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Title: Cycling of DOC and DON by Novel Heterotrophic and Photoheterotrophic Bacteria in the Ocean

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Abstract:

The flux of dissolved organic matter (DOM) through aquatic bacterial communities is a major process in carbon cycling in the oceans and other aquatic systems. Our work addressed the general hypothesis that the phylogenetic make-up of bacterial communities and the abundances of key types of bacteria are important factors influencing the processing of DOM in aquatic ecosystems. Since most bacteria are not easily cultivated, the phylogenetic diversity of these microbes has to be assessed using culture-independent approaches. Even if the relevant bacteria were cultivated, their activity in the lab would likely differ from that under environmental conditions.

This project found variation in DOM uptake by the major bacterial groups found in coastal waters. In brief, the data suggest substantial differences among groups in the use of high and molecular weight DOM components. It also made key discoveries about the role of light in affecting this uptake especially by cyanobacteria. In the North Atlantic Ocean, for example, over half of the light-stimulated uptake was by the coccoid cyanobacterium, *Prochlorococcus*, with the remaining uptake due to *Synechococcus* and other photoheterotrophic bacteria. The project also examined in detail the degradation of one organic matter component, chitin, which is often said to be the second most abundant compound in the biosphere.

The findings of this project contribute to our understanding of DOM fluxes and microbial dynamics supported by those fluxes. It is possible that these findings will lead to improvements in models of the carbon cycle that have compartments for dissolved organic carbon (DOC), the largest pool of organic carbon in the oceans.

Publications Supported by DOE

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Postdoctorate and Research Fellows

Amy Svitil
Matthew Cottrell

Graduate Students Fully or Partially Supported by this DOE project

1. Jessica Moore, M.S. 1999
2. Hila Elifantz, Ph.D. 2007
3. Vanessa Michelou, Ph.D., projected graduation in 2009
4. Lisa Waidner, Ph.D., 2007

Two other students, Rex Malmstrom (Ph.D., 2005) and Tiffany Straza (Ph.D. expected in 2009), were not supported by this project, but benefited from it and helped out in many aspects.

Undergraduate Students

This research grant support summer intern projects by undergraduate students from Lincoln University, the nation's oldest historical Black college. One or two students were supported each summer during the project.