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Rapid growth rate of sulfur-turf microbial mat developed in hot spring water in Nakafusa, Japan

Hiroyuki Kimura[1], Kousuke Mori[1], Satoshi Hanada[2], Kenji Kato[1]
[1]Geosciences, Shizuoka Univ., [2]AIST

Sulfur-turf microbial mats are mainly formed by filaments or bundles of a large sausage-shaped bacterium and appear to be white due to adherent elemental sulfur particles. The sulfur-turf also occurs in sulfide-containing hot spring water in Nakafusa in Nagano Prefecture. Phylogenetic analysis has indicated that the sausage-shaped bacterium in this sulfur-turf belong to the clade of *Persephonella-Hydrogenothermus-Sulfurihydrogenibium* in order *Aquificales*. However, no one has succeeded in isolation of this bacterium from the sulfur-turf microbial mat.

In this study, growth rate of the sausage-shaped bacterium in a natural hot spring were estimated by in situ cultivation. The sulfur-turf microbial mat growing in a natural vent of Nakafusa hot spring was collected at intervals of 3 hours, and dry weight of each mat sample was measured. In order to estimate cell number in the mat, cellular carbon contents of the sausage-shaped bacterium were determined by a CHN analyzer. In addition, carbon contents in every collected mats were also measured. Based on these carbon contents, conversion factor indicating a microbial cell number per dry weight of the mat was determined. Growth rate of the sausage-shaped bacterium was estimated to be 0.46 doubling $\cdot h^{-1}$ on average, and the fastest generation time was about 90 minutes. The generation time was equivalent to those of known hyperthermophilic *Aquificales* strains in enrichment culture media.

H. Kimura: shkimur@ipc.shizuoka.ac.jp

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Growth rate and production of (hyper)thermophiles in a 85℃ geothermal hot spring pool of Nakafusa, Japan

Kousuke Mori[1], Hiroyuki Kimura[2], Kenji Kato[2]
[1]Grad Sch Sci. Shizuoka Univ, [2]Grad Sch Sci & Tech. Shizuoka Univ

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This study investigated the growth rate and production of hyperthermophilic prokaryotes in an 85℃ geothermal hot spring pool from Nakafusa in Nagona Prefecture, Japan. In order to measure growth rate of hyperthermophiles found in hot subground water, *in situ* cultivations were performed in the geothermal pool by using culture chambers made of stainless steel tubes. Both ends of a tube were sealed using heat-resistant polycarbonate filters (pore size, 0.2 um), which allowed exchange of the geothermal hot spring water in culture chambers. Hyperthermophiles inhabiting the geothermal pool were incubated for 0 to 100 hours in culture chambers, and the cell numbers counted directly by fluorescence microscopy. The estimated fastest growth rate was 0.63 day^{-1}, which was equivalent to those of planktonic bacteria in ocean. To estimate microbial production in the geothermal pool, cellular carbon contents of hyperthermophiles were determined by using a CHN analyzer. The production of hyperthermophiles in the geothermal pool was estimated to be 5.3 to 5.9 ug C L^{-1} h^{-1}. These estimates indicate that hyperthermophilic production may be 2 to 90 times of those of planktonic bacteria in ocean.

Kousuke Mori : r0634014@ipc.shizuoka.ac.jp