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A Caffeine Kick

Every day, a staggering 587 million cups of coffee are consumed in the homes of Americans (Fernau 1). Caffeine is a vital stimulant in people's lives that helps them become active, alert, and stay awake. Little do people know, research finds that too much caffeine may result in negative effects towards the human, and other organisms, heart. Psychologist Norman B. Schmidt, PhD, finds that caffeine, in high amounts, may cause anxiety and panic attacks (Schmidt 1). Common causes and variants of heart rates are caused by air temperature, body position, body size, and medication (All About Heart Rate 2). It is essential to note that these variables may have an effect on the testing that is to be done in the experiment. If caffeine is added to a chemical solution of Daphnia, then the Daphnia's heart rate per minute will increase drastically.

Daphnia is a genus of small planktonic crustaceans also known as the common water flea. This unique specimen was first discovered by Otto Friedrich Müller in his book *Zoologiae Danicae Prodromus*, which describes the first ever recorded daphnia (Selah 4). The most common of these fleas are the Daphnia Pulex and Daphnia Magna (Selah 4). Other daphnia specimens include Daphnia Galeata, Barbarta, Lumholtz, Occidentalis, Jollyi, and Coronata (Selah 4). Unlike humans, it has average heart rate per minute of 300. Due to it having a transparent body, calculating its heart rate is very simple.

Caffeine is a bitter alkaloid ($C_8H_{10}N_4O_2$) that is commonly found in coffee, tea, cacao, and kola nuts; it is often times used medicinally as a stimulant and diuretic. (Caffeine 1).

Caffeine was first discovered by Friedlieb Runge in 1819 while studying Arabian mocha beans (Brynmawr Education 1). Caffeine's effect on the heart is three steps: blood level of adrenaline (epinephrine) will increase leading to the force upon the heart to increase which will eventually increase the heart rate of the subject (Caffeine, Your Heart, and Exercise 1).

The human heart is a vital organ part of the circulatory system that pumps blood through blood vessels. This blood provides the human body with oxygen and nutrition and removes metabolic wastes. In humans, the heart is separated into four different "compartment," the upper left and right atria as well as the lower left and right ventricles. Caffeine however, increases the amount of epinephrine or adrenaline in the blood that is pumped through the body which increases the load on the heart which will eventually raise heart rates (Caffeine, Your Heart, and Exercise 3). Psychologist Norman B. Schmidt, PhD, finds that this raised heart rate may affect a person's psychological side and cause anxiety or panic attacks (Schmidt 1).

By testing how caffeine affects *Daphnia*, it can clearly show how caffeine directly affects humans. Studies find that although *Daphnia*'s heart is different from a human's, the side effects of one chemical will have the same result on a human. It is clear to see through this research that caffeine's effect on *Daphnia*'s heart rate will translate over to humans in such a way that humans as a whole will have a better understanding of how caffeine affects the human body's circulatory system.

Work Cited

“All About Heart Rate (Pulse).” American Heart Association. American Heart Association. July 2015. 29 November 2016.

American Heart Association created this website which provides facts backed by research and experiments which leads me to believe and trust their information. It gives example scenarios as well as key answers to my questions during research. This website tells about the human's' heart rate as well as how they change and adjust. This is the best source possible because it is credible and gives information about how heart rates work.

B., Melissa. “Does Caffeine Affect the Heart Rate of Daphnia?” *Selah. Selah.* 2001. 29 November 2016.

This website is a person who conducts an experiment similar to what I will be doing. The question of the science project was if caffeine affects the heart rate of Daphnia? It gives key information about what Daphnia is as well as tips about conducting the science fair project. Therefore, the information presented through this web article helps me in researching Daphnia and how caffeine affects heart rates.

Brunch, Jared. “Caffeine, Your Heart and Exercise.” *Everyday Health. Everyday Health.* 29 November 2016.

This website primary focus is caffeine, the heart, and the corresponding reactions caused by their interactions. Without this information, it would be impossible for me to have enough knowledge to create a hypothesis that makes sense. It defines caffeine and the heart in ways that could not be discovered in any other website. With the information provided from this website, I now have a better understanding about my project.

“Caffeine.” *Definition of Caffeine*. Merriam-Webster. 29 November 2016.

Merriam-Webster is a famous dictionary that is widely accepted. This website gives exactly what I need, information about caffeine. It defines this key term in such a way that it provides its chemical composition as well as its literal meaning. This is a reliable source because it is one that I can definitely trust and it provides me with key definitions.

“When Was Tea Invented? Who Discovered Caffeine?” Brynmawr Education. 29 November 2016.

This website provides me, the researcher, with key answers to questions that are essential to my project. One of the questions it answers is when caffeine was discovered and its ability to increase the amount of epinephrine. This website also tells about the origination of tea and who first found and correctly identified caffeine.