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Effects of Ocean Acidification on Viral Ecological Characteristics

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Ocean acidification, as a major consequence of excessive emissions of anthropogenic carbon dioxide (CO_2), bring about changes in environmental chemistry and marine organism. Evaluation of the response of viruses to ocean acidification is crucial to explore the virus-mediated biogeochemical processes in future ocean. Here we investigated the viral production, decay and virus-host interactions with elevated pCO_2 by simulating cultivating experiments in natural environments and laboratory. In the field studies, elevated pCO_2 increased lytic viral production in the light compared with the ambient CO_2 concentration, but no significant effect was found on lysogenic viral production and viral decay, implying that ocean acidification potentially stimulated the viral propagation in light-dependent microbes while a negligible influence was found on viral structure and life strategy. Consequences of the abundance and infectivity of podoroseophage R2C and siphoroseophage R4C under laboratory incubation verified that viral particles were relatively stable in the acidified ocean, but elevated pCO_2 decreased viral infectivity via influencing the indefinite heat labile and high molecular weight dissolved materials in seawater. Strikingly, elevated pCO_2 boosted the metabolism of uninfected *Synechococcus* sp. CB0101 and played a positive effect on the burst size of cyanophage S-CBM2 during the infection, whereas no significant influence was found on the latent period and burst size of siphoroseophage R4C. These results suggesting that the interactions between viruses and heterotrophic bacteria, autotrophic bacteria responded differently to ocean acidification. Thus, ocean acidification was considered as a contributor to viral production via influencing the metabolism of photosynthetic microbes and the interactions between viruses and photosynthetic microbes.