Continued Exposure to Nicotine and its Effect on the Development of Zebrafish Embryos

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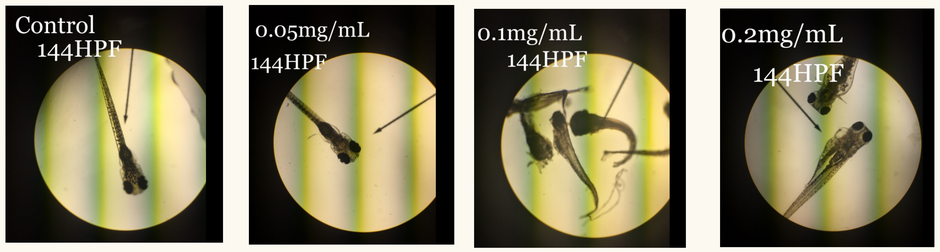
Abstract

Many pregnant women smoke cigarettes which contain the drug nicotine, nicotine is a drug that has been known to cause problems in babies and infants.. To test the effects of nicotine zebrafish embryos were placed in varied concentrations of nicotine from fertilization to four days after. Embryos were observed everyday. Some results included, disfigurement, underdevelopment, increased heart size, and discoloration. The results provided further evidence supporting the thought that nicotine affects babies and infants.

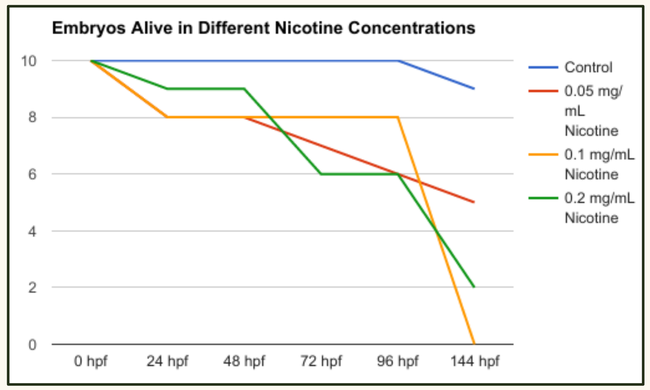


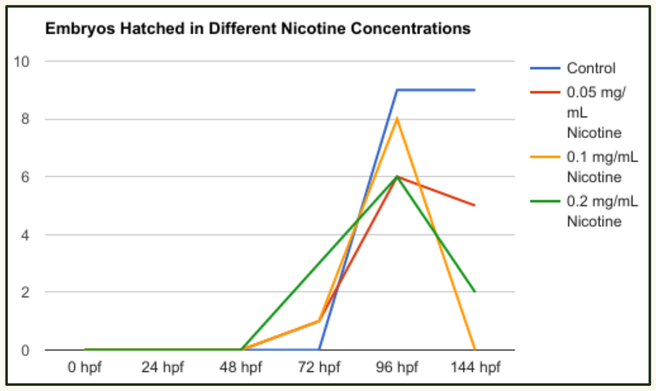
Methods

Day 1:All four wells were filled with 1mL of Instant Ocean. Three of the wells were filled with 1mL of their respective nicotine solutions. Ten embryos were added to each well. Individual embryos were obeserved. Observations were recorded on data sheets. The embryos were placed in a 28.5 degrees celcius incubator for rest if the day.
Days 2 & 3: Dead embryos along with waste solution was discarded into the waste beaker.The solutions were replaced by fresh ones. Embryos counted using the dissection microscope and were observed under a compound microscope. All observations was recorded in the data sheets. The embryos were returted to the incubator for the rest of the day
Day 4: Surviving were counted using the dissection microscope and observed under the compound microscope. All observations were recorded in the data sheets. All of the embryos, hatched fish, and solution waste were placed in the waste beaker. All of the embryos and hatched fish were euthanized at the end of day four.

Materials

- One plate with wells
- One pipette
- Depression slides
- One compound microscope
- One dissecting microscope
- One bottle of Instant Ocean/ Embryo Media
- Three separate bottles of nicotine containing different concentrations: 0.05,0.1, and 0.2mg/mL
- One beaker for waste
- One incubator set at 28.5 degrees celsius
- Zebrafish embryos





Introduction

The experiment was conducted in order to study the effects of nicotine in developing children. It was hypothesized that that embryos exposed to high concentrations of nicotine would suffer from slowed down development and underdevelopment.
The embryos were separated into their wells, the control with the embryo media and the rest of the wells with successively denser concentrations of the nicotine solution, the independent variable: concentration of nicotine and the dependent variable: number of live and hatched embryos along with their appearance and behavior.

The embryos residing in the nicotine solutions had premature hatching at 72HPF. The fish affected by the nicotine developed sooner but had more deformations (mainly tail and backbone) and differences in color and patterns, they stopped gaining color at 48HPF. The most clear deformations were the tails specifically the 0.2mg/mL solution at 96HPF. They also suffered from a rapid heartbeat.. At 144HPF the 0.2mg/mL batch had the most problems, some of the fish had physical deformities, were underdeveloped, had large heart sacs, smalls fins, large eyes, and they had the least color out of the rest of the whom resided in different solutions.

The results supported the hypothesis and provided further knowledge on the effects of nicotine during embryonic developmental stages. Most of the data we needed was found in the results but information on cognition, mental disabilities, societal issues, and behavioral issues was not found as it is not feasible with the current technology

References

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Results

Nicotine is a stimulant commonly found in cigarettes, it acts as a stimulant in small doses but can block the action of autonomic nerve and skeletal muscle cells in larger doses. Nicotine has been know to be smoked by around 15-20% of pregnant women, smoking during pregnancy has been shown to be correlated to premature births, underdevelopment, and behavioral issues though more research is still needed to provide further evidence on its effects, especially in babies and infants. Zebrafish are an ideal candidate to do research on due to their fast development which allows for fast experiments and quick results. Due to this, the experiment was done using zebrafish as the subjects. It was hypothesized that embryos exposed to high concentrations of nicotine would suffer from slowed down development and underdevelopment. The experiment concluded that the fish affected by the nicotine were underdeveloped and suffered many abnormalities such as spinal deformities and discoloration. Due to the current technology it was not possible to gather any data on their behavioral results and more research should be done on more ideal subjects.

Discussion

The experiment resulted in underdeveloped fish,obvious physical disfigurements, rapid development, and premature hatching. Rapid development may also lead to premature hatching which can be linked to the premature birth of babies.
This experiment concluded that embryos exposed to consecutively denser concentrations of nicotine were born prematurely, had discoloration, and wer deformed. These problems became more frequent and vsevere in higher concentrations of nicotine.
This experiment provided data on the physical effects of nicotine but further research should be done on the mental and societal impacts of nicotine in infants and children on more suitable subjects and with better technology.

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