Lead’s effect on learning and memory in zebrafish  
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Introduction
- We studied zebrafish (*Danio rerio*) learning and memory when exposed to lead.
- The zebrafish was used as a model for human learning and memory.
- The lead exposure of the zebrafish is the time equivalent of the first trimester of human fetal development.
- According to other research when lead exposure occurs in the womb, the central nervous system is affected.
- Our goal is to quantify the learning and memory cost of early exposure to lead.

Methods
- Using the T-Maze (Image 1), the zebrafish was allowed to acclimate for 5 five minutes.
- We then selected the direction we would like the fish to go (right or left).
- The fish was given 15 seconds in the starting position. We then released the fish and watched the fish chose a direction.
- If the fish went in the correct direction, they were allowed to roam for 45 seconds.
- If the fish chose the wrong direction, we scooped it up with a net and immediately put it back to the start to try again. The fish must get 5 out of 6 attempts correct in order to meet criteria.

Results
- Graph 1 shows that the control fish was able to meet criteria (5 of 6 correct) earlier than the lead exposed fish each day.
- Graph 2 shows that the lead fish were more likely to repeatedly get the direction wrong and continually made the wrong choice even after corrections and retraining.
- The lead fish were less cognitively flexible. Graph 3 shows that the lead exposed fish were only able to complete one reversal of the task during the 3 days of testing. While the control fish were able to complete 4 reversals.

Discussion
- From our investigation, we were able to detect a difference between the ability to learn and remember for lead exposed fish and control fish.
- The lead exposed fish took longer to learn (graph 1). They made the most mistakes in a row (graph 2), and were less cognitively flexible (graph 3).
- Our study reinforces our understanding that lead is detrimental to learning and memory. In a similar study, a similarly conditioned fish’s ability to find food was tested. They found that the fish exposed to lead had a significantly decreased accuracy and increased time when finding food. (Chen, 2012)
- Our finding suggest that early exposure to lead can have lasting consequences.
- More research should be done to investigate the physiological mechanism behind this trend in behavior.

Reference

Graph 1. Mean number of trials for the zebrafish to meet criteria (5 of 6 correct trials)
Graph 2. Longest string of incorrect trials.
Graph 3. Number of reversals completed by each group of fish throughout the study period.

Image 1. T-maze