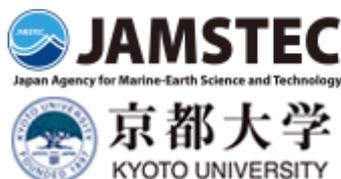

Press Releases



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JAMSTEC
Kyoto University

Deep-sea microorganisms preferentially utilize D-amino acids - Mystery of microorganisms in deep-sea world -

Overview

A joint research team by Research and Development Center for Marine Biosciences at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and Kyoto University identified microorganisms that preferentially utilize D-amino acids instead of L-amino acids for growth, which were isolated from deep-sea sediments in Sagami Bay by manned submersibles, *Shinkai 2000* and *Shinkai 6500* and a remotely operated vehicle, ROV *Hyper Dolphin* during JAMSTEC's expeditions.

Amino acids, which are the structural units that make up proteins, can occur in two isomeric forms; L-amino acids and D-amino acids. They are mirror images of one another with three-dimensional structures ([Figure 1](#)). It has been regarded that living organisms preferentially use L-amino acids only. Recent progress of analytical techniques unveiled, however, that D-amino acids are also utilized by all sorts of living creatures from human beings to microorganisms. In particular, since it became clear that D-Serine, one of D-amino acids, regulates higher brain functions in mammals, physiological functions and metabolic pathways of D-amino acids synthesis and degradation are drawing increased attention.

In this study, the research group successfully isolated microorganisms utilizing D-amino acids into 28 strains, which were from deep-sea sediments collected at depth of 800-1,500 m in Sagami Bay between 2001 and 2008. In addition, a deep-sea microorganism that grows D-amino acids most efficiently was compared with closely-related strains isolated from shallow sea ([Figure. 2](#) and [3](#)). The result demonstrated that only the deep-sea isolate have an ability to utilize D-amino acids efficiently, though there are almost no genomic differences between those from deep-sea and shallow sea. It is a remarkable characteristic, suggesting a rapidly acquired strategy of microorganisms to survive in deep-sea as an oligotrophic environment by preferentially utilizing D-amino acids as nutrition, while L-amino-acids are predominant among living creatures in general. Further analysis of deep - sea microorganisms should help clarify D-amino functions still with lots of mysteries, and contribute to development of new medical technology and biotechnology.

The above results were published on *Frontiers in Microbiology* on April 19, 2016 (JST). The online version is available at:

<http://dx.doi.org/10.3389/fmicb.2016.00511>

Title: Enantioselective utilization of D-amino acids by deep-sea microorganisms
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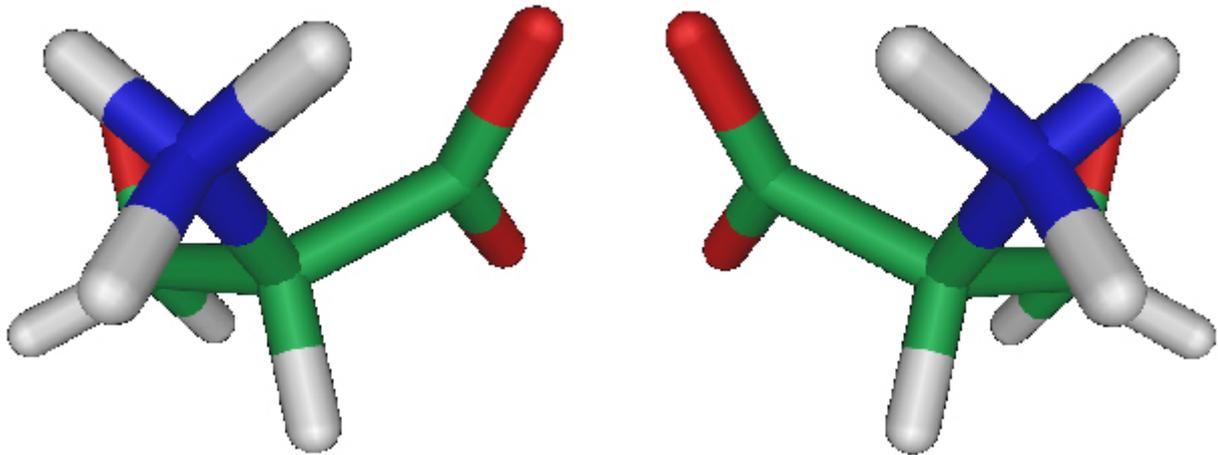


Figure 1. L-serine (left) and D-serine (right)

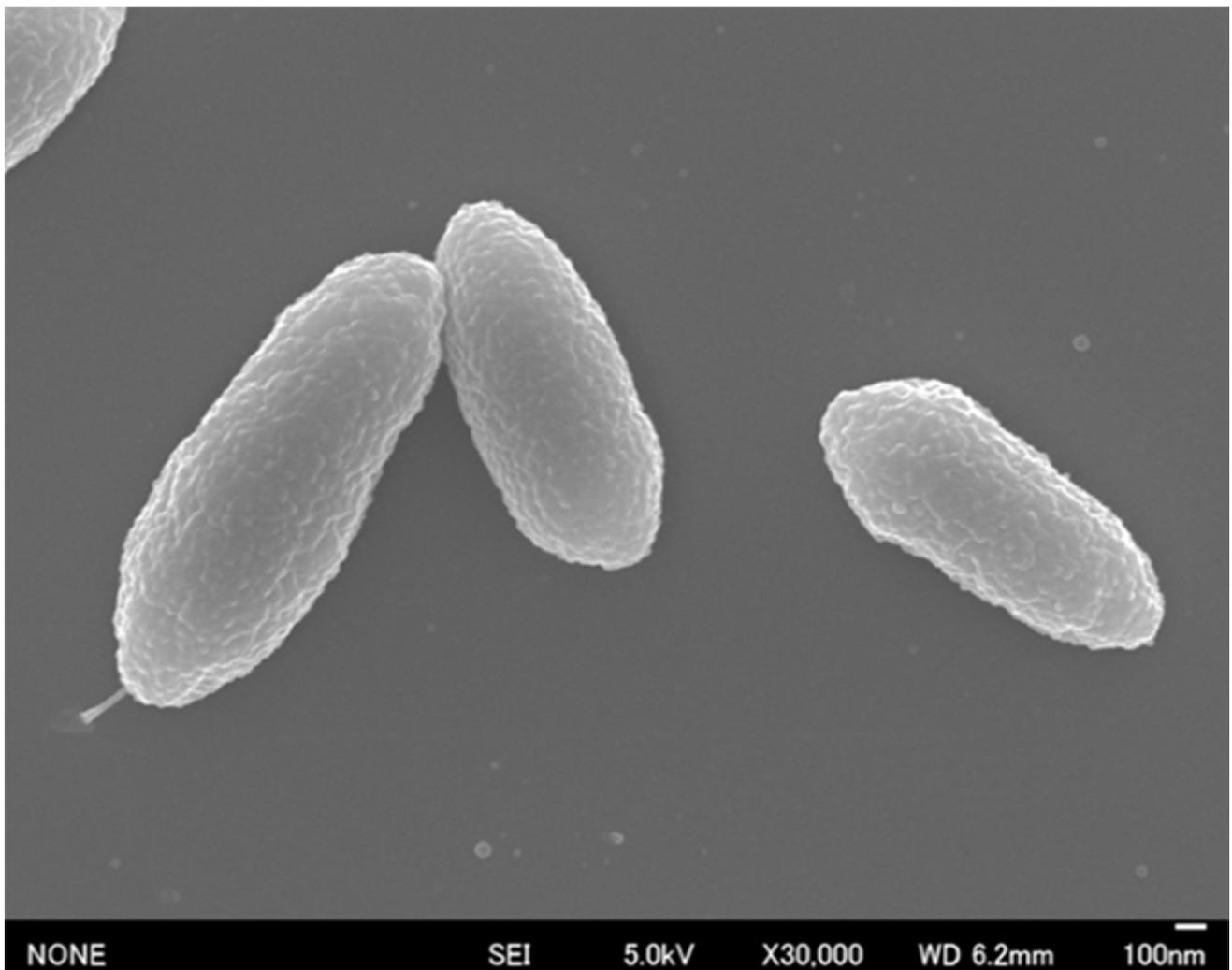


Figure 2. *Nautella* sp. strain A04V that grows with D-amino acid as a sole major amino acid in the medium.
(The image obtained by Scanning Electron Microscope.)

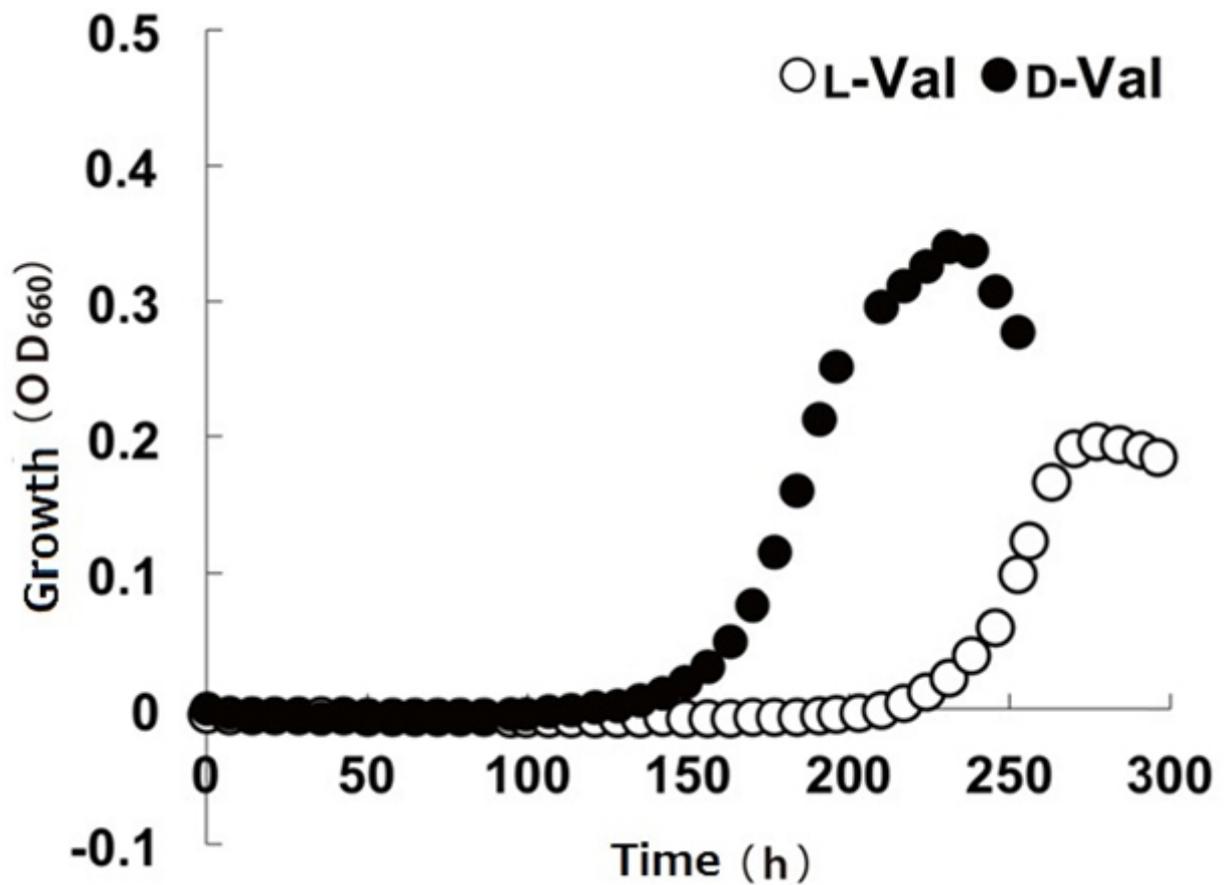


Figure 3. Growth of *Nautella* strain A04V with L-valine and D-valine as a sole major amino acid in the growth media.

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