Peptide hydrolysis, amino acid oxidation, and nitrogen uptake in communities seasonally dominated by Aureococcus anophagefferens

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ABSTRACT: Elevated levels of dissolved organic nitrogen (DON) and dissolved inorganic nitrogen (DIN) are among the factors implicated in the initiation of algal blooms. However, the degree to which phytoplankton augment their autotrophic metabolism with heterotrophic uptake of organic carbon that is associated with DON is unknown. We evaluated the relative importance of peptide hydrolysis, amino acid oxidation, and amino acid uptake over a seasonal cycle in an embayment on Long Island, New York, that had high concentrations of dissolved organic matter (DOM) and a bloom of the brown tide pelagophyte, *Aureococcus anophagefferens*. Amino acids were a significant component (up to 50%) of the total N uptake, particularly during the late summer. About half of the associated amino acid C was also taken up. Amino acid oxidation rates were an order of magnitude lower than free amino acid uptake rates, but still supplied up to 32.5% of the NH taken up. Up to 75% of the amino acid oxidation was in the bacterial size fraction (<1.2 µm), and rates were significantly correlated with bacterial densities. Peptide hydrolysis rates were high, and most (up to 72%) occurred in the brown tide size fraction (1.2-5 µm). The high rates of peptide hydrolysis and amino acid uptake measured in cultures of *A. anophagefferens* confirm that this species can readily hydrolyze peptides and take up N and C from amino acids. Laboratory findings and size-fractionation studies in the field suggest that *A. anophagefferens* plays a major role in consumption of both C and N from DOM.