Adaptation mechanism to salt stress in a protozoan, *Euglena gracilis.*

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Due to the increased use of fossil fuels caused by rapid industrialization and population growth, the concentration of carbon dioxide (CO_2) in the atmosphere is increasing. This gas is called green house gas and has a green house effect. It has been estimated that the global temperature will rise by 2-3°C due to the green house effect of the CO_2 if the its concentration raises from the presence to 600 ppm. To resolve the problem, the biological fixation of CO_2 can satisfy food demand and mitigate global warming simultaneously will be caused in the next century. We propose the biological fixation of CO_2 *via* photosynthesis with a microalgal system using a protozoan, *Euglena gracilis* which can adapt upto 40 % pCO_2 and is available for food production as feed for fishes and some animals. Recently we investigated that it can adapt to salt conditions upto 250 mM NaCl and that trehalose is formed from paramylon, which is a storage sugar of ß-1,3-glucan, in it. Here we report the mechanism of trehalose accumulation under the salt stress.

Trehalose phosphorylase, is trehalose metabolizing enzyme in *E.gracilis*, was purified from the organism and examined its regulation of activity. Fructose-2,6-bisphospahate (Fru-2,6-P_2) acting as a regulator on sugar metabolism in mammalian and in *E. gracilis* inhibited its activity with the competitive manner. Further its concentration in the cell decreased during trehalose synthesis was active and recovered to the initial level when trehalose synthesis and accumulation finished. Fru-6-P 2-kinase, catalyzes Fru-2,6-P_2 formation, activity was also under the salt stress. These results indicate that trehalose formation and accumulation is regulated by Fru-2,6-P_2.

Trehalose accumulation was inhibited in the presence of protein kinase inhibitor, K-252a and staurosporine. The decrease of Fru-2,6-P_2 concentration in the cell caused by the inactivation of Fru-6-P 2-kinase activity was also inhibited. These suggested that protein phosphorylation is involved in the signal transduction of trehalose synthesis.