OFFICIAL ABSTRACT and CERTIFICATION

The Ketogenic Diet Ameliorates the Effects of Caffeine in *Drosophila melanogaster*

Katherine St George
John F. Kennedy High School; Bellmore, NY; United States

Epilepsy is a neurological disease involving spontaneous and chronic seizures. Seizure susceptibility and intensity are affected by a multitude of factors, including caffeine exposure and dietary restriction. Caffeine exposure increases seizure susceptibility, whereas forms of dietary restriction such as the ketogenic diet (KD) decrease it. Other types of dietary restriction such as low-protein, high-carbohydrate dietary restriction (referred to as DR) mitigate the negative physiological effects of caffeine by decreasing target of rapamycin (TOR) signaling. This study was designed to determine the concurrent effects of caffeine consumption and dietary restriction on seizure susceptible Drosophila melanogaster. Easily shocked (eas) mutant strains were raised on one of three diets (KD, DR, or a standard diet) and were administered caffeine at one of three frequencies (no exposure, chronic exposure, or acute exposure). Each of the 27 experimental groups (n = 30) underwent seizure induction and was analyzed for seizure duration and susceptibility. It was found that KD counteracts the effects of caffeine on seizure susceptibility for both chronic and acute exposure groups. Because KD and caffeine both impact seizures via manipulation of glutamate levels, these findings suggest that any glutamate inhibitor could successfully modulate caffeine. It was also found that seizure susceptibility can function as a predictor for seizure intensity. Future research should seek to investigate the pathways at play in the interaction between KD and caffeine on a cellular level.

Category
Pick one only — mark an "X" in box at right

- Animal Sciences X
- Behavioral & Social Sciences
- Biochemistry
- Biomedical & Health Sciences
- Biomedical Engineering
- Cellular & Molecular Biology
- Chemistry
- Computational Biology & Bioinformatics
- Earth & Environmental Sciences
- Embedded Systems
- Energy: Sustainable Materials and Design
- Engineering Mechanics
- Environmental Engineering
- Materials Science
- Mathematics
- Microbiology
- Physics & Astronomy
- Plant Sciences
- Robotics & Intelligent Machines
- Systems Software
- Translational Medical Sciences

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check ALL that apply):

   ☐ human participants ☐ potentially hazardous biological agents

   ☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue

2. I/we worked or used equipment in a regulated research institution or industrial setting: ■ Yes ☐ No

3. This project is a continuation of previous research. ☐ Yes ■ No

4. My display board includes non-published photographs/visual depictions of humans (other than myself): ☐ Yes ■ No

5. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only ■ Yes ☐ No

6. I/we hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work. ■ Yes ☐ No

This stamp or embossed seal attests that this project is in compliance with all federal and state laws and regulations and that all appropriate reviews and approvals have been obtained including the final clearance by the Scientific Review Committee.