USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2003OH5B

Title: The Effect of Humic and Fulvic Acids on Arsenic Solubility in Drinking Water Supplies

Project Type: Research

Focus Categories: Geochemical Processes, Toxic Substances, Hydrogeochemistry

Keywords: Toxic Substances, Water Chemistry, Geochemistry, Solute Transport, Ground Water Quality

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Congressional District: 15

Principal Investigators: Lenhart, John

Abstract: Elevated concentrations of inorganic arsenic in ground water are often the result of natural processes and are found in many locations, including Ohio. Scientific studies link chronic ingestion of inorganic arsenic to an increased incidence of bladder, lung, and skin cancer in humans, and recently the United States Environmental Protection Agency (USEPA) lowered the maximum contaminant level (MCL) in drinking water from 50 microgram/liter to 10 microgram/liter. To meet this revised MCL, the USEPA has provided guidance to Public Water Suppliers in selecting appropriate treatment methods. Many of the recommended treatment processes exhibit degraded performance of 20-50 percent in the presence of dissolved natural organic matter (NOM). Little is known about the specific reason for this decrease in removal efficiency, although one hypothesis involves the formation of stable solution complexes between As and NOM through NOM-bound cationic intermediaries. In this research, I propose to investigate the association of inorganic arsenic with different sources of NOM in the presence and absence of cationic solute species (e.g., calcium, magnesium, and aluminum). I will characterize the interactions that occur between arsenic and NOM, and investigate whether cationic species enhance these interactions. Experiments will be performed as a function of the ratio of the constituent concentrations across a pH range of 4 to 8 in batch and miscible-displacement experiments. Samples from these experiments will be analyzed to determine the distribution of arsenic species using capillary

electrophoresis coupled with an inductively coupled plasma atomic emission spectrometer. From the results of these experiments my objective is to examine the influence of NOM on arsenic speciation, information that is crucial to accurately predict arsenic mobility and appropriately evaluate treatment methodologies.
