Effects of Stimulants and Depressants on Brine Shrimp

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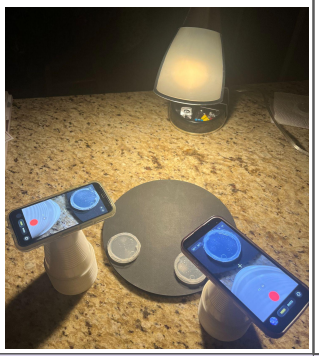
Research Question

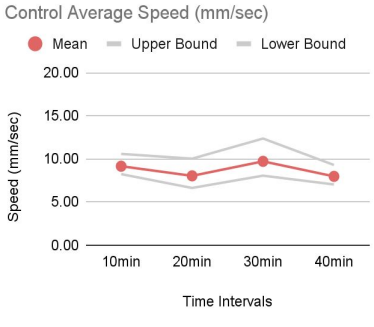
- **Problem:** A bioassay is required to assess the potency of a novel drug. A whole-animal potency test can be developed using a generated strain (tgMORr) of the nematode *C. elegans*. The strain contains the human mu-receptor, allowing them to respond to opioids. Before working with them, brine shrimps will be used as a model to develop methods for handling small organisms. To do so, it is important to observe their behavior in a controlled environment and how they react to being dosed with drugs.
- **Objective:** To test the effect of drugs on brine shrimp in a controlled enviroment.
- **Hypothesis:** If brine shrimp are dosed with drugs, then their behavior will change because of the substance affecting their receptors.

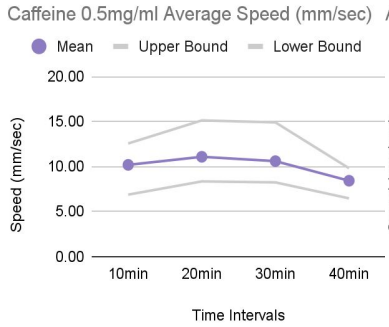
Caffeine: 30min 0.5mg/ml
Taken by Student Researcher

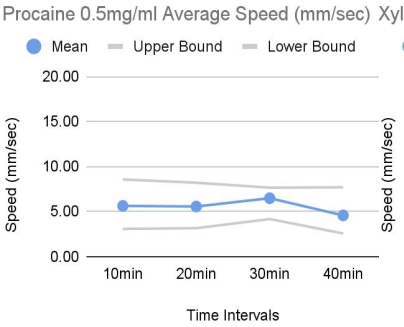


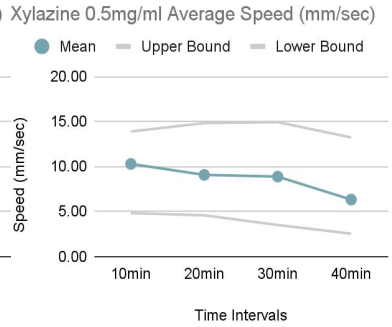
Brine shrimp video set up
Taken by Student Researcher

Data Analysis and Results









Graphs show average of 3 trials, with the upper & lower bounds acting as error bars

- Compared to the control:
  - caffeine-treated brine shrimp showed similar to higher speeds.
  - Alcohol & procaine-treated displayed similar to decreased speeds.
  - Xylazine-treated showed decreased speed, having the most variability.

Methodology

- Raise brine shrimps to adults to video them.
- Create device that allows them to swim in it & can record them.
- When the device is ready, fill it with saltwater/drug solution being tested & one brine shrimp.
- 4 drugs were used (caffeine, alcohol, procaine, xylazine) & all–except alcohol (0.1, 0.5, 1.0%)–had the same 3 treatments (0.25, 0.5, 1.0mg/ml), with each treatment being recorded incrementally for 30sec at intervals of 10min for 40min.
- Using ImageJ through Fiji, import a chosen video of the brine shrimp in the device to track their movement via TrackMate.
- Once the tracker is done, get rid of unnecessary data via Trackscheme & export results to google sheets for data analysis.

Conclusions

- The data collected supports my hypothesis, with the drugs demonstrating either an increase or reduction in speed compared to the control. Brine shrimp showed varying behaviors when exposed to the drugs such as: spasming, circling, becoming lethargic, and having bursts of speed.
- The future steps for this project are to construct a better device to view the brine shrimp, improve the design of the video set up, and eventually work with *C. elegans*.
- By doing this project, it provides a foundation for whole-animal opioid potency tests using C. elegans by developing methods to handle small organisms. In the long term, this will provide a relevant method on testing the potency of novel drugs.