Chinese Mystery Snails Exhibit Behavioral Changes Potentially Linked to Gut Microbiome Disruption Following Arsenic Exposure

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The 1993 ASARCO smokestack implosion dispersed Arsenic (As) throughout lakes and sediment across the Puget Sound. As is a cytotoxic metalloid that has been shown to alter the neurophysiology and gut microbiome composition of diverse organisms in freshwater systems. Emerging evidence suggests that the gut microbiome modulates host fitness, including feeding behavior and central nervous system communication. As bioaccumulates in the gut of Chinese Mystery Snails (CMS) living in As contaminated lakes. As exposure has been shown to shift gut microbial populations in another species of freshwater snail, prompting our research teams' active investigation on the potential impacts of As exposure on the CMS microbiome composition. These findings raise questions about the potential effects that As exposure has on snail host physiology, especially gut-nervous system communication. We sought to investigate the effects of As exposure on CMS behavior and hypothesized that As-exposed CMS would exhibit reduced feeding behavior and motility due to altered gut microbiome composition affecting gut-nervous system communication. Lab acclimated CMS were either exposed to 0ppm As (control) or 0.2ppm As (experimental) for seven weeks prior to conducting mobility and feeding assays. After the behavioral assays were completed, snails were dissected for DNA extraction. We found that As-exposed snails showed decreases in feeding behavior, but no detectable changes in overall mobility compared to controls, suggesting that As-induced microbiome disruption may mediate feeding behavior by influencing gut-nervous system communication. Next steps include sequencing the 16S rRNA gene to assess and compare microbiome diversity, as well as PCR amplification of As-metabolism genes (ArsB, ArsM, AioA, and ArrA) to evaluate their presence and relative abundance between treatment groups.