

Extremophiles from marine environments

Lee, Jung-Hyun, Seung-Sub Bae, Ji-Sun Ryu, and San-Jin Kim

Microbiology Lab., Korea Ocean Research & Development Institute

Ansan P.O. Box 29, 425-600, Korea (Tel; 031-400-6243, Fax; 031- 406-2495)

The deep ocean encompasses the extremes of virtually all environmental parameters found on Earth. Varieties of deep-sea habitats are currently under study; cold waters, sinking particles, sediments, and animal guts or other biological surfaces (at temperature from -1.7°C in polar oceans to $\sim 4^{\circ}\text{C}$ at temperate and tropical latitudes); hydrothermal vent environments - fluid, mineral and animal - that encompass a wide range of temperatures ($2\text{-}350^{\circ}\text{C}$) and nutritional conditions (organic compounds, reduced chemicals, heavy metals); and equally diverse but largely uncharacterized, seafloor habitats in deeply buried sediments (>500 m below the seafloor) and in seafloor ridges²⁾. Hyperthermophiles with maximal growth temperatures above 90°C are normally isolated from areas undergoing vigorous hydrothermal activity, and they are subject to varied biochemistry and biotechnological applications¹⁾. We have tried to access the microbial diversity of marine environments by participating several ocean cruises. Two extremely thermophilic archaeal strains that enriched at $80 - 90^{\circ}\text{C}$, pH 6 in anaerobic YPS media containing elemental sulfur, were isolated from a deep-sea hydrothermal vent area at the PACMANUS field ($3^{\circ}14$ S, $151^{\circ}42$ E) in the East Manus Basin. They are strictly anaerobic cocci, and are about $0.8\ \mu\text{m}$ in diameter. Based on its 16S rDNA sequence data, isolates NA001 and NA002 resembled the genus *Thermococcus*, and *Pyrococcus*, respectively. During the Japanese Cruise YK01-06, we have isolated a strain LT17 belonging to genus *Shewanella* known as one of piezophilic psychrophiles based on 16S rDNA sequence from East sea (depth, 3,100 m). Growth occurs between 10 and 20°C and optimal growth temperature is around 15°C . This strain is rod-shaped ($1.0\times 1.5\ \mu\text{m}$). The fatty acid profile of the LT17 was similar to those of other *Shewanella* species. The main cellular fatty acid consisted of monounsaturated acid, mainly $16:1\omega 7$. The omega-3 polyunsaturated fatty acid, eicosapentaenoic acid ($20:5\omega 3$, EPA) was detected at 11% of the total fatty acids. An anaerobic and psychrophilic microbial consortium was isolated from

sediments of clams beds around Edison seamount (depth, 1,500 m) using ZoBell broth containing sulfur under anoxic condition at 4°C. Analysis of sequences of several 16S rDNA clones has shown that those clones belonged to members of genus *Fusobacteria* with high similarity to *Fusobacteria* Ko711, *Propionigenium* sp. MGP-13AN and an uncultured *Fusobacteria* bacterium.

References

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