

Title: Examining the Physiological Stress Response of Snails Exposed to Environmental Toxins

All authors: Carolyn Gonzalez, Yuen Yi Pak, Emmanuel P Vululleh, Dr. Sarah Alaei Ph. D

Abstract:

The Asarco Company operated a copper smelter in Tacoma, WA that generated significant amounts of heavy metal contaminants that settled on the soil and water sediments around the Pierce and King County areas. Our current research focuses on understanding the physiological effects of arsenic contamination in snails and how their microbiome is impacted by this arsenic exposure. Previous research had noted high levels of inorganic arsenic in tissue samples of snails collected from Steel Lake and Lake Killarney. Therefore, snails were fed with plants from three different lakes that contained distinct arsenic concentrations (Meridian- Low [As], Steel- Mod [As], Killarney- high [As]) and were monitored via Hsp70 expression to determine whether a physiological stress response was induced. Results indicated that Hsp70 expression was induced in the head & gut tissue samples of snails fed with plants and associated microbes from Lake Meridian (low [As]). This result suggested that environmental factors other than arsenic exposure may have impacted Hsp70 expression in this experiment. Thus, we shifted our focus to the development of a lab-based system where we could manipulate one variable at a time. Development of a more tractable system is needed for future experiments. Lab reared snails were next exposed to distinct concentrations of chloramphenicol (50 ug/ml, 50 ng/ml, 50 pg/ml) to disrupt the snails' microbiota in a controlled environment and test the development of biomarker assays. Snails (30 days of age) exposed to chloramphenicol were noted to induce Hsp70 expression at all concentrations tested. Additionally, the microbiota of lab reared snails were tested for determining antibiotic sensitivity towards ten widely used antibiotics. Antibiotic sensitivity was noted in bacterial colonies exposed to tetracycline (30 ug) and novobiocin (30 ug) but were not as significantly impacted by chloramphenicol (30 ug). Future studies will consider whether the Hsp70 expression seen can be attributed to antibiotic toxicity or disruption of the snail's microbiome. Future experiments will focus on tying the antibiotic sensitivity and biomarker results on feeding arsenic-uptake periphyton to snails.