Organic matter cycling through reef-building corals

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Reef-building corals are one of the major primary producers in coral reefs because of the photosynthetic activity of symbiotic algae (zooxanthellae). A part of the photosynthetic products is released from the coral colonies to the ambient seawater as dissolved and particulate organic matter (DOM and POM, respectively), but subsequent pathways of the organic matter are not well understood. In this study, the release of DOM and POM from the coral *Acropora pulchra* was quantitatively measured for both carbon (C) and nitrogen (N), and bacterial consumption of the released organic matter was observed in dark over six months. The effect of nutrient enrichment on the organic matter cycling was also investigated from the perspective of increasing eutrophication in coral reefs.

The coral colony routinely released POC and DOC at the rates of 840 and 560 nmol cm^{-2} d^{-1}, respectively, per unit surface area of the coral, which were equivalent to 34% and 22% of the growth rate of the tissue C biomass. PON and DON were simultaneously released at the rates of 100 and 84 nmol cm^{-2} d^{-1}, respectively. The released organic matter was gradually decomposed by bacteria in seawater, but was composed of different fractions in the bacterial degradability: the fraction easily mineralized by bacteria had a turnover time of 3-7 d, while over 100 d for the refractory fraction. The flux of organic matter from the coral to bacteria was calculated to be 24% of the growth rate of the coral C biomass. Enhancement of bacterial growth would also increase the growth rate of subsequent heterotrophic microbial community. The experiment on nutrient enrichment has revealed that the organic matter flux from the coral to the heterotrophic community was stimulated due to activated photosynthesis by zooxanthellae. Coral colonies might have the potential to increase heterotrophy in coral reefs when nutrient levels are elevated.