Department of Environmental Science

Elizabeth Trembath-Reichert

Mentor: Brian Mailloux

Carbon Dating and Identification of Bacteria in Bangladesh Groundwater

It is estimated that over 74 million people in Bangladesh are drinking water with arsenic concentrations of 10ppb or higher. The source of arsenic in these waters is non-anthropogenic. However, the natural biogeochemical processes driving the release of arsenic from the sediment into the groundwater is not well understood. It is generally accepted that iron reduction, which is coupled with organic carbon oxidation, plays a major role in the release of arsenic into the groundwater. The Organic carbon driving the Fe(III) reduction in the shallow aquifers is believed to come from either young surface derived waste drawn down into the aquifer or old in situ organic carbon co-deposited with the sediment in the aquifers. This goal of this study is to determine the source the organic carbon driving the reactions in the aquifer. The determination of the source of the carbon can not be directly determined. Therefore we are going to ^{14}C date the DNA of the microbes in the aquifer to directly determine the carbon that is being utilized. An array of methods was developed to collect bacteria from groundwater at different well depths in Bangladesh for DNA extraction and carbon dating. The main collection method is a tangential flow filtration system that was tested with New York City tap water, and groundwater from Black Rock Forest and Durham, NC. The method has been used to successfully collect the 100ug/mL of DNA from these oligotrophic waters necessary for carbon dating. These results will enable us to determine the organic carbon source and further constrain the controls on the biogeochemistry of arsenic in groundwater with important implications for arsenic remediation and management strategies.