



# Effects of Nicotine on Zebrafish Embryos



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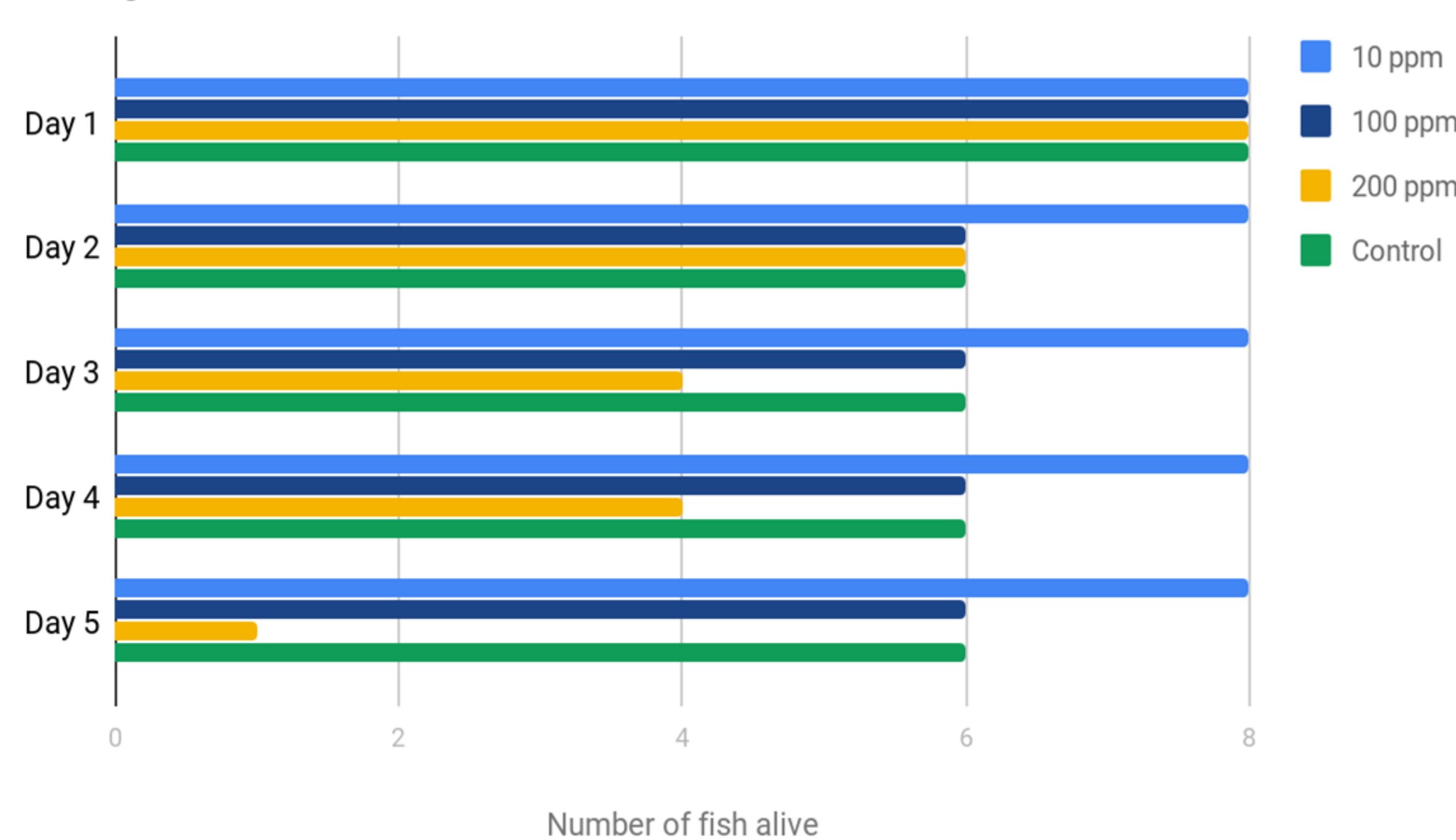
## Abstract:

In the U.S. there are approximately 15% of American women who smoke cigarettes during their pregnancy. This sometimes leads to their babies coming out premature because of the inhalation of nicotine. When the 15% of women continue to smoke it affects the development process because nicotine is so harmful to various steps of the development process. When nicotine is exposed to human body it is known to cause many problems. They can range from premature births to an high increase of the heart rate. Although all of these problems can happen to the human development process it can also occur during the development of the zebrafish embryo. Since zebrafish shared some similar characteristics to the human development process, zebrafish were an ideal subject to test. The purpose of this experiment was to see what outcome we would get when the zebrafish are exposed to a chemical with different concentrations. The chemical we decided to use was nicotine. To test this chemical (nicotine), zebrafish embryos were placed into a container that had many wells and four of the wells were filled.

## Introduction:

Over the past week, we studied the effects of nicotine on the zebrafish. Due to these past studies that have been done on nicotine and how harmful it can be, when we exposed the zebrafish embryos to nicotine we hypothesized that they would have some spinal defects and would be underdeveloped. We studied this chemical on the zebrafish because they develop fast and like I said before they have similar characteristics of the human development process. We filled the wells with various concentrations of nicotine, exposing the embryos to the harmful chemical. Throughout the five days, the development of the embryos were recorded, some of the embryos stayed alive some died. The effect of nicotine can affect any step in the development process causing the zebrafish not to develop right. This experiment tests the effects of nicotine on the development of the embryo.

## Living Zebrafish



## Materials/Methods:

- We used a falcon dish and added three different concentrations of nicotine into three of the wells, and filled one well with instant ocean as a control.
- In the first well, 10 ppm of nicotine was added, 100 ppm of nicotine was added to the second well, and 200 ppm of nicotine was added to the third well.
- Eight zebrafish embryos were then added to each well and the movements, color, and amount of living embryos were recorded.
- Each day the falcon dish was placed under the microscope to observe the amount of living embryos.
- They were also observed individually under another microscope and their development progress, movement, colors, amount of dead embryos, and any unusual observations were determined and recorded.
- The concentrations of nicotine were replaced each day to ensure an accurate concentration of nicotine.
- The remaining embryos in the falcon dish were then returned to the incubator.

## Number of Alive Zebrafish Embryos Per Day

Day	10 ppm of nicotine	100 ppm of nicotine	200 ppm of nicotine	Control
1	8 alive	8 alive	8 alive	8 alive
2	8 alive	6 alive	6 alive	6 alive
3	8 alive	6 alive	4 alive	6 alive
4	8 alive	6 alive	4 alive	6 alive
5	8 alive	6 alive	1 alive	6 alive

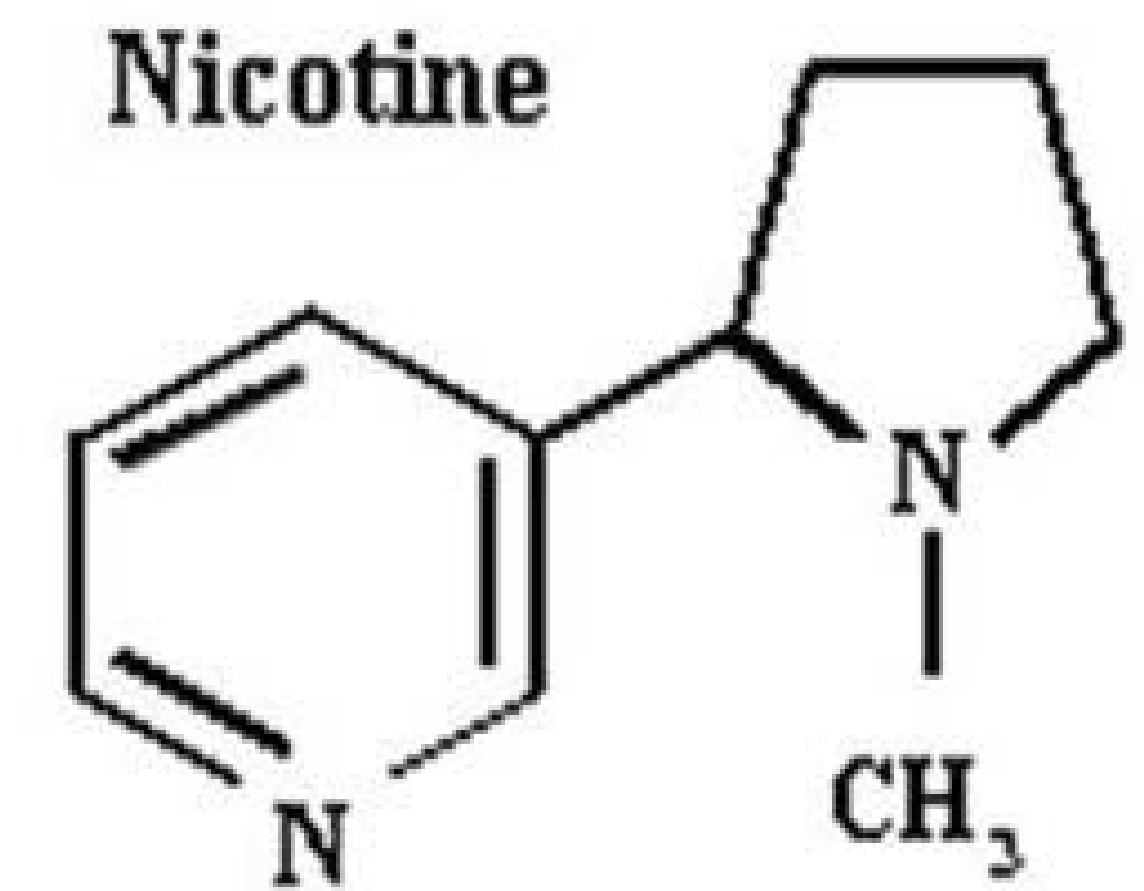


This embryo is in 200 ppm of nicotine. The picture of the embryo was taken on day 3 of the experiment. The zebrafish is still inside of its embryo and appears to be folded in half. The heart of the zebrafish also looks to be misshapen towards the tail end of the embryo.



This embryo is from the control group. This picture of the embryo was taken on day 3 of the experiment. The zebrafish appears to be developing normally, and has a straight tail, unlike the experimental embryos.

## Chemical Structure of Nicotine



## Results:

- Dependent Variables: The number of Zebrafish embryos that stayed alive after putting them in the Nicotine
- Independent Variables: The different concentrations of Nicotine
- Control: The control group was put into instant ocean and not Nicotine to show the effects of Nicotine on the embryos
- We were looking for spinal deformities, but it was hard to tell as they were still in the embryos and were under developed. Zebrafish embryos are used in this experiment because they are similar to human embryos. By using zebrafish embryos, we are able to identify similar effects that nicotine makes on the body that may occur in humans as well.

## Discussion:

When we started our experiment, we hypothesized that our embryos would develop a spinal deformity, or tail defect.. It was not apparent at first; because, the embryos development was slowed. One observation that we did not hypothesize, but had occurred was that the zebrafish were not leaving their embryos. The development of the embryos was delayed and most zebrafish were not outside of their embryos by the end of the experiment. The zebrafish that are stuck inside of their embryos are most likely not going to survive as they will develop quick enough in the future to survive and adapt to changes in their environment. Zebrafish and humans have very similar genes, and 84% of diseases in humans have a similar version in zebrafish. By having these similarities, it makes it a lot easier to test for diseases, disabilities, and effects made on zebrafish that also occur in human bodies.

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