

Experiment to determine whether caffeine can have an effect on the heart rate



**ASSIGN
BUSTER**

Caffeine is an xanthine alkaloid, that is a known steroid that can promote hypertension and hyperactivity. It is commonly used in drinks that are supposed to “pick you up”.

They are caffeine rich and give the drinker a boost of energy. It also has medicinal uses in aspirin and some weight loss drugs. It acts as a stimulant and increases the number of stimulatory neurotransmitters released. Due to this it has been linked to restlessness, insomnia, twitching and raised levels of stress, which leads to higher blood pressure. Caffeine is an addictive drug; people who consume large amounts of caffeine often have withdrawal symptoms after extended periods of time.

These symptoms are similar to those found in heroin addicts; just not as severe. Excessive consumption over longer periods of time can produce peptic ulcers, due to an increase in stomach acid production. It is produced naturally in over 60 plants as a pesticide, which paralyzes and kills certain insects that feed upon it. Hypothesis: Due to the information stated in the background knowledge, I can predict that caffeine will induce a higher heart rate in the Daphnia, as opposed to daphnia exposed to no caffeine. This increase in heart rate will increase as the concentration of caffeine increases, and the length of time the daphnia are exposed to the caffeine solution increases.

Variables: Independent variables: These are the variables that will be changed during the experiment. The only variable that will be changed in this experiment is the concentration of the solution with caffeine in. The values for the concentration are: . 5%, . 4%, . 3%, .

2%, . 1% and distilled water. This is the only variable that will be changed as it reduces the degree of error. Dependant variables: These are the factors which we will be measuring.

In this experiment there is only one dependant variable and this is the beats per minute of the water fleas. This will be measured at 2 minute intervals at which a 15 second sample will be taken. The beats per minute of the flea will be calculated by multiplying the value from the 15 second sample by 4. This will be repeated at: 0, 2, 4, 6, 8 and 10 minutes.

As this method of sampling will be used for all of the fleas and intervals, the results should be accurate in relation to each other. We shall use a microscope to count the beats in 15 seconds and use a counting device to count the number of beats per minute. Controlled variables: These are the factors which we will wish to keep the same. During this experiment there are many variables which must be kept to within a certain degree of each other so that all results acquired are accurate in terms of each other. The temperature of the room must be maintained within a few degrees as the water fleas might become more excited when the temperatures are higher.

The daphnia used must all be near enough the same size as the larger fleas would be affected to a lesser degree by caffeine. In order to maintain accurate results, the fleas should be of equal size. The same flea must not be used for more than one caffeine involved experiment as the heart rate of the flea might still be affected and a caffeine overdose may harm the flea.

Method: Apparatus: * Culture of Daphnia* Cavity slides* Dropping pipettes.*

Distilled water* Caffeine solution* Cotton wool* Beakers* Measuring

<https://assignbuster.com/experiment-to-determine-whether-caffeine-can-have-an-effect-on-the-heart-rate/>

cylinders* Syringe* Stop clock/timer* Paper towels* Microscope

1. Set up the microscope and all the equipment.

Make sure it is all clean to prevent contamination of caffeine solution.

2. Dilute the caffeine solution to the required concentrations.
3. Take a Daphnia out of the pond culture and place it onto the cotton wool in the cavity slide containing distilled water.

This is the control experiment.

4. Start counting the beats of the Daphnia's heart when it is in the distilled water.
5. Remove the distilled water and cotton wool and replace it with fresh cotton wool and the caffeine solution that is being tested.

(Ensure that the Daphnia is on top of the cotton wool at all times and, during the replacing of cotton wool, is not distressed too much as this can increase the heart rate of the Daphnia)

6. Start the stop clock.
7. Observe the beats for 15 seconds at 2 minute intervals for 10 minutes.
8. Once the experiment is finished, place the "used" daphnia into a beaker containing distilled water.

(these Daphnia must not be used for future experiments)

9. Repeat steps 3 to 8 for each concentration of caffeine and repeat all concentrations 3 times.

Note: The Daphnia's heartbeat can be detected in the area pointed out below. Ethics: As there are living organisms being used in this experiment, there are ethical issues. Their safety must be taken into account.

If the concentration of the caffeine is too high, the Daphnia might overdose and be killed. If they are in contact with caffeine for extended periods of time, they might also be harmed by the caffeine. Due to this, each Daphnia

must only be used for one concentration and they must not be exposed to high caffeine levels (. 5% is the highest they should be exposed to. This experiment is not being performed on humans as an overdose could lead to severe medical issues.

The Daphnia are being used instead as they are a simple organism with a very short life span. Results: AnalysisThe mean results showed that caffeine can affect the heart rate of the water fleas. The mean values for the caffeine were higher than those of the controls. The caffeine values also increased each time, except for the first trial at the 6 minute interval. This could have been caused by human error with the counting or an inactive or dying Daphnia.

These results support my hypothesis. The caffeine affected the daphnia by increasing their heart rates. The results did not vary as much as I expected but this could be due to the low concentration of the caffeine solution. The results therefore show that caffeine affects the heart rate and can therefore contribute to hypertension. This can increase the risk of CHD and combined with stress, can pose health risks. Other experiments conducted on animals have produced more dramatic results.

Spiders were given caffeine and allowed to build their web whilst others were not given any caffeine. The results, shown left, are plain to see. This is because caffeine is a stimulant, which can affect the central nervous system and the heart. It has been likened to the hormone adrenalin, in that it can increase a person's mental alertness in moderation and can affect stamina and the central nervous system. The results are not as valid as I would have

previously expected. As we did not have enough time, all of the experiments could not be carried out effectively, or repeated enough times to achieve more accurate results.

Human error would have played an important part in this experiment as the recording of the data was carried out by eye. The reaction times of the people counting the number of beats per 15 seconds would have had an influence as the Daphnia's heartbeat could be very irregular. To reduce this in future experiments, more efficient equipment should be used such as a high speed camera that can be reviewed later to count exactly how many beats there were in the time frame. The experiment should also be repeated more times in order to achieve more accurate results and an effective average.