



## Production of dissolved organic matter by phytoplankton and its uptake by heterotrophic prokaryotes in large tropical lakes

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**ABSTRACT:** In pelagic ecosystems, phytoplankton extracellular release can extensively subsidize the heterotrophic prokaryotic carbon demand. Time-course experiments were carried out to quantify primary production, phytoplankton excretion, and the microbial uptake of freshly released dissolved organic carbon (DOC) derived from phytoplankton extracellular release (DOC<sub>p</sub>) in four large tropical lakes distributed along a productivity gradient: Kivu, Edward, Albert, and Victoria. The contributions of the major heterotrophic bacterial groups to the uptake of DOC<sub>p</sub> was also analyzed in Lake Kivu, using microautoradiography coupled to catalyzed reporter deposition fluorescent in situ hybridization. The percentage of extracellular release (PER) varied across the productivity gradient, with higher values at low productivity. Furthermore, PER was significantly related to high light and low phosphate concentrations in the mixed layer and was comparatively higher in oligotrophic tropical lakes than in their temperate counterparts. Both observations suggest that environmental factors play a key role in the control of phytoplankton excretion. Standing stocks of DOC<sub>p</sub> were small and generally contributed less than 1% to the total DOC because it was rapidly assimilated by prokaryotes. In other words, there was a tight coupling between the production and the heterotrophic consumption of DOC<sub>p</sub>. None of the major phylogenetic bacterial groups that were investigated differed in their ability to take up DOC<sub>p</sub>, in contrast with earlier results reported for standard labeled single-molecule substrates (leucine, glucose, adenosine triphosphate). It supports the idea that the metabolic ability to use DOC<sub>p</sub> is widespread among heterotrophic prokaryotes. Overall, these results highlight the importance of carbon transfer between phytoplankton and bacterioplankton in large African lakes.

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