Norzoanthamine, isolated from the colonial zoanthid Zoanthus sp. has been known to suppress the decrease in femoral weight and bone biomechanical parameters caused by ovariectomy. The results of cell response assays against murine mesenchymal stem cells suggested that norzoanthamine does not affect osteoblastic differentiation, because there was no change in the alkaline phosphatase activity, while the total collagen increased in a long-term cell culture. This phenomenon is apparently caused by the suppression of collagen degradation, rather than the acceleration of collagen production. Furthermore, norzoanthamine significantly accelerates the formation of the collagen-hydroxyapatite composite, an elemental structure of bone tissue. We found that more collagen hydroxyapatite composite was formed when more collagen was present, and this represents a significant mode of action for norzoanthamine. Therefore we hypothesize that the reported bone mechanical strength enhancement is caused by collagen-norzoanthamine supramolecular association. The facts that norzoanthamine is nontoxic and that it has a collagen protective activity indicate that it may provide significant therapeutic benefits. In particular, it may be a promising drug candidate for osteoporosis treatment and prevention.

Since Zoanthus sp. is a boneless cnidarian, the described above functions are directly irrelevant to the host animal. A significant point is that norzoanthamine did not inhibit protease activity, but rather, it protected the substrate proteins from proteolytic cleavage. This protective effect is more pronounced in substrates with a longer peptide chain length, and thus it exhibits a kind of cluster effect. The marine invertebrate, Zoanthus sp. is found in tropical coral reefs. These organisms are exposed to external stresses, such as UV light in intense sunshine. Norzoanthamine could protect skeletal proteins in the host animal bodies from external stresses and possibly enhance survival. Although thousands of natural products have been isolated from marine organisms, there are few compounds that resemble norzoanthamine either structurally or functionally. In the course of our effort to clarify the biological function of norzoanthamine by investigating its distribution within the animal using MALDI imaging mass spectrometry, a fungus was isolated as the predominant symbiont of the zoanthid, and production of norzoanthamine by its laboratory culture was confirmed by mass spectroscopic analyses.

Date: 3rd March 2011 (Thursday)
Time: 2pm – 3.30pm
Venue: NTU SPMS CBC Building Level 2, Conference Room
Host: Professor Koichi Narasaka