The Effects Caffeine Has On Zebrafish

By: Megan Ellis

Abstract

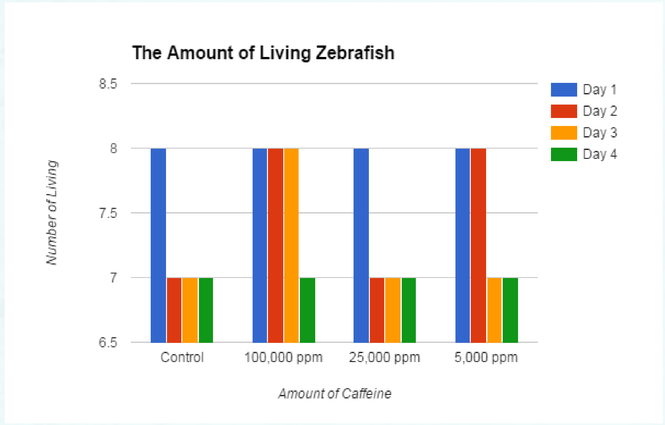
- The objective of this lab is to collect data on how zebrafish grow in their embryos and how fast they can fully develop in just a few days.
- Our objective is to expose zebrafish embryos to different types of Caffeine concentration then record the growth of development.
- Our groups hypothesis was correct after the embryos were exposed to Caffeine.
- When there is clear data that shows a big change on one specific chemical it is recorded and how the fish reacted to it. Then there is research if the chemical only happens to the fish, or if it could happen to humans as well.

Introductions

- Caffeine ($C_8H_{10}N_4O_2$) is the common name for trimethylxanthine. The chemical is also known as caffeine, theine, or mateine. Researchers have found that its effects are short-lived and it tends not to negatively affect concentration or higher brain functions.
- Hypothesis: If Zebrafish are exposed to Caffeine, their spines would become curved.
- How will Zebrafish development differ when there are different amounts of concentration to each well?

Materials and Methods

- 8 embryos were put into each well using an eyedropper.
- Each day we took an embryo and examined it under a microscope. We then recorded any changes in their growth daily compared to the embryos in the control well. We selected one person as our group's artist so she could record how the embryo looked in the developmental process from day to day.
- When the different strengths of the chemical was added to the wells, our group used a glass tray to place the embryos on once we took them out using the eyedropper. Once in the eyedropper had the embryos we had to make sure we would not return them into the old Insta Ocean, which would eventually get poured down the sink and replaced with new solution. We then put the new chemical solutions into the wells and put the embryos back into the original well with the fresh solutions.



The Amount of Living Zebrafish

	Day 1	Day 2	Day 3	Day 4
Control	8	7	7	7
100,000 ppm	8	8	8	7
25,000 ppm	8	7	7	7
5,000 ppm	8	8	7	7

Figure 1.1: Shows the amount of Caffeine in each well. Also shows the amount of dead embryos that we lost during the lab

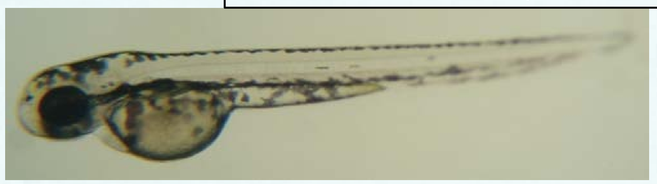


Figure 2.1: Zebrafish embryo with normal spine

Figure 2.2: Zebrafish embryo with curved spine that we saw during our lab

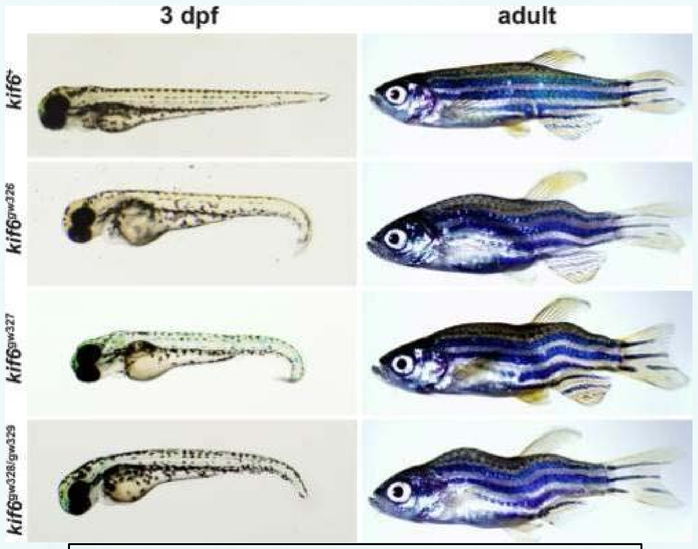


Figure 4.1: Shows the effects in the long run of Caffeine on the Zebrafish when they are growing until fully grown

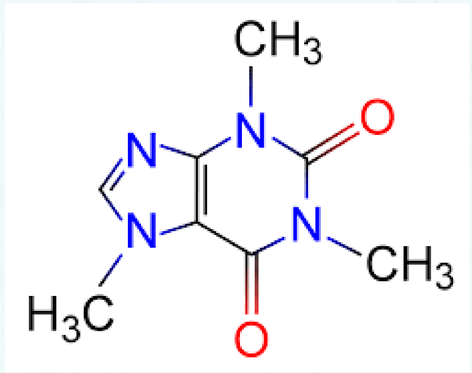


Figure 3.1: Molecular structure of Caffeine

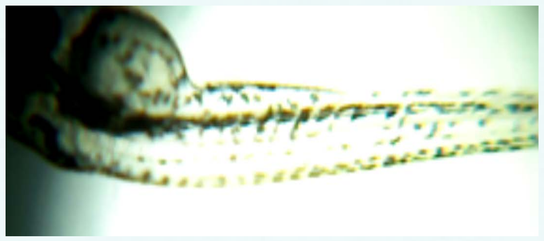


Figure 5.1: Embryo with a straight spine from our lab that was in 25,000 pmm of Caffeine

Results

- Independent Variables: ppm of Caffeine in each well.
- Dependent Variables: number of embryos alive per day and the straightness of the embryo's spine depending on the concentration of Caffeine they were exposed to.
- The purpose of the experiment was to determine what deformities can happen when humans ingest Caffeine and how it affects the fish embryos as well.

Discussion

- Embryos exposed to as little as 5,000 ppm of Caffeine developed no deformities. Embryos in 25,000 ppm also showed no deformities. When it came to the well filled with Insta-Ocean and 100,000 ppm of Caffeine only 2 embryos developed with curled tail shapes, while others had a sporadic and violent shaking throughout their body.
- Our hypothesis was correct when it came to the higher levels of Caffeine (100,000 ppm) as it caused a larger number of embryos to deform per day than any of the other wells and ppm. Those that survived had significantly curved spines as well as the sporadic shaking than those of the control group. This could help demonstrate why pregnant women should refrain from consuming large amounts of Caffeine while carrying a baby.
- An error occured when trying to retrieve an embryo from the well, one remained stuck in the top part of the eyedropper which almost caused a miscount of the surviving embryos.
- As a result of our data we can conclude that as our hypothesis stated, embryos affected by larger amounts of Caffeine have deformities such as curved spines and sporadic, violent shaking.

Works Cited

- "Caffeine+molecule - Google Search." *Caffeine+molecule - Google Search*. RESEARCHGATE, Aug. 2012. Web. 03 Jan. 2017.
- "Caffeine+molecule - Google Search." *Caffeine+molecule - Google Search*. WIKIMEDIA COMMONS, 28 June 20104. Web. 03 Jan. 2017.
- Sharp, Cassandra V. "Caffeine+molecule - Google Search." *Caffeine+molecule - Google Search*. Open Wet Ware, 7 Apr. 2015. Web. 03 Jan. 2017.
- "Zebrafish+embryo - Google Search." *Zebrafish+embryo - Google Search*. N.p., n.d. Web. 04 Jan. 2017.
- "ZFIN All Figures, Buchan Et Al., 2014." *ZFIN All Figures, Buchan Et Al., 2014*. N.p., n.d. Web. 06 Jan. 2017.