Looking at the Physiological Stress in Snails from Arsenic Contaminated Lakes

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Arsenic contamination poses a threat to ecological systems and the organisms that reside within these contaminated areas. The Asarco Company operated a copper smelter in Tacoma, WA that created pollution consisting of arsenic, lead, and other heavy metal contaminants that settled in the soil and water sediments around Puget Sound in Pierce County and Federal Way area. Our research focuses on the physiological effects of arsenic contamination in snails and the impact seen in this organism's microbiome. Previous research noted that snails from Lake Steel and Killarney contained the highest levels of inorganic arsenic within their tissues due to their ability to filter phytoplankton from the water. We deduced that if snails were fed with high arsenic exposed plants and plant associated microbes, then their microbiome would be impacted and its physiological stress response could be monitored via Hsp70 expression. For our portion of the research, the foot region of the snail was examined for the presence of arsenic. A Western blot analysis was completed to determine relative levels of Hsp70 expression present in Chinese Mystery snail tissue samples. No indication of Hsp70 expression was noted for any of the treatment groups. Bacterial sensitivity towards arsenic concentration and antibiotic resistance was examined in bacterial colonies present in different tissues isolated from Apple snails. Apple snail antibiotic sensitivity results were used to draw a comparison of possible effects seen in Chinese Mystery snail microbiota. Bacterial colonies were observed to be sensitive to certain antibiotics but resistant to As(V) plates. Overall results indicated that Hsp70 expression was seen in tissue samples consisting of the head or gut region of Chinese Mystery Snails fed with plants and associated microbes from Lake Meridian plants [low As]. Foot and upper mantle/gut samples had no expression of Hsp70 regardless of whether snails were fed with plants that contained higher or lower levels of arsenic concentration. Antibiotic sensitivity results indicated that bacterial colonies found within the distinct regions of the snail were all affected by Kanamycin (Kan) and Chloramphenicol (Clm), which was supported by previous data regarding antibiotic sensitivity seen in periphyton. High levels of inorganic arsenic present in lakes can lead to the bioaccumulation of arsenic in primary producers such as periphyton and phytoplankton that are consumed by lower trophic consumers such as snails. This leads to a trophic transfer of arsenic and microbiota from the periphyton to these snails, therefore, antibiotic sensitivity between these organisms may overlap due to similarities in their bacterial communities. Future research should examine whether physiological stress induced by antibiotics will impact the Chinese Mystery snail's microbiome and determine which biomarkers can be used to monitor this physiological effect.