



Interactive regulation of dissolved copper toxicity by an estuarine microbial community

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ABSTRACT: Cultured marine microorganisms under copper stress produce extracellular compounds having a high affinity for copper (copper-complexing ligands). These ligands are similar in binding strength to those found in natural waters, but few studies have examined the relationship between copper, copper-complexing ligand concentrations, and natural microbial populations. A series of in situ experiments in the Elizabeth River, Virginia, revealed that an intact estuarine microbial community responded to copper stress by production of extracellular, high-affinity copper complexing ligands. The rate of ligand production was dependent on copper concentration and resulted in a reduction of the concentration of free cupric ions, Cu^{2+} , by more than three orders of magnitude during a 2-week period in one experiment. We believe that this interactive response to copper stress represents a feedback system through which microbial communities can potentially buffer dissolved Cu^{2+} ion concentrations, thereby regulating copper bioavailability and toxicity.

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