

Association for the Sciences of Limnology and Oceanography





Home

Members

Libraries

Publications

Meetings

Employment

Activ

Phosphonate metabolism by *Trichodesmium* IMS101 and the production of greenhouse gases

Beversdorf, L. J., A. E. White, K. M. Björkman, R. M. Letelier, and D. M. Karl

Limnol. Oceanogr., 55(4), 2010, 1768-1778 | DOI: 10.4319/lo.2010.55.4.1768

ABSTRACT: A series of laboratory experiments were conducted to investigate (1) the capacity of Trichodesmium IMS101 to hydrolyze phosphonates as a source of phosphorus (P) for growth, (2) the stoichiometric relationship between phosphonate use and biogenic gas production, and (3) the potential inhibition of phosphonate hydrolysis by additions of dissolved inorganic phosphorus (DIP). Trichodesmium IMS101 is capable of cleaving the carbon-P bond found in methylphosphonate (MPn) and ethylphosphonate (EPn), and the decomposition of these particular phosphonates results in the stoichiometric production of the greenhouse gases methane (CH₄) and ethane (C,H,), respectively. Growth on 2-aminoethylphosphonate (2-AEP) led to modest ethylene (C,H,) production. Normalized to rates of Trichodesmium carbon (C) fixation, biogenic gas production as a result of either MPn or EPn hydrolysis (0.95 \pm 0.04 mmol CH, (mol C)" and 1.18 \pm 0.11 mmol C₂H₆ (mol C)", respectively) approximates rates of DIP use (1.11 \pm 0.05 P mmol P (mol C)") measured in parallel cultures. DIP, MPn, and EPn can be used by Trichodesmium IMS101 as a sole source of P with equal metabolic efficiency. Additionally, neither MPn hydrolysis nor the production of CH, was significantly inhibited by additions of up to 30 mmol DIP L.". These results imply that Trichodesmium can use multiple P resources simultaneously for growth and that the production of greenhouse gases occurs during decomposition pathways of select phosphonates.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.