Innovative Technologies to Quantify Environmental Contaminant Bioavailability & Exposure

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Wednesday
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Seminar: 10 – 11:30 am

Chamblee 106 1A/B

Networking Lunch with Speaker: 11:30 am – 1 pm
Chamblee 106 Cafeteria

Office Hours: 1 – 4:30 pm
By Appointment

Centers for Disease Control and Prevention
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4770 Buford Highway NE
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Accurately determining a person's exposures to environmental chemicals is a central challenge to evaluating potential health consequences of contaminants. Collection of a series of "grab samples" at single time points generates too many complex samples to chemically analyze and too dilute samples to reasonably assess biological activity. Analysis of trapped local aquatic organisms such as fish or shellfish can be used to assess persistent bioaccumulative toxicants, but this approach has many limitations: metabolism, difficulties in obtaining samples, necessary destructive sampling and inherent biological and physiological variability and the challenge of determining the duration of exposure. Many similar challenges exist with the analysis of biomarkers in epidemiological studies of environment and disease. To overcome these issues, we have further developed passive sampling devices (**PSD**s) for water, air, sediment and personal monitoring now used at multiple Superfund sites, in the Gulf of Mexico as part of the DeepWater Horizon oil spill, and in several western Africa countries as part of an on-going United Nations sponsored pesticide-monitoring project. Membranes in PSDs sequester thousands of bioavailable chemicals including previously unmonitored chemicals. The micro-porous and hydrophobic nature of the membranes was chosen to mimic both chemical and physical selective processes that affect uptake by organisms. We now routinely use the PSD extracts from water exposures in the embryonic zebrafish assay model system to assess biological activity. Because contaminants sequestered by such membranes are recovered for use in both chemical analysis and bioassays, we are able to combine continuous sampling with biological endpoints that will enhance our ability to assess effectiveness and mitigation of toxicity. The design, calibration, use and comparison of PSD membrane technologies will be discussed. Two applications of the PSD will be presented in detail. The first illustrates sampling from an urban Superfund River with assessment of biological responses in zebrafish. The second demonstrates the diagnostic attributes of the sampling platform when used to sample air and water near Gulf of Mexico shores to screen for over 1,200 chemicals and to quantify unsubstituted polycyclic aromatic hydrocarbons (PAHs), methylated PAHs, and oxygenated PAHs.

Dr. Anderson's research focuses on environmental exposure of contaminants, contaminant mixtures and development of novel bio-analytical technologies for assessing bioavailability in multi-contaminant environments. She is the project leader for a long-term research project funded by the Superfund Research Program, NIEHS: *Biological Response Indicator Devices for Gauging Environmental Stressors (BRIDGES)*. Dr. Anderson was recruited by the Food and Agriculture Organization of the United Nations (FAO) in collaboration with the Global Environmental Fund (GEF) to develop and lead a new program of international scope and to design bio-analytical technologies to conduct environmental assessment for use in setting of protective standards for human and environmental health. Current research is also focused on further development of a personal wristband passive sampler, the "Environmental Integrated Organic Monitor of Exposure" (Einome); this is a silicone-based passive sampling device structured as a wristband, which has the potential to greatly expand the possibilities for developing quantitative measures of exposures in humans. These unique devices are inexpensive, lightweight, non-intrusive, "low tech", and have the capability to measure a wide range of chemicals in a person's ambient environment. The Einome has many potential applications within health research, including use in epidemiological studies of environmental exposures and adverse health outcomes and for human bio-monitoring or bio-surveillance.

Learn more about her research & publications!

http://emt.oregonstate.edu/publications

http://tools.niehs.nih.gov/srp/programs/Program_detail.cfm?Project_ID=P42ES164650104&FY=2010

http://oregonstate.edu/superfund/oilspill

http://emt.oregonstate.edu/fses