Zinc-cobalt colimitation of Phaeocystis antarctica

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ABSTRACT: We present evidence demonstrating the capability of *Phaeocystis antarctica* colonies to substitute cobalt (Co) and zinc (Zn) as micronutrients, in which Co limitation is alleviated by additions of Zn and vice versa. Maximal growth rates and biomass were determined by fluorescence and the values obtained under replete Zn and no added Co conditions were significantly higher than under replete Co and no added Zn conditions, suggesting a preference for Zn over Co. The observation of Zn-Co substitution in this high-latitude member of the Prymnesiophyceae class, coupled with similar previous observations in the coccolithophore *Emiliana huxleyi* and several centric diatoms, suggests that Zn-Co substitution could be a widespread global phenomenon in eukaryotic phytoplankton. The Zn-Co biochemical substitution seen in *Phaeocystis* might be the result of evolutionary pressure for maintaining growth rates in high export environments in which rapid depletion of Zn, Co, and carbon occur simultaneously in the upper water column.

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