Environmental Applications in Nuclear-Contaminated Hazardous Waste Sites
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There are currently 83 Superfund sites across the United States that are contaminated with radioactive waste, including sites maintained by the Department of Energy (U.S. Environmental Protection Agency, EPA). Contaminants at such sites include the nuclides radium, uranium, thallium, and radon. Clean-up of such sites requires innovative practices, as well as disposal of low-level and moderate-level radioactive nuclear waste. This seminar will provide an overview of nuclear-related research in the environmental engineering field.

The potential of reclaimed wastewater to remediate nuclear contaminated hazardous waste sites is currently being explored. As described by boron neutron capture theory, the products Li-7 ions and $^4$He are released when boron reacts with a thermal neutron ($^1$H$n$). Boron neutron capture has been successfully used in the medical field for cancer treatment, and boron is also integrated into the control rods of a nuclear reactor. Sewer water has a distinct signature of $^{10}$B and $^{11}$B due to the presence of detergents in water, and previous research has shown a link between wastewater impacted groundwater and boron as a conservative tracer. As wastewater progresses through primary, secondary, and even tertiary treatment processes, $\delta^{11}$B, the $^{11}$B boron isotope ratio, is conserved, making reclaimed wastewater an ideal solution to dampen radiation when neutrons are released. The impact of wastewater discharge near the Fukushima nuclear reactor disaster will be discussed.

Biochemical applications of remediation include introducing radiation-resistant to the contaminated, while rendering them metal-resistant. This involves transforming *Deinococcus radiodurans* with metal-resistant proteins, which are similar in structure and function to antibiotic resistant pumps in bacteria. Radiation-resistant bacteria that are also metal-resistant would allow for bacteria to tolerate hazardous waste sites that are contaminated with radionuclides, metals, and even solvents.

**Biography**

Dr. Otakuye Conroy-Ben is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of Utah. Dr. Conroy-Ben received her B.S. in Chemistry from the University of Notre Dame, and here Master’s in Analytical Chemistry, Ph.D. in Environmental Engineering from the University of Arizona, and did her Post-doc in the Department of Biochemistry all at the University of Arizona. She teaches the courses Introduction to Environmental Engineering, Groundwater Remediation, Water and Wastewater Treatment, and Solid & Hazardous Waste Engineering. Her research interests include wastewater reclamation; illicit drugs, antibiotic and chemical-resistant bacteria, and endocrine disrupting chemicals in wastewater impacted water; biochemical applications of remediation; and solid waste management. She previously served as Secretary on the Board of Directors of the American
Indian Science and Engineering Society (AISES), and currently serves on the University’s Sustainability Certificate Advisory Committee. Otakuye is married to Colin Ben, and they are proud parents to a 1-year old daughter, Wayuwita.