# BPM in direct proportion to applied ethanol in chick in a boat of Fetal Alcohol Syndrome

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## Introduction:

Fetal alcohol syndrome (FAS) is a pattern of physical and mental defects that can develop in a fetus prenatally. According to the Europe PubMed Central significant alcohol ingestion during pregnancy can cause a spectrum of malformation of various degrees of severity in offspring. The full expression of FAS includes reduced growth, facial anomalies, and mental disabilities. Affected infants are usually of near-term gestation, but small in weight and length. They continue to exhibit decreased growth postnatal. Mental retardation appears to be related to the degree of dysmorphic severity of appearance. It is primarily caused by central nervous system pathology rather than social environment (Miller M, Israel J, Cuttone J). Another big defect on the fetus is the heart; congenital heart disease is common in children with FAS. The most common problems are atrial septal defects and ventricular septal defects but more complex and even lethal lesions may arise. In our developmental biology lab, we conducted study where we exposed chick embryos to different levels of Ethyl alcohol and observed and recorded the different effects on the embryo. One thing we observed were the chicks' heart, specifically their BPM. If a chick embryo is exposed to Ethyl alcohol, and the more is it exposed, then it will have a slower heart rate than the control chicks.

## Materials/Methods:

- your lab notebook
- your instruction sheets from *A Laboratory Text for Developmental Biology* (by P.B. Armstrong et al. Kendall/Hunt Publishing Co. 1994.)
- other materials as described below and in the P.B. Armstrong protocol.

Ten-day chick embryos (Gallus gallus) were explanted from their shells as per the method of Morris (2015) and Armstrong, et al., (1994) except that a sterile weigh boat was used instead of a sterile hammock described by Armstrong. Ethyl alcohol was administered to each embryo to achieve a final concentration on-the-cells of 0.0 % (for control), or 0.002% (for low ethanol dose), or 0.02% (for high ethanol dose). Penicillin/streptomycin was also added to each embryo to achieve a final concentration on-the-cell of 100 U mg/ml. Over the course of seven days, I would go in, observe and take measurements of all my chicks in a boat. The measurements I took were time of measurement, microscope magnification, pulse, area vasculosa diameter, body length, wing bud length, leg bud length, and allantois width. I measured the diameter of area

vasculosa (along longest axis), the wing bud length (base to tip), leg bud length (base to tip), allantois width (along longest cross axis) and body length (along the longest axis). To get the BPM (the topic of interest), I would count the number of heart beats within a 15 second timeframe. I would set the timer for 15 seconds and my lab partner would press start. Once the 15 seconds were over, I would have my heart rate and multiply it by four because there are four 15 second period within a minute. This is would ultimately give me an accurate BPM. I would do this my all my chicks, in my case only being two. I would stop calculating the BPM when I observed through the microscope that were was no longer a pulse. Having an experimental chick and a control chick were critical in examining whether or not the ethyl alcohol had an effect on the heart.

# Results:

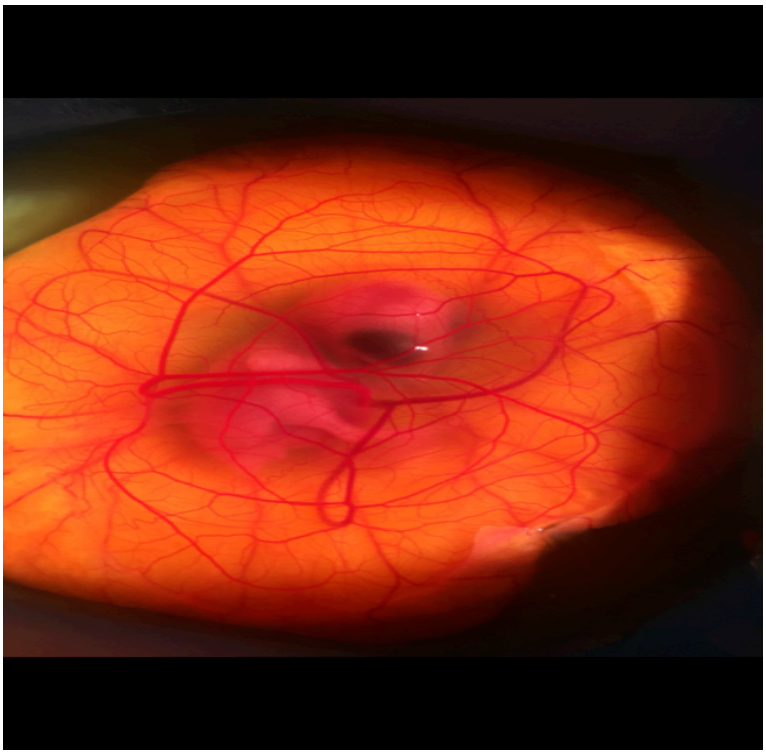

Fig.1 Chick embryo on day 7 of study. Developed some digits and it is the control. (sweet,Will)

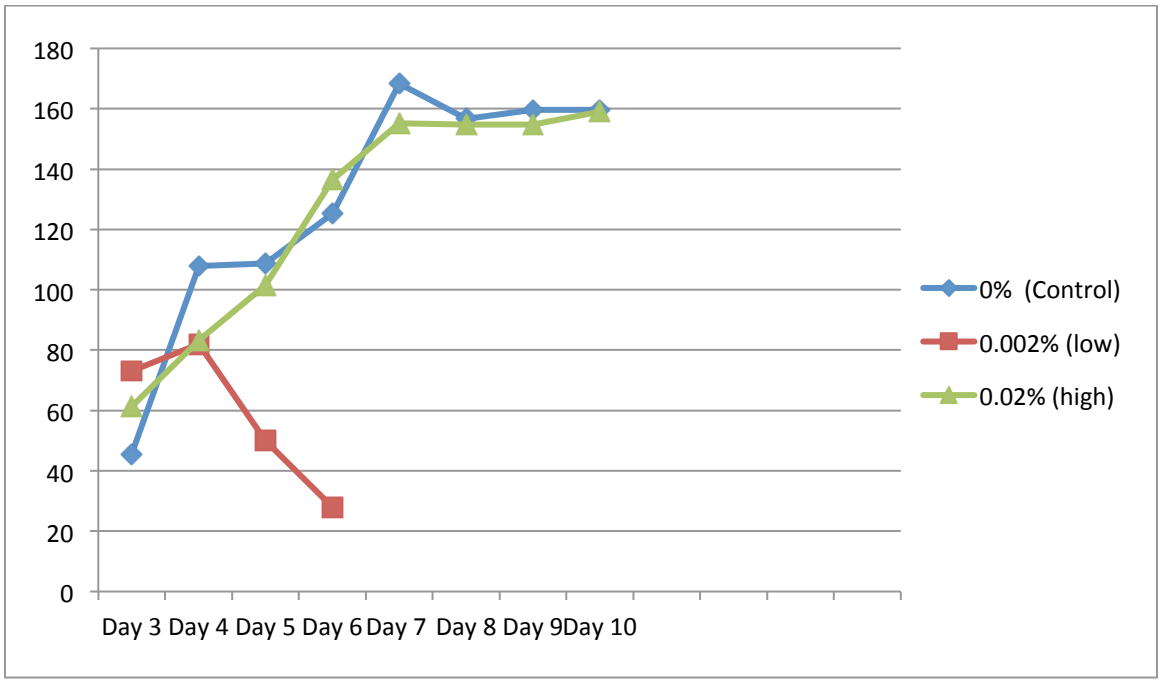


Fig.2 The average of the beats per minute for all three different chicks in a boat. The average is, for the span of 7 days, based on the class' data.

The control or 0% chick in a boat had the highest on average BPM for all seven days. The high or 0.02% had the second highest on average BPM and the low or 0.002% had the lowest on average BPM. The low concentration having the lowest BPM could be due to that there were only 3 students who had these embryos and they died only after 3 or 4 days. The low concentration may have been drastically different if every student were able to have this chick; it is not the best representation of the low concentration BPM but does show how ethyl alcohol can decrease BPM. The high concentration slightly overlapped with the control but overall the control had the highest BPM on average. The overlapping is more evident near the last couple days of the study. It is not evident in the graph but the control had the most chicks live throughout the seven days, which indeed could affect what the average BPM is for that group. Both the control and the high concentration had a steady increase over the course of the seven days.

# Discussion:

Ethyl alcohol does have an effect on BPM for chicks. The control group had the highest on average BPM for every single day over the course of the seven day study. The control also had the most the chicks come out alive at the conclusion of the study so for the high and low concentration chicks, it was hard to get an accurate representation of their BPM because a good amount of them were deceased. These chicks had FAS which is why they passed away during the study; without a heartbeat, these chicks cannot live. The lower BPM or no heartbeat at all could be due to congenital heart disease which is a side effect of FAS according to Dr. Larry

Burd (Congenital Heart Disease and Fetal Alcohol Spectrum Disorders). It would be interesting to see if there were other heart defects other than congenital heart disease that were a side effect of FAS. In the future I would do study where I would measure the heart's width and length as well as take the BPM to see if an enlarged heart was also a factor in the heart defects of an organism with FAS. But for this study, my hypothesis in general was supported because the control group had the highest BPM out of all three groups.

References

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