PK-03

Structural characterization of LPS (lipopolysaccharide) from deep-sea vent symbiont and its free-living counterparts.

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Key word: deep-sea hydrothermal vent, Epsilonproteobacteria, endosymbiosis.

In legume-Rhizobium and squid-Vibrio symbiosis, LPS is regarded as the important component of bacteria in host-symbiont recognition. *Alviniconcha sp.* thrives the hostile deep-sea hydrothermal environment through their nutritional relationships with chemosynthetic *Epsilonproteobacteria*. *Alviniconcha sp.* houses horizontally transmitted symbionts in its gill cells. However, little is known about the molecular basis behind this specific host-symbiont recognition. We hypothesized that symbiont LPS could serve as tags for the host recognition. To elucidate the host "symbiot" crosstalk mechanism, we focused on LPS structure of a symbiont and its free-living counterparts.

We analyzed LPS saccharide compositions of *Alviniconcha sp.* symbiont and two free-living *Epsilonproteobacterial* strains with HPLC. Four different saccharides were identified in free-living *Epsilonproteobacterial* LPS. SDS-PAGE showed a free-living bacterial LPS had ladder-like bands due to O-antigen repeating units. MALDI-TOFMS and NMR analysis of the detailed LPSes structure are ongoing. In this presentation, we will discuss the possible role of symbiont LPS in the host-symbiont recognition. This study represents the first investigation of deep-sea hydrothermal vent symbiosis using glyceobiological approach.

PK-04

Structural comparison of lipopolysaccharides isolated from deep-sea hydrothermal vent chemosymbionts.

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Key word: lipopolysaccharide, symbiosis, deep-sea hydrothermal vent, pathogen evolution.

Invertebrates living in deep-sea hydrothermal vents get nutrients from their chemosymbiotic symbionts. Most deep-sea hydrothermal vent invertebrates are considered to acquire specific symbionts from surrounding environments. However, little is known about how host invertebrates and symbiotic bacteria recognize each other. Previously, deep-sea symbiont genomes provided insights into the origins of virulence of their pathogenic relatives, such as *Helicobacter* and *Campylobacter* species. Therefore, we have focused on the molecular mechanism of symbiotic interactions in deep-sea vents. Lipopolysaccharides (LPSs), crucial components of Gram-negative bacterial outer membranes, are expected to be involved in host-symbiont interactions. The LPS molecule is composed of three structural domains: lipid A, core oligosaccharide, and O-antigen polysaccharide. The complete LPS of *Alviniconcha* is called R-type LPS. Lipid A is the most conserved portion of LPS and activates the innate immunity. In contrast, O-antigen is the most variable portion of LPS and imparts serum specificity. In this study, we analyzed structures of LPSs from symbiotic bacteria and their cultured relatives isolated from a deep-sea hydrothermal field. We discuss the LPS structure potentially essential for the symbiotic relationship.

PK-05

Characterization of serum lectins from a deep-sea hydrothermal vent invertebrate.

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Key word: deep-sea hydrothermal vent, invertebrate, lectin.

In deep-sea hydrothermal fields, a variety of invertebrates (tubeworms, mollusks and shrimps) forms symbiotic relationships with specific bacteria. However, little is known about the mechanism of host-symbiont interactions. The mechanism can be of interest to a variety of researchers, as it is applicable to drug development. Recently, some studies showed lectins, carbohydrate-binding proteins, mediated symbionts acquisition by host (*Rhizobium*-legumes, *Vibrio*-sepiolid squid and *Symbiodinium*-cora). Therefore, we investigated the serum lectin of deep-sea hydrothermal field endemic crab to understand the molecular basis of host-symbiont interactions.

We performed both hemagglutination activity (HA) assay and lectin inhibition assay with various monosaccharides. We identified some lectins in the serum. The lectins were found to bind to five different monosaccharides (Glc, Man, Gal, Aro and GlcNAc). The HA of the serum was shown at 4°C, but not at room temperature. This result suggests that lectins may be tuned for the habitat of deep-sea vent crab (4-6-8°C). We will discuss possible functions of these lectins.

PK-06

Limited geographic distribution of the bioluminescent symbiont Photobacterium leiognathi.

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Key word: Photobacterium, luminous bacteria, symbiosis.

*Photobacterium leiognathi* is a widely distributed facultative bioluminescent symbiont of marine animals. The bacteria luminescence depends on an operon of 10 genes, luxCDABEG-ribEBHA. All known *P. leiognathi* isolates contain a vertically inherited lux-rib operon, but certain strains of *P. leiognathi* were found to contain an additional, horizontally transferred lux-rib operon. Strains of *P. leiognathi* that contain the lux-rib operon have been previously obtained only from Japan. In contrast, strains bearing a single lux-rib operon have been obtained from all the areas sampled in Japan and the western Pacific. In this study, we tested whether distribution of merodiploid *P. leiognathi* is limited by physical barriers in the environment, or because fish in the western Pacific preferentially form symbiosis with bacteria bearing a single lux-rib operon. Our results suggest that the limited geographic distribution of merodiploid *P. leiognathi* can be attributed to preferential colonization of fish species found in the western Pacific by strains bearing a single lux-rib operon.