Diversity of chemolithoautotrophs associated with hot hydrothermal fluid chemistry

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Diversity of chemolithoautotrophs associated with hot hydrothermal fluid chemistry Ken Takai (JAMSTEC) Physical and chemical parameters existing in steep and relatively mild gradients of the deep-sea hydrothermal seafloor and subseafloor, respectively, represent the range of physiological diversity and function of microbial ecosystems. These gradients generate a wide range of geochemical niches and energy sources for microorganisms.

For example, chemolithotrophs are able to generate energy by exploiting the chemical disequilibria resulting from sluggish reaction kinetics for redox reactions at the interface between oxidized seawater (such as O2, NO3-, Fe3+, SO42-, CO2) and reduced hydrothermal vent fluids (e.g. H2, H2S, CH4, Fe2+, formate). While a range of novel chemolithotrophs have been isolated from deep-sea vents, some more chemolithotrophs and chemolithotrophic metabolisms remain uncultured and even unidentified, perhaps those that use rare or unusual redox couples. The primary production by chemolithoautotrophs sustains not only the heterotrophic components in the ecosystem but also macrofaunal communities, having symbiotic or non-symbiotic association with them.

It has been assumed that patterns in diversity of chemolithoautotrophs and chemolithoautotrophic metabolisms are primarily controlled by input of energy sources from the hydrothermal fluid. However, for the long time, it has been very difficult to obtain clear evidences for geochemical control of chemolithoautotrophic microbial communities in the deep-sea hydrothermal vent habitats. Recent interdisciplinary approach to the microbial communities and the physical-chemical settings of their habitats has been clarifying the some linkages between them.

Comparison among the different fields (inter-fields) and different vent sites in a field (intra-field) has provided what could be key physical-chemical characteristics to formation of chemolithoautotrophic microbial community. In addition, it has been becoming evident that the hydrothermal fluid chemistry determined at the seafloor venting would have impacts of microbial functions in somewhere of the subseafloor hydrothermal fluid flows. Here, I would like to overview the different patterns in the chemolithoautotrophic microbial communities and hydrothermal fluid chemistries in a variety of deep-sea hydrothermal fields in Mid Ocean Ridges and Subduction Zones. The patterns would represent the patterns in biogechemical interaction in the deep-sea hydrothermal systems.

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