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Study on metabolism and physiological functions of selenium which regulates the growth of white water bloom-forming marine algae

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Summary

We intended to study on how the growth of bloom-forming coccolithophorids is regulated in marine environment. In our previous study, we found that coccolithophorids such as *Emiliania huxleyi* and *Gephyrocapsa oceanica* essentially require selenium for their growth. In this study we tried to compare the response to selenium, kinetics of Se-transport and Se-metabolites among three species of haptophyte algae. Those algae are coccolith-producing species such *as Emiliania huxleyi* and *Gephyrocapsa oceanica*, and non-coccolith-producing species such as *Isochrysis galbana*.

Isochrysis showed no requirement of Se for its growth but absorbs Se to produce a single low-molecular compound. Proteins were labeled with ^{75}Se non-specifically in both soluble and insoluble fractions. ^{75}Se-labeling of proteins in *Isochrysis* increased with time and did not saturate. On the other hand, ^{75}Se was incorporated into proteins specifically in bloom-forming. Those patterns were largely different from Se-metabolism of *Emiliania* and *Gephyrocapsa*. In these two species Se-methyl-selenocysteine was identified in the low-molecular compounds that may function of detoxification process of selenium in the cells.

The present study showed that Se is a possible candidate of bloom-regulation element for *Emiliania*. *Emiliania* is able to utilize selenite ion at wide range, since kinetic curve shows that the transport is mediated by both an energy-dependent active process and a passive process. Thus, the bloom of *Emiliania* can be regulated by the change in selenite ion concentration in the ocean. Selenium can be supplied from the land via river and upwelling from the deep ocean.