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Developing a Filtering Method for Radioactive Carbon Analysis of
Microbial DNA and PLFA in Bangladesh Groundwater

Exposure to elevated arsenic in contaminated groundwater has affected more than 50 million people in Bangladesh. The natural occurrence of arsenic in Bangladesh's geologic structures and current evidence supports the hypothesis that arsenic is largely released by microbial heterotrophic respiration. These sources of carbon are still being studied and debated, but there is a general consensus that microbes incorporate carbon from their direct surroundings towards generating DNA and PLFA (phospholipid fatty acids). Research has indicated both "young", anthropogenic organic carbon sources as well as "old" geologic sources, but there currently exists no way to directly differentiate between such sources. In this study, a method to collect and radiocarbon date microbial DNA and phospholipid fatty acids (PLFAs) was developed as a means to understand the origin of the carbon sources from these cellular structures. DNA samples have previously been successfully extracted, purified, and carbon dated from samples of groundwater collected in Araihasar, Bangladesh. Collecting and radiocarbon dating microbial PLFA serves to reinforce our understanding of the heterotrophic mechanisms responsible for driving arsenic release. PLFAs have been recognized to provide "near-instantaneous" snapshots of the carbon directly available to a microbial community, and can be purified and dated through gas chromatography. When filtering for both DNA and PLFAs, however, it is critical to consider using tools and materials that would avoid carbon contamination and interfere with the dating process. In this study, I have developed a filtering method that would allow for the most efficient accumulation of microbial DNA and PLFA from Bangladesh groundwater in order to obtain $\Delta^{14}\text{C}$ dates for pond and well samples collected from our study sites, in further understanding the source of organic carbon driving arsenic release.