Behavioral and Gut Microbiome Impacts of Arsenic Exposure in Chinese Mystery Snails

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Historical smelter operations have posed a threat to environmental safety by leaving persistent arsenic (As) contamination in urban lake sediments within the South Puget Sound lowlands. The Chinese mystery snail (CMS), which inhabits littoral zones with high arsenic bioavailability, provides a useful model for evaluating contaminant effects on aquatic organisms. Understanding CMS behavioral responses to arsenic exposure may help explain how they accumulate and transfer arsenic through the food web, by monitoring its potential effects on CMS feeding, movement, and predation. In this experiment, we examined how arsenic alters snail feeding behavior. Studies in other animals have provided evidence that gut microbiome alterations can directly modulate host behavioral responses. Thus, we hypothesized that arsenic exposure might alter feeding activity of CMS and that arsenic-induced microbiome alterations contribute to these behavioral changes. To test this hypothesis, we conducted laboratory-based assays with acclimated, lab-raised snails including a control (0 ppm As) and experimental group (0.2 ppm As). We found that As-exposed CMS exhibited a reduction in feeding behavior versus controls. This observed reduction in feeding activity suggests that chemoreceptor function in the CMS brain may be impaired. Given that gut microbiota can influence host sensory behavior, we also conducted gut tissue DNA extraction and PCR, to characterize microbiome composition. Our sequencing attempt was unsuccessful, however, we aim to refine our DNA extraction protocols to improve our ability to characterize microbiome

composition. In future experiments, we also plan to investigate how water temperature affects CMS feeding behavior under control and arsenic-exposed conditions.