Ah-015 Room: C309 Time: June 11 14:15-14:30

Comparison of the efficiency of the utilization of CO2 in photosynthesis between coccolithophorids and other microalgae

Yoshihiro Shiraiwa [1], Koji Iwamoto [1]

[1] Inst. Biol. Sci., Univ. Tsukuba

http://www.biol.tsukuba.ac.jp/~ikawa/D302home.html

Mechanisms for the photosynthetic fixation of CO_2 have been changed throughout the evolution of photosynthetic organisms. Marine coccolithophorids were more sensitive to environmental oxygen in comparison with that of unicellular green algae. The affinity of photosynthetic machinery for inorganic carbons and the CO_2-fixing enzyme, Rubisco, was very low in coccolithophorids but very high in green algae and cyanobacteria. These differences can be considered to be due to the differences in the cellular-level of mechanisms for an efficient utilization of external inorganic carbons among those algae.

Mechanisms for the photosynthetic fixation of CO_2 have been changed throughout the evolution of photosynthetic organisms. Marine coccolithophorids were more sensitive to environmental oxygen in comparison with that of unicellular green algae. The photosynthetic activities of coccolithophorids were suppressed 50-60% by air-level of O_2, whereas those of unicellular green algae were suppressed only 15%. Both affinities of photosynthetic machinery for inorganic carbons (DIC) and the CO_2-fixing enzyme, Rubisco, for CO_2 was very low in coccolithophorids, Emiliania huxleyi and Gephyrocapsa oceanica. The K1/2-values for DIC and CO_2 attained at equilibrium at pH 8.0 were 4.7-5.5 mM and 47-55 micromolar, respectively. On the other hand, the values in cyanobacteria were 14.3 micromolar DIC (0.34 micromolar CO_2) and 150-185 micromolar CO_2, respectively, and those in green algae were 33 micromolar DIC (0.83 micromolar CO_2) and 29 micromolar CO_2, respectively. These results show that coccolithophorids seemed not to develop an efficient mechanism for the utilization of DIC to support insufficient Rubisco. In contrast, cyanobacteria developed mechanisms to increase the supply of DIC to Rubisco at cellular-level, although their Rubisco possess low affinity for CO_2.