-mail and text messages. Due to only having one 50 minute research meeting a week, it is hard to fit everything into 50 minutes, so anything that is not covered or left with questions is addressed in texting or emailing communication. For example, we are all assigned one day of the week to do animal care, and one time someone was not able to make it to their scheduled animal care shift so they texted our research group chat, and their shift was covered. Another example is that after one of us had done statistical analysis with the statistics tutoring center, we emailed our research faculty member our data analysis and we arranged a meeting to discuss the data analysis. Not only did we practice communicating effectively through a presentation format, but we also communicated effectively through emails and texting, and one on one meetings with my research faculty advisor. Not only will the previously mentioned modes of communication be utilized in preparing this research presentation, but presenting to a larger group for the Husky's Showcase will highlight the dimension of the year, communication. These skills that we have strengthened throughout this research project will not only benefit us throughout our last semester at St. Cloud State University, but we will also be able to apply these skills to practically any situation we are thrown into, such as with medical school interviews. In addition to being able to communicate effectively, being able to think creatively and critically has been a skill we have been able to strengthen throughout our research project preparation experience. Specifically, finding, evaluating, and communicating substantive information. Throughout preparing this research project, we had to come up with a research design; we thought of a question and thought of a way to solve it. Additionally, once data was collected and looked over, we then evaluated the data with our research faculty member and went to that statistics tutoring center for help evaluating and analyzing our current data. Finally, once all of the data has been entered and analyzed, we will communicate the results of the experiments to our research peers

and faculty member, and also during our oral presentations at the Husky's Showcase. Furthermore, seeking and applying the knowledge is very important to all expectations of life how to apply knowledge is crucial in workplaces and in academy settings. Through our research project, we have been able to enhance the skill of seeking knowledge and applying them to our research through communicating with online resources and gathering information about other projects. Secondly, meet with the tutoring department as well as the faculty member to discuss the intent of our graph and see what best thought they can give. All of these were ways in which we were able to gain knowledge and apply it to our project.