Geophysical Research Abstracts, Vol. 8, 00166, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00166

Beyond the Calvin Cycle: Microbiology and Biogeochemistry of Autotrophic Microbes in the Subsurface at Hydrothermal Vents

1 S. M. Sievert

Woods Hole Oceanographic Institution, Woods Hole, USA (ssievert@whoi.edu / Fax: 508-4572076 / Phone: 508-2892305)

At present, our knowledge about the organisms responsible for inorganic carbon fixation at hydrothermal vents is inadequate, despite the fact that these organisms form the basis of these ecosystems. Available information indicates that microbial symbionts and free-living *Thiomicrospira* spp. are important in the surface portion of hydrothermal vents. Bacteria belonging to the epsilon subdivision of the proteobacteria (epsilon-proteobacteria) have been identified as a major, if not dominant component of microbial communities in deep-sea hydrothermal vents, ranging from black smoker chimney walls and associations with invertebrates to the shallow subsurface. Given the prevalence of epsilon-proteobacteria at hydrothermal systems, and the fact that cultivated representatives are autotrophic, it is likely that these organisms contribute significantly to primary organic matter production at hydrothermal vents. Recently, we have obtained evidence that autotrophic epsilon-proteobacteria are using the reductive TCA (rTCA) cycle for autotrophic carbon fixation. In addition, various other autotrophic and extremophilic microorganisms potentially occurring at hydrothermal vents use the rTCA cycle. These data suggest that autotrophic carbon fixation through the rTCA cycle might be more significant for carbon production at hydrothermal vents than previously thought. Thus, a picture begins to emerge that calls the paradigm of the Calvin-Cycle being at the base of the food web at deep-sea hydrothermal vents in question. This seems especially relevant for the subsurface portion heretofore unconsidered in the overall organic matter production at deep-sea hydrothermal vent sites. We have previously identified a novel sulfur-oxidizing epsilon-proteobacterium that

may form an important component of a shallow subsurface biosphere and that uses the rTCA cycle for carbon fixation. This organism excretes filamentous sulfur (0.5 μm wide and 20-500 μm long) as a product of its metabolism that is morphologically and chemically similar to the “snowblower” material observed after hydrothermal vent eruptions. We are pursuing integrated geochemical and biological studies to better define the potential importance of this novel metabolic process as a contributory factor of the subseafloor biosphere.