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Massive coral bleaching has been recently observed around the world, which is caused by changes in the environment by natural and anthropogenic activities. The run-off of various matters from human activities to the coastal seawater would also pose significant stresses to the coral reefs by degrading the quality of seawater. In Okinawa, Japan, red-soil run off from the developed land has been a major environmental issue since 1980's. Hydrogen peroxide (H_2O_2), strong active oxygen, is one of the photochemically formed chemicals in both seawater and atmosphere. Recent photochemical studies of seawater showed that H_2O_2 photo-formation was faster in the red-soil-polluted seawater than clean seawater. Because of its strong oxidizing power, H_2O_2 affects plants and marine organisms. But few studies reported how concentration of H_2O_2 in seawater affects metabolic activities of coral colony. Coral metabolism can be used as an indicator for physiological state of a coral colony. We measured coral metabolism by using a continuous flow complete mixing (CFCM) experimental system. The CFCM experimental system is a newly developed experimental system for quantitative investigation of corals' metabolic changes. Our objectives of this study were to obtain quantitative information on coral's metabolic changes when H_2O_2 concentrations were increased in the seawater under high water temperature.

Coral incubation conditions tested were: 1) normal water temperature (27℃) and no addition of hydrogen peroxide (H_2O_2) to the supplied seawater (27℃ and 0 μM H_2O_2) 2) 27℃ and 0.3 μM H_2O_2, 3) 27℃ and 3 μM H_2O_2, 4) high water temperature (31℃) and 0 μM H_2O_2, 5) 31℃ and 0.3 μM H_2O_2, 6) 31℃ and 3 μM H_2O_2.

Under normal temperature and with no addition of H_2O_2, the coral metabolisms (photosynthesis and calcification) were relatively stable. Under high temperature, we observed decreases in photosynthesis and calcification, suggesting that high temperature apparently gave stress on coral colony. There are some differences that depend on the concentration of H_2O_2. With 0 μM H_2O_2 under 31℃, we found 22.1 % decrease of photosynthesis and 20.4 % decrease of calcification. With 0.3 μM H_2O_2 under 31℃, we found 6.7 % decrease of photosynthesis and 20.5 % decrease of calcification. With 3 μM H_2O_2 under 31℃, we found 27.9 % decrease of photosynthesis and 29.7 % decrease of calcification. In photosynthesis, we found significant deference between test 1 and test 4, test 1 and test 6. But, we could not find significant deference between test 1 and test 5. Thus, it was suggested that low concentration H_2O_2 reduced high temperature stress.