**Quest for the Superpower in Marine Organisms**

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Life originated from the sea and there remains a variety of unidentified animals in the sea. Marine organisms are expected to possess superpower, specific biological functions not found in land animals. We are now trying to understand the molecular mechanism of the superpower in the marine organisms and apply them to our daily life.

**Mystery of Spider Silk in the Shell**

The shell is made of calcium carbonate and a small amount of proteins that give a variety of structural properties specific for each species including pearls. We recently found that spider silk proteins play important roles in the biomineralization process of shell formation. We are now establishing an artificial method to produce shell for the purpose of medical and industrial application.

**White Ants in the Mud**

Cellulose is the most abundant biomass on the earth and is suggested to contribute to the carbon circulation at the global level. We recently found that river and coast animals contribute to the breakdown of cellulose similar to the white ants in the wood. We are now studying the biological functions of these animals in the river and coastal area to apply these functions to the environmental purification.

**Transgenesis is a powerful tool not only for basic science but also for applied science. Now, we are developing Genome-Editing-Technology in medaka with artificial nucleases, ZFN and TALEN. With this technique, we analyze gene function and produce useful fish lines, for example, human disease model.**

**Genome Editing**

Transgenic medaka with green and red fluorescence proteins (GFP and RFP) (left figure), GFP in liver in response to endocrine disrupters (middle figure), microinjection into medaka fertilized egg (right figure).

**Pigmentation and Beautiful Color Pattern in Fish**

Marine fish has beautiful pigments and color patterns on its body surface. We are trying to know the molecular mechanism how these pigments and color patterns appear with anemonefish.
Keywords

Biomineralization, Benthos, Wet land, Transgenic technology, medaka, Anemonefish

Recent Publications

Function of meiobenthos and microorganisms in cellulose breakdown in sediments of wetlands with different origins in Hokkaido.

The extension peptide contributes to the shell stability and surface hydrophobicity of phytoferritin.

A novel silk-like shell matrix gene is expressed in the mantle edge of the Pacific oyster prior to shell regeneration.

Cellulase activity in meiobenthos in wetlands.

Widespread distribution of cellulase and hemi-cellulase activities among aquatic invertebrates.

Targeted disruption of exogenous EGFP gene in medaka using z-nc-finger nuclease.

Uptake, excretion and toxicity of nano-sized latex particles on medaka (Oryzias latipes) embryos and larvae.

An attempt to detect contamination with estrogenic compounds in river water of urban area in Thailand and Malaysia using transgenic medaka.

Transient and permanent gene transfer into the brain of the teleost fish medaka (Oryzias latipes) using human adenovirus and the Cre-loxP system.