Journal of Emerging Investigators
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Biology: Alcohol and endocrine development

Paper citation: Payne EM, Moonis ZM, DeMaria M (2013). The Effect of Ethanol Concentration of Beta-cell Development in Zebrafish. J Emerging Investigators *17*: 1-7

Paper questions

In reading through the assigned paper, please answer the following questions:

1. What is fetal alcohol syndrome?

Fetal alcohol syndrome (FAS) is a condition caused by alcohol consumption of the mother during fetal development. It is associated with a host of developmental defects.

2. What is the question being investigated by the researchers?

Because FAS is correlated with diabetes, the authors want to know if exposure to alcohol during embryonic development can cause damage to β-cells (the cells in the pancreas that secrete insulin).

3. What are some normal functions of a healthy endocrine system?

The endocrine system releases peptides and signaling hormones to regulate critical body functions such as regulation of blood glucose.

4. Why are the zebrafish an appropriate animal model for development and toxicology studies?

Zebrafish have many available genetic mutant lines, their eggs are transparent and can be easily observed, they have a short generation time, they reproduce in high quantities (up to 200 embryos a week!), and develop organs in a fashion analogous to human organ development.

5. What are fluorescent proteins, and how are they used in scientific research?

   Fluorescent proteins are proteins that emit particular wavelengths of light when excited by a different wavelength, allowing scientists to visualize cells when they otherwise might be hard to see. The authors use a fluorescent protein called 'mCherry' in order to indicate the location and shape of β-cells in the developing zebrafish.

6. Describe the authors' experimental approach. What concentrations of ethanol do they test?

   The authors incubate zebrafish embryos in a range of ethanol concentrations in water from 0% to 2%. Fifty embryos were incubated in each ethanol concentration for 8 hours, starting at 12 hours post fertilization (hpf),

7. What were the results of the authors' experiments, and what is their interpretation?

   The authors found increasing abnormalities in β-cell clusters as the concentration of ethanol was increased.

8. What are some shortcomings of this paper?

   The authors classify β-cell abnormalities in a 'qualitative' manner, by looking at the clusters and attempting to classify them. This approach is subject to human error. In addition, the authors suggest that some of the mCherry fluorescent protein may have been 'bleached' by too much exposure to light while other fish were being imaged. In addition, the ethanol concentrations to which the fish were exposed are much higher than those which a developing child would be exposed to during embryonic development in humans.

9. Propose two follow-up experiments that could be performed given the data presented in this paper.

   The authors could try exposing the zebrafish to ethanol at different stages during their development to see when ethanol is most damaging to in β-cell development. In addition, the authors could use lower concentrations of ethanol that were added to water over a longer timecourse.