Ultramafics-Hydrothermalism-Hydrogen-HyperSLiME (UltraH3) linkage: a key for LUCA community of life

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Deep-sea hydrothermal system has been recognized one of the most plausible places for origin of life in this planet. This hypothesis has been supported by evidences from multidisciplinary scientific fields. In geology, it has been demonstrated that the potentially most ancient microbial fossils are retrieved from the paleoenvironment, that might be related with deep-sea hydrothermal systems in the Archean. Chemical reactions suggesting prebiotic chemical evolution (synthesis of amino acids, nucleic acids and hydrocarbon, and polymerization of these molecules) are observed under the simulated physical and chemical conditions of the deep-sea hydrothermal vents in the laboratory. In addition, phylogenetic analyses of all the lives in this planet have clearly revealed that hyperthermophiles inhabiting deep-sea hydrothermal systems represent the deepest lineage of the life.

Supposed that the Archean deep-sea hydrothermal system hosted the origin of life, what was the first life? We are pursuing the energy metabolism of our last universal common ancestor (LUCA) and the environmental settings hosting the LUCA. It is definitely expected that the genesis of LUCA occurred at high temperatures of locally organics-rich microenvironment around deep-sea hydrothermal field and the first energy metabolism depended on fermentation of simple amino acids, organic acids and sugars. However, these organics were immediately consumed by the hyperthermophilic LUCA activity. Inheritance of the LUCA needed to evolve the energy and carbon acquisitions to more stable and efficient mode. Chemolithoautotrophy might be the best because a plenty of reductive gas components were always provided by the hydrothermal activity. Hyperthermophilic chemolithoautotrophs could serve as the primary producers and could foster the heterotrophic fellows. This was the genesis of the last universal common ancestral (LUCA) community of life. We hypothesize that the LUCA community was metabolically approximated to hyperthermophilic subsurface lithoautotrophic microbial ecosystem (HyperSLiME) currently discovered beneath the Central Indian Ridge hydrothermal field. The environmental settings for the occurrence of HyperSLiME are now being characterized and an important linkage among the occurrence of HyperSLiME, extraordinary amount of hydrogen in the hydrothermal fluids and ultramfics-hosted hydrothermal systems is proposed. This ultramafics-hydrothermalism-hydrogen-HyperSLiME (UltraH3) linkage is very likely a key for the genesis of the LUCA community. We would like to discuss the possible UltraH3 linkage in the Archean earth.