



The role of unchelated Fe in the iron nutrition of phytoplankton

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Limnol. Oceanogr., 53(1), 2008, 400-404 | DOI: 10.4319/lo.2008.53.1.0400

ABSTRACT: The important question of iron bioavailability in the sea has become complicated by the discovery that marine phytoplankton can take up Fe bound in very stable chelates via reductive processes, and some particular Fe species through specialized transport mechanisms. As a result there is some question of whether the small fraction of Fe that is "free" or unchelated in seawater is important in the nutrition of natural phytoplankton assemblages. A careful examination of published laboratory studies on Fe uptake by model organisms all support the idea that unchelated Fe(III) is highly available for uptake and that it is an important source of the Fe taken up by phytoplankton under a variety of experimental conditions. Comparing these results with field data on Fe speciation shows that unchelated Fe can be an important source of Fe to the phytoplankton in the sea: it is likely sufficient to contribute the bulk of the Fe supporting primary production in regions that are not limited by Fe and a significant fraction everywhere, including high-nutrient low-chlorophyll areas.

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