The Effect of Nicotine on Zebrafish Development

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Abstract

Over 1000 unborn children die every single year due to their mother smoking while pregnant (American Pregnancy Association, 2017). **The study being conducted is testing to see how nicotine affects the development of zebrafish embryos. Nicotine is a very harmful and deadly substance that is consumed while smoking, vaping, etc.** It carries through the bloodstream and if pregnant, will go straight to the embryo in the womb. We expected that there would be a correlation between a higher concentration of nicotine and the survival rate of the embryos. Fish embryos were exposed to different concentrations of nicotine and data was recorded on what percent of the embryos survived in each environment. Essentially, what was found was that with an increase of the concentration of nicotine, the more zebrafish that were found dead. **This further develops the idea of just how harmful nicotine is to embryos and stresses the importance of not exposing embryos in the womb to this harmful substance while pregnant.**

Introduction

Zebrafish are good models for studying development because they grow at an extremely fast rate, developing as much in a day as a human embryo does in a month.Nicotine users are more prone to diseases such as cancer, heart disease, stroke, lung diseases and diabetes (Centers for Disease Control and Prevention, 2018). It is a very harmful and deadly substance. It is important to note that what a mother consumes during pregnancy is the same as what the baby consumes. **Our investigation is going to be looking more in depth on how varying amounts of nicotine affect the development of Zebrafish embryos**. Using this information, we are going to draw a conclusion on whether or not it, in turn, affects human embryos in a similar way. This data is important in strengthening the argument that nicotine is a harmful substance, especially during pregnancy. **Our hypothesis is that when exposed to the highest concentration of nicotine, survival rates will go down 40%.**

Materials and Methods

- 12 wells containing about 75ml of liquid
- Large and small minimum bore pipettes
- Nicotine Solutions
- Large and small graduated cylinder for creating nicotine concentrations
- Microscope for examining fish (optional)
- 1 depression slide with a cover slip

1. Solutions are made and put into wells. Zebrafish embryos are placed in solutions using the pipettes.
2. Every 24 hours until 96 hours total, embryos are checked on and observed. The amount of fish Embryos alive in each well was observed and recorded.
3. On the final day final data was observed and recorded and fish eggs were disposed of in a proper manner.

Control Group: Fish embryos placed in the instant ocean solution

Independent Variable: The concentration of nicotine that the fish were exposed to.

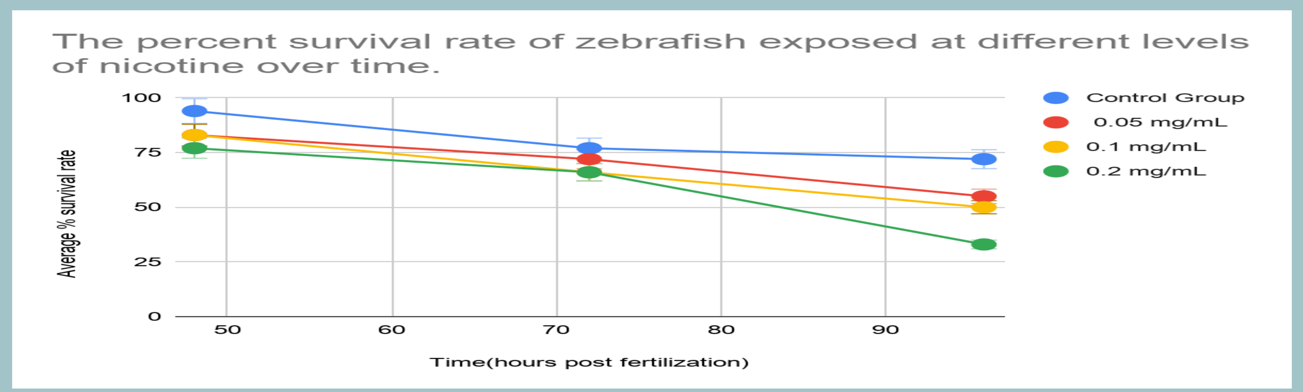
Dependent variable: The amount of embryos alive after intervals of 24 hours

Images

Zebrafish in highest nicotine concentration after 96 hours. Clearly underdeveloped egg, with deformities in the back, and one formed eye.

Zebrafish in control group 96 hours post fertilization. Healthy spine, with two full eyes.

Results



This Graph shows the average percent of zebrafish that survived per treatment at intervals of 24 hours post fertilization.

Results Summary

It was found in the experiment that after 96 hours, in the control group, 75% of the zebrafish lived. However, the group that was exposed to the largest concentration of nicotine had a 33% survival rate. This statistical test was taken to identify if varying levels of nicotine discreetly affect the development of zebrafish in seeing whether or not they make it to adulthood. The tests taken showed that with an increase of nicotine, an increased number of Zebrafish died during the experiment.

Discussion

The findings are important since they show a clear relationship between higher death rates among eggs that were exposed to nicotine compared to those that were not. This support are original hypothesis that the nicotine the eggs were exposed to, the higher the death rates that would occur among the eggs. **This is proven with only 33% of the eggs being alive in the 0.2mg/l 96 hour post fertilization, compared to 77% survival rate among the eggs in the control group after 96 hours post fertilization.** There were many limitations with lab, including not being able to put the solutions into the well until 48 hours post fertilization. In addition, some oddities occured in a couple of the wells, with the total number of fish being slightly uneven from day to day. In addition, time constraints made some days harder to properly observe the zebrafish development.

Citations

Health Effects. (2018, February 8). Retrieved from https://www.cdc.gov/tobacco/basic_information/health_effects/index.htm.

Johnson, T. C. (2018, November 10). Effects of Smoking While Pregnant: Dangers to Your Baby.Retrieved from https://www.webmd.com/baby/smoking-during-pregnancy#1.