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Environmental factors that enhance or collapse foraminifer-microalgal symbiosis

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Algal symbionts-bearing large benthic foraminifers are known as prolific primary and carbonate producers in coral-reef associated environments at the present and geological times. Understanding the mechanism of foraminifer-microalgal symbiosis is necessary to clarify their responses to secular variations in the Earth system, paleoceanographic changes, and future global environmental changes. Here I reviewed environmental factors that enhance or collapse the foraminifer-microalgal symbiosis. Negative factors which reduce net primary production of algal symbionts and the growth of a foraminiferal host include extremely high and low temperature, low pH, stagnant water motions and high nutrient concentrations. On the other hand, positive factors which enhance net primary production and calcification are poorly known. Our new culturing results indicated that higher pCO₂ enhanced the calcification of symbiont-bearing hyaline taxa due to enhanced photosynthetic activity of the symbionts under high pCO₂ seawater. Future culturing experiments under unrealistic seawater chemistry will give new insights into the mechanisms of foraminiferal-microalgal symbiosis.