Microbial Fe-S-As cycling in a shallow-sea hydrothermal system

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Arsenic, a notorious poison, is naturally enriched in many hydrothermal vents. Shallow-sea vent systems are regarded as physical and geochemical transitions between deep-sea and on-land hydrothermal systems. Soufriere Spring (SOU) offshore Dominica (Lesser Antilles island arc) is an ideal site for investigating the microbial influence of arenic on a marine ecosystem. The aim of this study is to establish the interactions between microbial distribution, metabolism and *in situ* geochmical Fe-S-As cycling.

SOU is characterized by elevated temperature venting fluids (~55ºC). The arsenic concentrations (predominantly As^{III}) in sediment cores range from 0.09 to 1.8 μM, and the profile was similar to that of ferrous iron with depth. It indicates that arsenic concentrations are controled by iron dissolution. Sediment and biofilm samples were used as inocula in enrichments targeting heterotrophic arsenite oxidation and arsenate reduction. From these enrichments, several strains were isolated at 30, 50 and 70 ºC. In the 50ºC sediment enrichments on oxic, heterotrophic media, unknown thermophilic sulfate reducers produce high concentrations of sulfide and transform ferrihydrite to amorphous arsenic-metal-sulfide. Molecular biological surveys of microbial community diversity indicate that Bacteria (Chloroflexi, Deltaproteobacteria and Gammaproteobacteria) dominated in all samples; Archaea (Thermoprotei) were only found in venting fluid and deep sediment (20-22 cm), not in shallow sediment (0-2 cm) or biofilms. Site comparisons revealed that anaerobic, thermophilic microorganisms were prevalent in venting fluid and the deeper sediment. In venting fluid, *Thermodesulfovibrio* spp. might be the major player in regulating the *in situ* S cycle.

The current results implicate biological redox of iron, sulfur and arsenic as primary biogeochmical processes in the SOU shallow-sea hydrothermal vent system. More molecular and culture tests are underway to better characterize the microbe-mineral interactions in laboratory enrichments and the natural environment.