Production of extracellular superoxide and hydrogen peroxide by harmful phytoplankton

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Phosphorus (P) is an essential nutrient that can limit ocean productivity and the biological carbon dioxide (CO_2) pump over a range of timescales. In the marine environment, microbial communities recycle bioavailable P by employing enzymes known as phosphatases to degrade complex P-containing molecules under a range of prevailing nutrient concentrations, from oligotrophic to eutrophic. Here, we examined the transformation of various P-containing molecules by representative diatoms of the genus *Thalassiosira*. Rates of phosphate production arising from the degradation of alternative P sources, as well as proteomic analysis of phosphatase enzyme diversity, revealed preferential degradation of molecules containing phosphoanhydride (P-O-P) bonds, such as inorganic polyphosphate. The transformations of these diverse P-containing compounds by diatoms has implications beyond nutrition, as the degradation of polyphosphate has previously been linked to the sequestration of P via calcium phosphate mineral precipitation. Therefore, this work may act to clarify the role of marine microorganisms in shaping long-term inventory of marine P, and therefore illuminate feedbacks on global marine primary productivity, ecosystem health, and climate.