

* The Effect of Various Vitamins and Supplements on Zebrafish Embryos

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Introduction

A commonly debated topic is whether or not daily vitamins are beneficial to one's health. But, in the case of early development stages of pregnant women, vitamins and minerals are highly recommended. The purpose of this experiment was to determine the effects of Zinc, Folic Acid, and Prenatal Vitamins on the embryonic development of Zebrafish. Folic acid aids in cell division and neural tube development, Zinc is beneficial in helping cells grow and replicate, and prenatal vitamins are useful in filling any nutritional gaps. There is controversy over taking vitamins and nutrients, and whether it actually helps the development of embryos or not.

Hypothesis: If Zebrafish embryos are exposed to beneficial nutrients in concentrations proportional to human doses, then they will develop and function normally because their intake of the nutrient is considered healthy and balanced.

Materials and Methods

- Pipettes
- Instant Ocean
- Zebrafish Embryos
- Multi-well plate
- Solutions of folic acid, zinc, and a prenatal vitamin

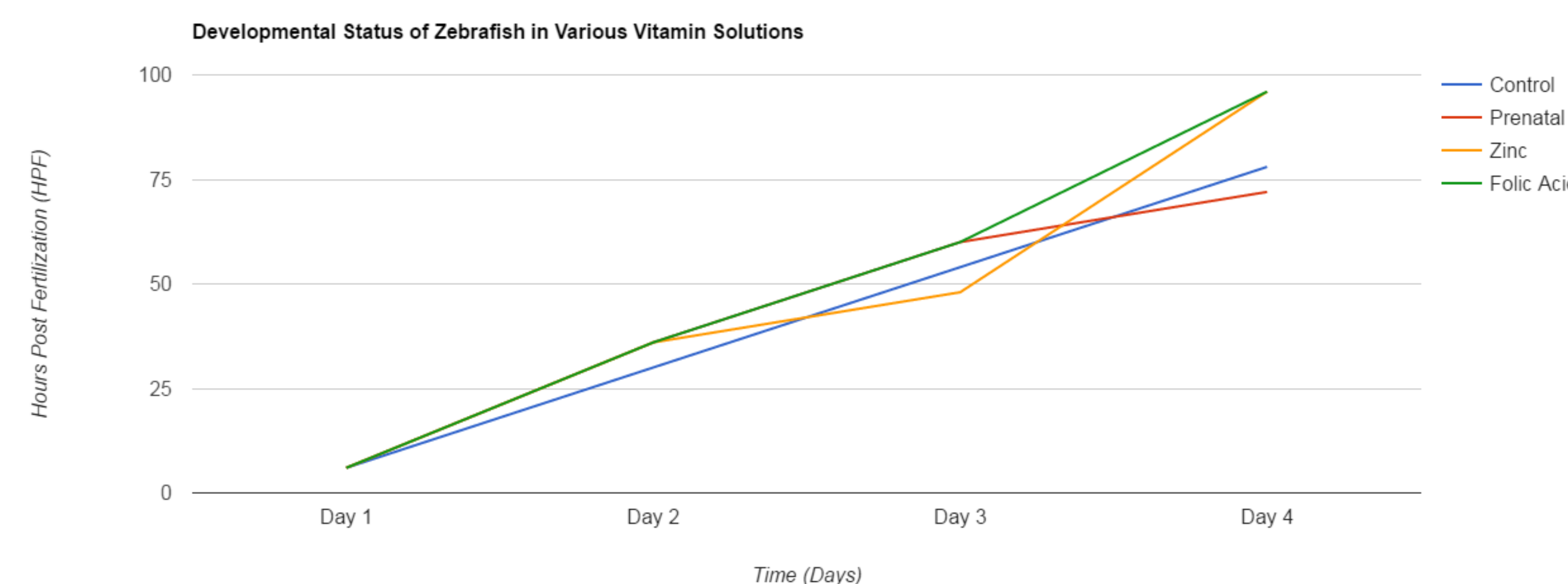
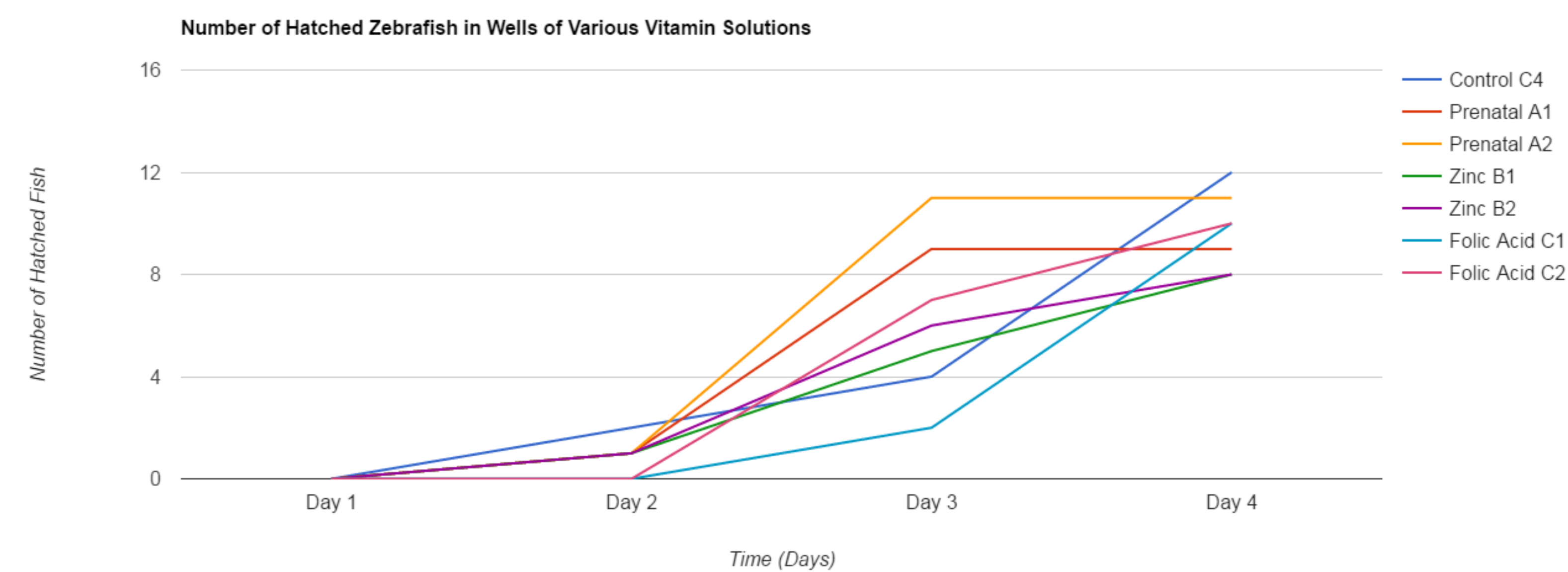
We made the solutions using serial dilutions to create 10×10^{-7} concentrations (proportional to recommended human doses)

10-15 embryos were placed in each well; 1 control well with 7mL of the instant ocean, 2 wells with 4 mL of folic acid solution and 3 mL of instant ocean, 2 wells with 4 mL of zinc solution and 3 mL of instant ocean, and 2 wells with 4 mL of prenatal solution and 3 mL of instant ocean.

These solutions were replaced every day after the number of dead, alive, and hatched embryos were recorded (the same concentrations were maintained). Over the course of 4 days, the embryos were looked at under a microscope so data on the embryo state of growth could be recorded.

Abstract

The purpose of this experiment was to determine the effects of three of the recommended nutrients for embryonic development. Concentrations of zinc, folic acid, and a prenatal vitamin in proportion to human doses were combined with the instant solution for the embryos to reside. The hypothesis was supported by the results because the nutrients proved to not do any harm to the normal development of the embryos.



Observations

Day	Observations
Day 1	<ul style="list-style-type: none"> •None of the embryos hatched but one from the A2 well died •Zinc embryos were not as developed or active as the prenatal were
Day 2	<ul style="list-style-type: none"> •None of the embryos died •1 embryo in A1 hatched, 1 embryo in A2 hatched, 1 embryo hatched in B1, 1 embryo hatched in B2, 2 embryos hatched in control, none hatched in C1 or C2. •Zinc embryos were dark compared to control embryos
Day 3	<ul style="list-style-type: none"> •None of the embryos died •9 embryos hatched in A1, 11 embryos hatched in A2, 2 embryos hatched in C1, 7 embryos hatched in C2. 5 embryos hatched in B1, 6 embryos hatched in B2, 4 embryos hatched in control •Hatched prenatal had dark spots on them and were swimming actively
Day 4	<ul style="list-style-type: none"> •4 embryos died in A1, 1 embryo died in A2, no embryos died in C1 or C2, 2 embryos died in B1, 3 embryos died in B2, 3 embryos died in control •The remaining embryos had all hatched •The hatched embryos moved slower than the previous days

Results

The experiment was designed to study the successful survival of Zebrafish embryos in the different solutions of a Zinc supplement, Folic Acid supplement, and Prenatal vitamins. The success rate was measured by percentages of alive fish and hatched fish. The independent variable was the different solutions in each well. The dependent variable would have been the percentage of dead, living, and hatched fish. The control was the group of fish placed in solely dechlorinated water and instant ocean solution. The data in the graphs and tables suggest that the three vitamin and mineral solutions used in this experiment are beneficial to early stages of development in the embryos. It was inferred that once the zebrafish had hatched, after hatching the benefits of the solutions were not as prominent.

Discussion

In controlled conditions 60-70 percent of zebrafish generally survive to the hatching stage. The data collected supported this report. This survival rate is comparable to the survival rate of a human embryo, which is about 66 percent. The results supported the hypothesis that Zinc, Folic Acid, and Prenatal vitamins would benefit the survival rate of the embryos. While not all of the fish in the supplemental solutions survived, the survival rate did increase in all solutions, compared to the control. The Zinc supplement and Prenatal vitamin increased the survival rate by 10-20 percent. In this experiment the Folic Acid groups had a 100 percent success rate, increasing the chances of living by close to 40 percent. Limitations of this experiment were the number of available Zebrafish embryos. There were only enough embryos for two trials of each solution. Time was also a limiting factor, the Zebrafish could only be studied one hour out of the day and not over a long period of time. While the experiment did not prove the it is essential to take vitamins or supplements to develop a healthy baby, it did greatly increase the chance of living to birth or in this case, hatching. It may be best of pregnant mothers to incorporate a supplement of Folic Acid or a Prenatal Vitamin containing Folic Acid and other supplements into their daily routine.

References

Marks, S. (2012, June 14). 8 Nutrients Most Essential for Fetal Development. Retrieved from <http://www.healthinsurancequotes.org/8-nutrients-most-essential-for-fetal-development/>