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Fermentation technology to recover energy and high-value added products from seaweed

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Seaweed has attracted the attention as a promising candidate of a renewable feedstock. In the presentation, we will demonstrate several technologies for biorefinery of brown algae with marine microbial resources. Methane fermentation has been widely used to treat organic matters such as food wastes and livestock wastes with production of fuel gas. However, methane fermentation is inhibited by high salt concentration. This restricted biogas production from undiluted brown algae since it contained high salt content of ca. 2-3% in wet basis. We will present that the marine sediments were successfully used for halophilic methane fermentation to treat raw brown algae. To improve the economics of energy production from marine biomass, it is feasible to produce high-value added functional lipids such as polyunsaturated fatty acids, xanthophylls, and hydrocarbons by using marine protists, thraustochytrids, as biocatalyst. Although, thraustochytrids *Aurantiochytrium* strain do not have ability to directly utilize such algal saccharides for their growth, we found a microorganism can degrade and convert algal saccharides into suitable substrates for *Aurantiochytrium* strain. By cultivating in media composed of culture supernatant of some algal saccharide-assimilating bacteria, the *Aurantiochytrium* strain was able to propagate and accumulate the target lipids. Marine macroalgae are metal absorbers. We found that photosynthetic bacteria can remove toxic heavy metals and recover rare earth. Copper, cobalt and cadmium that were detected in the Laminaria lysate at minute amount level, were successfully removed from lysate. Moreover, some strains succeeded to recover yttrium and tellurium with high purity by easy method.

Biography

Yutaka Nakashimada received Doctorate degree in Chemical Engineering from Nagoya University in 1995. Since 2014, he has been Professor at Department of Molecular Biotechnology, Hiroshima University. His current research interests are in effective control of anaerobic digestion of solid organic matters including land and marine biomass and syngas fermentation for biogas conversion to more useful materials using a thermophilic acetogen.

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