Developmental Behavioral Alterations Following Lead (Pb) exposure in the Zebrafish Model System

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Abstract
Lead (Pb) is a toxic heavy metal of concern that can be found in drinking water, dust, and soil. Environmental exposure to lead has been associated with neurological alterations in both adults and children. Numerous studies have suggested adverse health outcomes caused by the neurotoxic effects of lead and its ability to interfere with many physiological processes in the central nervous system. For example, epidemiological studies indicate lead can induce neurobehavioral alterations and cognitive impairments that result in lowered intelligence quotient and increased risk for attention deficit hyperactivity disorder (ADHD), a mental health disorder caused by hyperactive and impulsive behavior. This study used the zebrafish model to investigate the developmental toxicity effects of exposure to nonlethal concentrations of lead from 1 to 120 hours post fertilization (hpf).

Methods
Adult AB zebrafish were bred to produce embryos. Embryos were collected and dosed within 1-hour post fertilization (hpf) in 0, 10, 50, 100, 500, or 1000 ppb of lead (as lead acetate) through 120 hpf. Dosing was repeated seven times (N=7).

Results
Behavioral visual motor response assay at 120 hpf using Noldus Daniovision

Results (continued)

Conclusions
- Results from the visual motor response test showed that zebrafish larvae exposed to lead during embryogenesis display various changes in behavior depending on lead exposure concentrations.
- Increased behavioral and locomotor activities were observed at lower concentrations of lead.
- Alterations in behavior may be indicative of improper central nervous system development, specifically the sensory-motor pathways in the brain as observed in other studies.
- The findings of lead toxicity will be used as a reference for future studies comparing single metal toxicity to mixture (lead and arsenic) toxicity to elucidate the interactions between the two metals and their combined toxicity.

References

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