Change in the cellular composition of elements during selenium-deficient culture in a marine-calcifying alga, Emiliania huxleyi (Prymnesiophyceae)

Toshihiro Obata[1)], Koichiro Sera[2)], Shoji Futatsugawa[3)] and Yoshihiro Shiraiwa[1), 4)]

[1)] Graduate School of Life and Environmental Sciences, University of Tsukuba
1-1-1 Tennoudai, Tsukuba 305-8572, Japan

[2)] Cyclotron Research Center, Iwate Medical University
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

[3)] Takizawa Laboratory, Japan Radioisotope Association
348-58 Tomegamori, Takizawa, Iwate 020-0173, Japan

[4)] Institute of Biological Sciences, University of Tsukuba
1-1-1 Tennoudai, Tsukuba 305-8572, Japan

Coccolithophorids are abundant and worldwide distributed components of marine phytoplankton in the ocean. The algae are globally significant for worldwide production of $CaCO_3$. They had contributed substantially to the formation of limestone in the sediments of the ocean floor, and had been a long-term sink of inorganic carbon. We reported previously that nanomolar level of selenium (Se) is essential for growth of coccolithophorids but it was toxic at high concentration (micromolar level). Therefore, selenium can be a very important growth-regulation factor for coccolithophorids. In this study, we determined the cellular composition of elements and tested the effects of Se-deficiency on the compositions of elements in a coccolithophorid, *Emiliania huxleyi* using PIXE for analyzing elements.

By using nitric acid incineration, 13 of 24 elements added in the culture medium could be detected in the cells. Micronutrients, such as Se, Co, Al, Fe, S, P and Mo, were highly concentrated in the cells. The intracellular concentration of Se was 7.66 μM, and the concentration factor was 766-fold to the initial concentration in the medium. Under Se-deficient conditions, changes in cellular components of elements were classified into three categories according to their responses, as follows. Firstly, an element whose concentration decreased was only Se. Secondly, elements whose concentration increased were S, Mn and P. Thirdly, elements whose concentrations were not affected were Ca, K, Mg, Al, Sr, Fe, Br and Mo. Reasons for the increase in S, Mn and P are under investigation.