

Scientific Paper:

FEMS Microbiol Ecol 64, 230-239, 2008

Effect of exposure to sunlight and phosphorus-limitation on bacterial degradation of coloured dissolved organic matter (CDOM) in freshwater

Theis Kragh¹, Morten Søndergaard¹ & Lars Tranvik²

¹Freshwater Biological Laboratory, University of Copenhagen, Helsingørsgade, Hillerød, Denmark

²Department of Ecology and Evolution, Limnology BMC, Uppsala University, Uppsala, Sweden

Abstract:

This study reports on the interacting effect of photochemical conditioning of dissolved organic matter and inorganic phosphorus on the metabolic activity of bacteria in freshwater. Batch cultures with lake-water bacteria and dissolved organic carbon (DOC) extracted from a humic boreal river were arranged in an experimental matrix of three levels of exposure to simulated sunlight and three levels of phosphorus concentration. We measured an increase in bacterial biomass, a decrease in DOC and bacterial respiration as CO₂ production and O₂ consumption over 450 h. These measurements were used to calculate bacterial growth efficiency (BGE). Bacterial degradation of DOC increased with increasing exposure to simulated sunlight and availability of phosphorus and no detectable growth occurred on DOC that was not pre-exposed to simulated sunlight. The outcome of photochemical degradation of DOC changed with increasing availability of phosphorus, resulting in an increase in BGE from about 5% to 30%. Thus, the availability of phosphorus has major implications for the quantitative transfer of carbon in microbial food webs.

Key-words: Bacterial growth efficiency, BGE, CDOM, DOC, UV light, phosphorus