TRANSPARENT EXOPOLYMER PARTICLES (TEP) PRODUCTION BY MARINE PHYTOPLANKTON IN RESPONSE TO INCREASING CO₂ : LABORATORY AND FIELD MESOCOSM EXPERIMENTS

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The export of organic carbon to the deep ocean is mediated by sinking of large particles, such as marine snow, the formation of which is enhanced in the presence of transparent exopolymer particles (TEP). TEP form from dissolved and colloidal polysaccharides by aggregation processes. Especially when running into nutrient limitation phytoplankton organisms are a source of TEP in pelagic ecosystems as the cells release a significant amount of the assimilated carbon in the form of polysaccharides. Because CO₂ concentration influences carbon assimilation rates, we hypothesized that polysaccharide exudation and aggregation into TEP is related to CO₂ concentration under nutrient limiting conditions. We tested this hypothesis in several lab and outdoor experiments with natural populations and cultures of phytoplankton exposed to various levels of CO₂ concentrations. Our results indicate that TEP production increases with CO₂ concentration and provides an enhanced sink for carbon during phytoplankton blooms.