

One Health Research Project Abstract

Jenna Honan

Principal Investigator: Frank von Hippel, Professor of Public Health, Community, Environment and Policy Department, Mel and Enid Zuckerman College of Public Health

Research Abstract:

Residents and workers in agricultural communities are often exposed to elevated levels of environmental contaminants, especially pesticides and groundwater pollutants. The combination of naturally occurring and anthropogenic sources of contaminants can intensify environmental pollution. In Yuma County, the presence of environmental toxicants, heightened social vulnerability, and limited resources have left people susceptible to health conditions potentially triggered or aggravated by exposures to pollutants, specifically metals and perchlorate. The extent of most Yuma residents' exposure to these contaminants is unknown. For the community-based Yuma Environmental Health Project (YEHP), I will examine environmental exposures and evaluate the risk factors that lead to increased exposure to toxic metals and perchlorate for this concerned community.

This research focuses on the historical and current use of metal-containing pesticides, as our project site, Yuma County in southwestern Arizona, is an intensive agricultural area. Other artificial sources, such as the Marine Corps Air Station, the U.S. Army Proving Ground, a growing commercial/maquiladoras sector, and heavy winter tourism may play a role in contamination. I am also interested in perchlorate as an environmental contaminant due to the long-term pollution of the Colorado River, the main source of drinking and irrigation water in Yuma. Aerospace and munition sites in Las Vegas, Nevada were a major source of perchlorate in Lake Mead, which feeds into the Colorado River and lies upstream of Yuma. Elevated levels of these contaminants in the environment would signify a concomitant increased risk of exposure.

Using exposure science, epidemiology, and statistical modeling techniques, and drawing from the One Health framework and community-engaged research practices, I will assess relationships between exposures to perchlorate and thyroid dysfunction, and build exposure profiles for toxic metal contaminants across demographic groups for Yuma study participants. I will determine if associations exist in the sample population between urinary perchlorate concentration measured in hair samples and presence of thyroid dysfunction and, more specifically hypothyroidism, based on health survey responses and electronic medical records and verified via blood hormone assay results. I will test statistical relationships between concentrations of metals (Cd, Cu, Hg, Mn, Pb, and U) measured in hair samples and other parameters such as potential risk of exposure or demographics using CART analysis. Finally, I will complete a retrospective exposure analysis in children living in Yuma County by measuring concentrations of perchlorate in urine samples collected from 1998-2003. Environmental remediation efforts took place at the point source between the sampling timepoints, providing an opportunity to assess changes to the exposure profiles of Yuma residents. I will use publicly available data for concentrations of these contaminants in the environment to accomplish a multifaceted comparison. I will integrate these results with those from an associated animal model developed by this research team using equivalent endpoints of thyroid dysfunction and hormone levels in *Peromyscus* mice collected from the area. The mice will have an additional assessment of gonad formation, histological disorders, and brain function outcomes.

The goal of my project is to focus on health protection and disease prevention. The project considers how the environment affects health outcomes of both people and animals, and how people and animals

affect their environment. Ultimately, I will present the results from these analyses to the community members to help them make informed, autonomous decisions regarding their own health and wellbeing, with the opportunity to discuss potential interventions. The results will augment local understanding of environmental exposures and health hazards, providing resources directly to the community as they assess their environmental salubrity.