Examining Variations in Microbial Communities and Establishing Biomarker Assays for Stress Induced Physiological Changes in Freshwater Snails in Arsenic Contaminated Ecosystems

The air pollution caused by the ASARCO copper smelter in Tacoma, Washington has led to traces of heavy metals such as arsenic in the soil and lakes around the Puget Sound area. Our research aims to observe variations in taxonomic diversity and abundance of bacteria in relation to variations of arsenic concentrations when comparing ecological compartments [sediment, water, plants, and Chinese Mystery Snails (CMS) visceral mass] of samples collected from lakes in Puget Sound: Pine Lake (little to no [As]), Steel Lake (moderate [As]), and Lake Killarney (high [As]). We hypothesized a variation in microbial community when comparing the 4 ecological compartments and variations in measured physiological stress on CMS between lakes utilizing Heat Shock Protein 70 (HSP70), a protein expressed in response to stress, as a biomarker. We used mass spectroscopy to measure arsenic in the samples from each compartment. To identify taxonomic diversity and abundance of bacteria, we sent those same samples out for Next Generation Sequencing of the 16s rRNA gene. We performed HSP70 immunoblots of the CMS snail gut samples to assess for physiological stress and determine usefulness of this biomarker. We found that arsenic concentrations are highest in Lake Killarney. The abundance of Phyla and Order of microbial communities show similarities between Lake Killarney and Steel Lake. Additionally, we found that HSP70 is not a good indicator of stress resulting from chronic As exposure in CMS. This study allows for a better understanding of the effects of the copper smelter on the Puget Sound ecosystem.