CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)

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Project Number

S1802

Project Title

What Toxins Affect the Heart Rate of Daphnia magna?

Abstract

Objectives/Goals

The purpose of this project is to study the effect of ethanol and nicotine on Daphnia magna. Observations were made on the heart rate of D. magna as the concentration of each poison increased.

Methods/Materials

The D. magna were divided into six groups for each substance, i.e. control, 1%, 5%, 10%, 15%, and 20% solutions. Each chemical was diluted into solutions of the different concentrations of the chemical. Five D. magna were observed under a stereo-dissection microscope, and the time was counted using a digital stopwatch. The variable controlled in this project was the concentration of the toxic chemical. A total of 15 separate measurements were taken per group to create a larger sample of data.

Results

As the concentration of ethanol increased, the heart rate for D. magna decreased. In a controlled setting, the heart rate was 155.2 bpm. As the concentration of ethanol increased to 20%, the heart rate decreased, by 89%, to a rate of 17.6 bpm.

As the concentration of nicotine increased, the heart rate for D. magna increased. In a controlled setting, the heart rate was 148.8 bpm. As the concentration of nicotine increased to 20%, the heart rate increased, by 39.5%, to a rate of 207.6 bpm.

Conclusions/Discussion

The project provided an interesting comparison between the contrasting effects of ethanol and nicotine on D. magna. Ethanol and nicotine are known to be extremely toxic substances that can cause much harm to the human body. This project enabled physical visualization of the extent to which the poisons could harm organisms by either increasing or decreasing the heart rate. The change was caused by ethanol and nicotine binding to different nerve cells in the body of the D. magna, thus affecting the heart rate in different ways. Ethanol decreased the heart rate, while nicotine increased it.

Summary Statement

This project was aimed to study the effects of ethanol, a depressant, and nicotine, a stimulant, on the heart rate of Daphnia magna.

Help Received