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### How Coffee Effects Daphnia

Many substances can affect a human body. Substances such as caffeine are known to have a stimulant effect on humans and many humans use them to help stay awake and alert. One question is how does the substance affect the body. Since all living things are made of cells, it is assumed that by examining the effect of caffeine on other animals its effect on humans can be better understood.

In order to test the effect of caffeine on animals a controlled experiment was done using coffee and Daphnia. Daphnia (water fleas) were obtained from a standing puddle outside room 204. These daphnia were placed on a microscope slide and viewed under medium power, so that their heart beat was visible. After adding one drop of water the heart beat of the daphnia was counted for ten seconds. This was used as a control. Then one drop of coffee was added and the heartbeat was counted for 10 seconds. This was repeated 8 times, each with a different Daphnia. The results are shown in Table 1.

Substance	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8
Water	16	17	16	19	15	16	17	18
Coffee	20	22	21	25	17	19	21	13

TABLE 1. The number of Daphnia heartbeats in 10 seconds after being exposed to 2 substances.

The data show that all of the daphnia experienced an increase in heart rate after being exposed to caffeine. In order to determine the extent of the effect, the percent change is calculated using the equation

$$\frac{(\text{Ending heartbeat} - \text{Initial heartbeat})}{\text{Initial Heartbeat}} \times 100$$

The result of these calculations is shown in Table 2.

Daphnia	1	2	3	4	5	6	7	8
Percent Change	25	29	31	32	13	19	24	-27

TABLE 2. Percent change in heartbeat of the Daphnia

Using the results shown in Table 2 the average change in heart rate can be calculated to be 25% (the data from Daphnia #8 was not used since its negative change indicates error in experimental procedure).

This experiment has shown that one of the effects of caffeine is to increase the heart rate in Daphnia. It might be assumed that caffeine has a similar effect on humans and other animals, but other experiments clearly need to be done. It is also possible that there is some other chemical in the coffee which is causing the elevated heart rate. Either way, it is clear that coffee affects animals and that those who consume it should be aware of its effects.

#### APPENDIX

Independent Variable - the substance (coffee) placed on the Daphnia.

Dependent Variable - the number of heartbeats

Control - first heartbeats were counted in water.