EFFECTS OF PARTICLE ADSORPTION IN AQUATIC ENVIRONMENTS ON THE BIOAVAILABILITY OF PHARMACEUTICAL CONTAMINANTS IN FISH

Alexis M. Wormington[1], *Sarah Robinson*[1], *Candace Lavelle*[1], *Tara Sabo-Attwood*[1], *John Bowden*[2], *Joseph Bisesi*[1]

[1]Department of Environmental and Global Health, Center for Environmental & Human Toxicology, University of Florida, Gainesville, FL, USA

[2]Department of Physiological Sciences, University of Florida, Gainesville, FL, USA

Every year, small-sized particulate contaminants such as microplastics and nanomaterials are released into the environment. A portion of these make their way into aquatic systems, including surface and drinking waters. Because of their large surface area and chemical properties, many particulate contaminants can adsorb chemicals before being taken up by aquatic organisms, acting as a "trojan horse" for oral exposure of chemicals. This is especially a concern for pharmaceuticals, which have been shown to both adsorb to particles and bioaccumulate in fish. We conducted two exposures in largemouth bass (*Micropterus salmoides*) exploring the impact of single-walled carbon nanotubes (SWCNTs), particulate contaminants that are expected to be released into aquatic systems, on the bioavailability of two pharmaceuticals: ethinyl estradiol (EE2), a synthetic estrogen common in birth control pills, and venlafaxine, a SNRI antidepressant. After exposure to SWCNTs with EE2 adsorbed, largemouth bass exhibited induction of the egg-yolk protein vitellogenin, an indirect measurement of estrogenic activity, in male fish at levels that were similar to EE2 alone. These results indicate that EE2 sorbed to aquatic particulate contaminants becomes desorbed and bioavailable after ingestion. Additionally, we conducted a month long feeding study with SWCNTs and adsorbed venlafaxine. Measurements of venlafaxine in plasma and tissues will be used to determine whether adsorbed venlafaxine is bioavailable following oral exposure. Preliminary results from these studies indicate that pharmaceuticals bound to the surface of particulates in the water can become bioavailable following oral exposure, which runs counter to the conventional wisdom that chemicals bound to particulate matter are not bioavailable. As such, oral exposure to particle adsorbed pharmaceuticals should be considered in risk assessments.

PRESENTER BIO: Alexis Wormington is a doctoral candidate within the University of Florida department of Environmental & Global Health, with a research concentration in environmental health. Her research addresses the molecular and behavioral impact of emerging contaminants in aquatic species; specifically the impact of nanomaterials and pharmaceuticals in fish.