A NOVEL APPROACH TO DOP PRODUCTION RATE ESTIMATES IN EPIPELAGIC OCEAN WATERS

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ABSTRACT

The importance of dissolved organic phosphorus (DOP) in meeting microbial phosphorus (P) requirements in surface ocean waters was examined. Laboratory studies were conducted to evaluate two methods of measuring $DO^{32}P$ accumulation during seawater sample incubations with $^{32}PO_4$. Accumulation rates (nCi ^{32}P per unit volume per unit time) were then extrapolated to total DOP fluxes (ng P per unit volume per unit time) by assuming either: (1) $DO^{32}P$ specific radioactivity (nCi ^{32}P per ng P) was equal to that measured for the total dissolved phosphorus pool (TDP method), or (2) $DO^{32}P$ specific radioactivity was equal to that of the P contained in newly formed RNA, measured by independent methods (RNA method). The latter approach yielded lower specific radioactivities and consequently higher estimates of DOP flux in the majority of oligotrophic ocean samples. Other calculations compared nucleic acid synthesis rates based on ^{3}H-adenine incorporation to synthesis rates based on incorporation of either dissolved inorganic phosphate (DIP) or TDP.

Two north Pacific Ocean stations were examined in detail. Measured DOP production rates in the mesotrophic ocean off Manzanillo, Mexico ranged from 18 to 328 ng P l^{-1} h^{-1} (by TDP method) and from 3 to 421 ng P l^{-1} h^{-1} (by RNA

method). DOP production rates in the oligotrophic central north Pacific Ocean ranged from 3 to 56 ng P l^{-1} h^{-1} (by TDP method) and from 2 to 193 ng P l^{-1} h^{-1} (by RNA method). Size fractionation studies indicated an important role for both bacteria and algae in converting phosphate to DOP, and emphasized the importance of two size classes of grazers in contributing to DOP production.