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Glucose Turnover by Bacterial Assemblages in Coral Reef

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In a previous report it was clarified that microbial assemblages responded quickly to the organic production by coral and grew actively (Fukami, 1994). Bacterial assemblages were likely to utilize organic matter released from coral, especially mucus, and grow on it. Bacterial production rates in reef flat have already been measured (Moriarty et al., 1985b), however, little information was available on the bacterial assimilation activity in coral reef ecosystems. It has been reported that main components of mucus were protein and polysaccharide (Ducklow and Mitchell, 1979; Meikle et al., 1988). Although glucose is rather a minor component in mucus polysaccharide (Meikle et al., 1988), glucose turnover is still a good index of the activity of microorganisms. In this study glucose turnover rates by bacterial community were measured at three stations on reef edge and in lagoon area to elucidate the microbial activities.

Materials and Methods

Water samples were collected from two stations on the reef edge and one in the lagoon of Heron Island, Great Barrier Reef, Australia in 1992 and 1993 (Fukami, 1994). After getting surface water at each station, water samples were immediately brought back to the laboratory of Heron Island Research Station (HIRS), the University of Queensland. To 20 ml of water samples was added 217 or 342 pmol of ^{14}C-glucose solution (final conc. 11 or 17 nM) and incubated at room temperature (ca. 25°C) for 30 min. The incubation temperature of ca. 25°C was about 2°C higher than *in situ* water temperature. Formaline-killed samples were used as blank. These incubated water samples were filtered through 0.22 μm Millipore filters. After rinsing thoroughly with filtered seawater, radioactivities on the filters were determined with a liquid scintillation counter. Turnover times of glucose were calculated by dividing the amounts of radioactive glucose incorporated by those added.

Results and Discussion

Figure 1 shows the turnover time of glucose by microbial assemblages at 3 stations. Although relatively long turnover times of more than 100 h were occasionally obtained at Stn. 1, values of around several ten hours were usually measured in all three stations. These values are slightly longer than those in eutrophic Tokyo Bay, where glucose turnover time of 8.7 h was obtained by Seki et al. (1975), however, they are remarkably shorter compared with those in pelagic ocean (Seki, et al. 1974). Very short turnover time of 4.1 h was obtained at Stn. 3 (in a lagoon) on October 4, 1992. Around the station on this sampling time, it was observed that extremely high amount of mucus was transported into a lagoon and was supposed that concentration of organic matter in seawater increased. There are, however, apparently no relationships between turnover times and sampling stations nor tidal cycles. Although bacterial activities in terms of glucose turnover rates (this study) and production rates (Moriarty et al., 1985a) in coral reef environments were high, the abundances of bacteria were

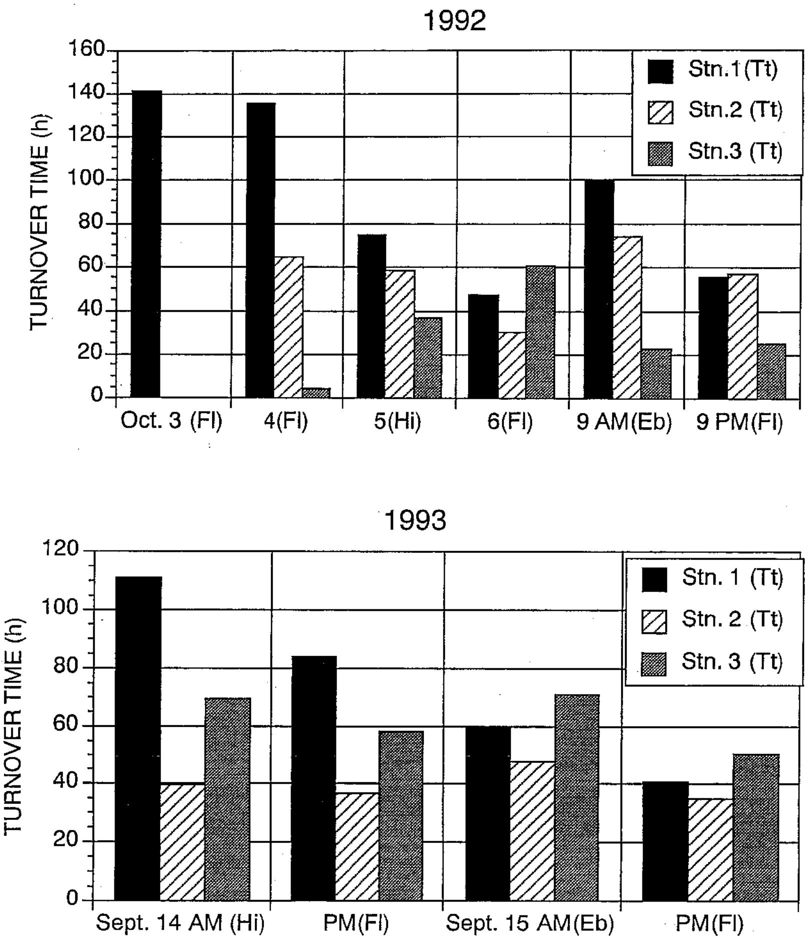

Fig. 1. Glucose turnover time of microorganisms at coral reef edges (Stns. 1 and 2) and in lagoon (Stn. 3) in Heron Island, Great Barrier Reef, Australia. Above: results in 1992; Below: results in 1993. Fl.: flood tide; Hi: high tide; Eb: ebb tide.

relatively low, and moreover, heterotrophic nanoflagellates grew just after the increases of the bacterial number (Fukami, 1994). These results indicate that microbial assemblages in coral reef were of high production and consumption rates, suggesting the quick turnover of microbial communities in reef ecosystems.

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