

Marine microorganisms: new bio-resources

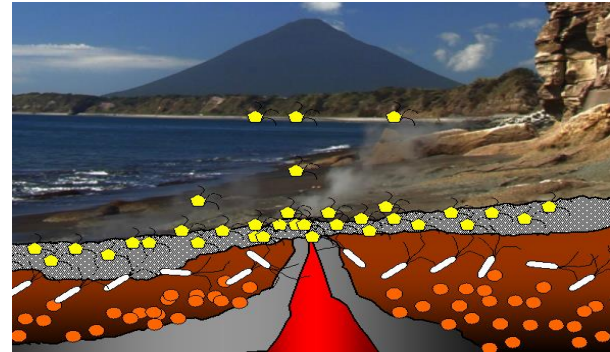
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Division of Applied Biosciences, Laboratory of Marine Microbiology
 Prof.; Yoshihiko Sako, Associate Prof.; Takashi Yoshida

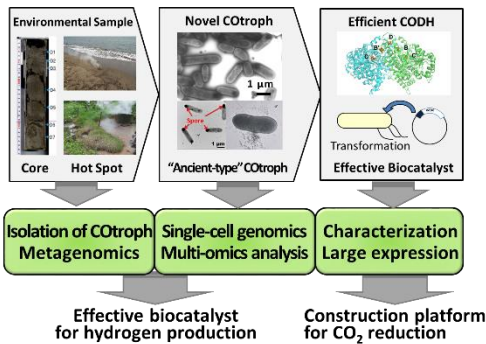
Ocean covers 70% of the Earth surface, and its biomass and bio-diversity overtake those of terrestrial ground. But studies of marine bio-resources have been done in quite few areas. Especially marine extreme environment contain various unknown microorganisms and microbiological ecosystem. Our laboratory focus characterization of novel marine microbes and development of useful genetic resources and genomic studies of harmful microalgae, by using microbiological and molecular biological techniques.

Research of novel microorganisms from marine hydrothermal environments

There are many hot springs and marine hydrothermal vents in Japan. Hyperthermophiles isolated from hydrothermal environments possess quite important bio-resources for genetic engineering and post-bioindustry. We have isolated numerous novel (hyper)thermophiles and thermophilic hydrogen bacteria from various hydrothermal environments and studied useful genes and enzymes.



Distribution of thermophiles in coastal hot spring



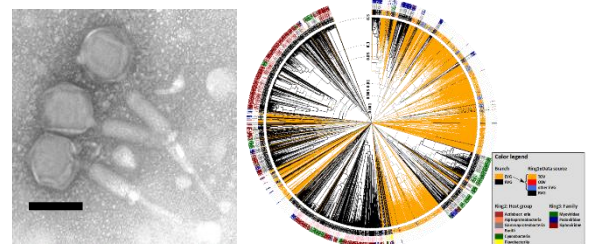
Overall strategy of research on Carboxydrotrophs

Carboxydrotrophic microorganisms

Carboxydrotrophic microorganisms can grow on poisonous CO using CO dehydrogenases (CODH). We isolate various COtrophs from different hydrothermal environments and unveil CO-metabolism through genomic, metabolomic and transcriptomic analysis. We plan to characterize recombinants carrying efficient CODH and construct large expression system for the CODH.

Marine viruses

Viruses infecting microorganisms are ubiquitously and abundantly present in the ocean and virus-mediated microbial lysis has considerable impact on the marine biogeochemical cycles. We constructed over one thousand viral genomes from marine environments and are investigating their diversity and ecological dynamics of thorough metagenomic approach.



Cyanophage Ma-LMM01 and Viral proteomic tree based on 4200 viral genomes



Omics

Ecology, genomics, metabolomics and metagenomics of hydrospheric microbes and their viruses for understanding of their roles in global nutrient cycling and their evolution.

Keywords

Marine Microorganisms, Hyperthermophile, Archaea, Genome Analysis, Thermo-tolerant Enzyme, Homing Endonuclease, Intron, Hydrogenase, CO dehydrogenase, Carboxydrotroph, Toxic Harmful Microalgae, Cyanobacteria, Cyanophage, Nitrogen fixation, Molecular ecology, Metagenomics, Virome, CRISPR

Research Achievements

2017

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