Effects of Salt on Zebrafish Embryos

By: Jordyn Malnarick

Abstract:

The objective of this experiment was to develop a better understanding of the effects that salt can have on the development of organisms. In order to study this, zebrafish embryos were exposed to varying levels of concentration of salt, and their developmental processes were observed over the course of four days. Ultimately, it was found that exposure to high levels of salt can negatively impact the development of zebrafish embryos by slowing their growth. Zebrafish embryo growth is similar to that of a human embryo. Based on the experiment and data, if a mother consumes a large amount of salt while pregnant, the human embryo could potentially develop more slowly, mimicking the stunted growth that occurred with the zebrafish embryos.

Introduction:

- Salt is a mineral composed mainly of sodium chloride. It is present in most foods, but occurrs naturally in very small quantities. It is often added to processed foods to act as both a preservative and a flavoring.
- If consumed in high quantities, the kidneys can have a hard time keeping up with excess sodium in the bloodstream, and the body will hold onto water to dilute the sodium. This can potentially lead to high blood pressure, heart attack, and stroke.
- Zebrafish help researchers understand the development of vertebrates. Many scientist use Zebrafish to study because of their experimental advantages, such as their ability to reproduce at extremely high rates, and the speed at which they develop.
- How would varying levels of salt concentration affect the development of zebrafish embryos?
- Hypothesis: Zebrafish embryos kept in higher concentrations of salt will develop more slowly compared to those kept in freshwater.

Materials and Methods:

- Using a falcon dish, one well was filled with Insta-Ocean and three wells were filled with different levels of concentration of salt (60 ppm, 480 ppm, and 10,000 ppm).
- On the first day, 8 Zebrafish embryos were placed into each well. In total, there were 32 zebrafish embryos.
- Each day, the Zebrafish embryos were removed from their wells and examined under a microscope in order to observe changes in development. Any developmental changes were recorded.
- After the embryos were examined, the solutions were replaced each day to ensure cleanliness.

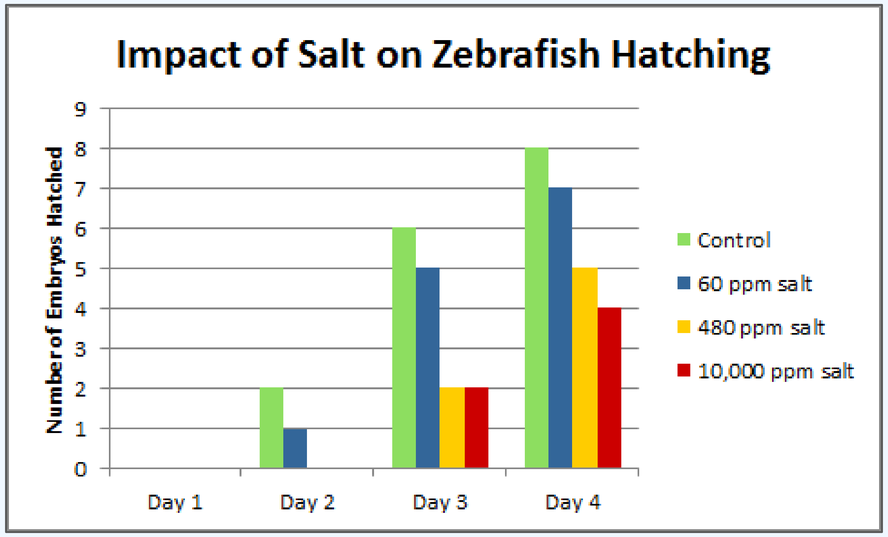

Figure 1.1 This graph illustrates the relationship between the level of concentration of salt and the hatch rate of zebrafish embryos.

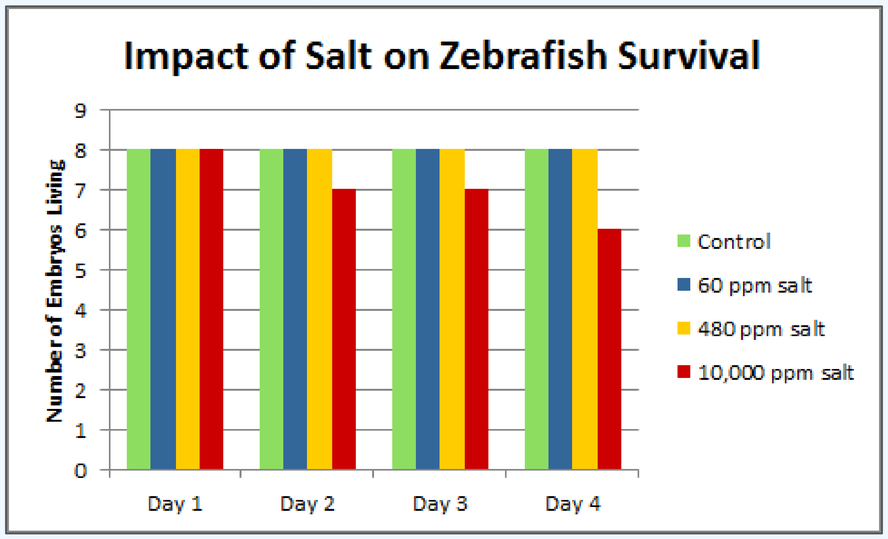

Figure 1.2 This graph illustrates the relationship between the level of concentration of salt and the survival rate of the zebrafish.

Treat-ment	Number of Starting Fish	Day 1		Day 2		Day 3		Day 4	
		Number Hatched	Number Living	Number Hatched	Number Living	Number Hatched	Number Living	Number Hatched	Number Living
Control	8	0	8	4	8	6	8	8	8
60 ppm Salt	8	0	8	3	8	5	8	7	8
480 ppm Salt	8	0	8	0	8	2	8	5	8
10,000 ppm Salt	8	0	8	0	7	2	7	4	6

Figure 1.3 This table states the number of zebrafish both hatched and living each day in each of the varying levels of concentration of salt.

Data Analysis and Discussion:

- In general, our hypothesis was correct in that a higher level of concentration of salt caused fewer of the zebrafish embryos to hatch.
- There was a possibility for error in recogizing and recording of the exact stage of development each embryo was in.
- Based on the information gathered, it can be hypothesized that an excessive amount of salt consumption could potentially lead to slowed development of human fetuses.

Results:

- In this experimental design, three Falcon dishes were filled with varying levels of salt (60 ppm, 480, and 10,000 ppm) and one Falcon dish was filled with Insta-Ocean and used as the control. Eight zebrafish embryos were placed in each dish, and observations were made regarding the development of the embryos every day for four days.
- Independent variables: Varying levels of salt concentration in each well.
- Dependent variables: Number of embryos alive each day, number of embryos hatched each day, stage of development of the embryos in the varying levels of salt concentration.
- After observing the embryos for four days, we came to the conclusion that zebrafish embryos exposed to higher levels of salt concentration develop more slowly compared to those in lower levels of concentration.

Figure 2.1 Zebrafish embryo that has been exposed to 10,000 ppm of salt, 96 hours past fertilization; Illustrates the stunted growth that occurs as a result of exposure to high levels of salt concentration.

Figure 2.2 Normal zebrafish 96 hours past fertilization.

Work Cited:

"Health Risks and Disease Related to Salt and Sodium." *Hsph.harvard.edu*. Harvard School of Public Health, n.d. Web. 8 Jan. 2017.